

Developing information and communications technology to provide more intelligence and leverage more wisdom for a dramatically changing World

-Part 4-



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Abstract

*The paper analyses the context of the increasing complexity of World evolutions, now manifesting by the multi-crises we began to face and suffer from, which leads to unpredictable challenges for our ecosystem, resulting from unprecedentedly complicated and unsustainable processes of this system, as we could count here the climate changes, social and geopolitical unbalances or Earth resources fading. Along with such premises, largely known, we consider, for a more efficacy approach, to also include the role of humankind nature/behaviour and evolution along with these processes, in order to find how we have arrived to this point/level of dramatism at Earth scale and the ways toward appropriate solutions. We believe that, usually, the larger the humankind power, the probability of going to unsafe/unsustainable directions, or even failing the target, is slightly increasing. More than these, from a long history, we know that humankind potential has a dual face: to construct and to destroy. As a matter of fact, we consider that, generally, the fundamental problem of humankind evolution was and remain just our ability to balance this duality for a sustainable/constructive progress, but here **the news is that the actual levels of power, complexity and Earth resources, which humankind could use, arrived in a critical combination of parameters**. This actual critical combination could be seen like a very sharp sword, for which the technology provided highly strong materials but humankind decisions positive potential, in spite of the science unprecedented progress, is highly impaired by the highly complex and complicated processes of Earth ecosystem.*

*For a more realistic image of the factors to be approached for an optimization analysis, when estimating the actual premises, we consider to count perhaps the most influent, but difficult to control factors of the aimed balance: the ever changing/subjective role of human personality and the crucial multiplying role of technology, where information and communication technology (ICT) is the most prevailing. We think that the education is the main way to change the people toward a better World and the combination of human intelligence (HI) and artificial intelligence (AI), we already approached [6][9], is and will be more and more linked with ICT sustainable development. Among the few certainties of the new normality, we are looking for, **the necessity of new paradigms for a multicriteria approach, along with the relativity of any optimization solution in a complex, complicate and interconnected Earth ecosystem of highly dynamic processes, should be included.***

As relevant ICT advances, AI is the most complex and also promising, but **any optimization** should address both measuring and metrics, which are real challenges to define and design for the complex and complicate subsystems of Earth ecosystem, especially for those parts of the processes where ICT/AI is largely involved. Addressing these issues, the paper analyses a comprehensible example for the **multi-criteria approach and the relativity of AI development optimization** [1], approaching both AI measuring and metric. Although, apparently, the main issue and criteria of the optimization is energy efficiency (**among the most important performance parameter for present and future ICT systems**), for AI unprecedented advances and expansion this is far from being enough to be considered, especially because of the inherent diversity and complexity of the potential AI applications World-wide. Beyond competition aspects, we noticed the technology advances implications, as AI accelerator chips, which could make the difference in certain areas of applications. Even with such complex AI benchmarks, in the actual dynamic ICT/AI context, it is very difficult to generally optimize/rank the technology advances, but they still provide means to evaluate the typical applications performance differences.

Another analysed example, also presenting systemic covering and relevance at Earth scale, referred to the implications of developing safe ICT applications for the huge industry of modern cars, aiming the proper protection/reliability against cyberattacks [2]. The crucial importance of cars industry must be also understood in the crises emergent context, but inherently from multi-criteria point of view (sustainability, energy, reliability, security etc.), being a special part of World critical infrastructure/services. The complex dependence on ICT was proved, this way, more than obvious and highly increasing, in the Earth ecosystem expansion, generating more complex challenges at different levels of development, even when considering the standardization at the United Nations (UN) level, which is surely more and more necessary, as the diversity and complexity increase in every industry. From the resulted list of requirements for achieving a proper protection/reliability against cyberattacks, we could notice that optimizing such complex and dynamic industry/domain is involving a lot of interdependent processes, along with associated human inputs/outputs which are surely relative and time sensitive factors.

Further, we noticed that the ICT optimal development analyses should be extended by deeper refining of context knowledge and multi-criteria optimization at Earth scale and humankind behaviour level. Using one of the special features of ICT development, we consider that a systemic approach should include the proper information management in order to maximize the efficacy and efficiency of optimization analyses, i.e., to **refine knowledge** in a continuously manner regarding the **multi - crises challenges** implications on short and long term, but taking into account the unprecedented high level of incertitude and changing which must alter the actual paradigms of development.

There are many lessons to be learned from the cars example/case, as the modern car (especially the emerging self-driving one), along with the smartphone, are perhaps the most relevant symbols of humankind technology progress, where ICT advances impact is more than essential. Still, the protection of modern cars, although a planetary issue with dynamic challenges, considering the increasing complexity and the extended proliferation, is only a facet of World picture, but still relevant here by the impact of ICT involved applications and their fast advances. In fact, **all the World seems to be a fast and complicated car, moving still faster by the ICT impact, but sometimes we wonder where to and which are the chances to safely get there!**

Recalling the mentioned essential role of the proper information management in the modern cars huge industry, the information context and risk factors evaluation must be also considered, for intelligent cars, but also for the rest of the World led by ICT advances. Finally, concrete ways to attend the needed target in the complicate and changing environment of hostile factors could be found by practical sets of measures which should be followed and continuously improved in processes of check and act type.

Paper analysis, which aimed more general and large covering approaches, using the ICT potential at Earth ecosystem scale, also considered the comprehensive frame of the information security standard, given by ISO 27001, the world's best-known standard for information security management systems (ISMS), which provides a coherent and holistic approach (meaning that the entire organization is covered, not just IT [4]), i.e., here we have the evidence that the link between information and all the Earth ecosystem is essential, real and functional, as the information is the operational element of the systemic approach. This way, the understanding of refining knowledge, i.e., the highest way/level of benefit from information, is clear, as we have to approach introspections on how the most complex actual challenges could be identified and step by step treated using actual data/information/knowledge, new models and innovation.

Finally, for the considered ICT role in the World dramatic/crises context and emergence, the analyses must be further focused on testing the resilience of the associated complex systems, i.e., the appropriate models of the Earth ecosystem context. This way, engineering and designing complex and interconnected systems become a major goal of the actual ICT development, as resulted from another relevant example [5].

As seen in the case of modern cars industry, **testing procedures are not enough if the knowledge is not continuously refined, i.e., using actual data, new paradigms and human innovation/imagination.** In concrete approaches, refining knowledge means that we have to change paradigm, use data of actual crises and challenges, along with needed support.

Along with these technical/logical ingredients, in order to get wisdom solutions, perhaps the most difficult of them is to identify and introduce those human weighting factors (as behaviors) that meet the wisdom which corresponds to the actual context and provides the sustainable evolution and sometimes even the surviving requirements for the Earth ecosystem and humankind progress, as it is, indirectly, confirmed by[5] too, where a ray of hope could be imagined, as there exists an inherent ability to survive and bounce back, but, in addition, **we should also consider the need to be in natural ecosystems, i.e., to benefit from their potential of adapting and surviving.** Practically, using also the huge potential of AI/ICT, we have to count our differences versus a natural ecosystem and mitigate the consequences, focusing on **climate changes, Earth resources fading etc.**

As main conclusion, we consider that, for meeting “wisdom”, in such complex and dramatic World context we live in, deeper and timely analyses should continue, keeping in mind the necessity to achieve what it seems that we have lost: the (natural) chances of our Earth ecosystem to adapt and survive.

Keywords: artificial intelligence performance, cybersecurity, modern cars, refining knowledge, accelerator chips, ISO/IEC 27001, resilience of complex systems

JEL Classification: L63; L86; M15; O31; O33

Knowing yourself is the beginning of all wisdom
— Aristotle

1. Watching ICT advances through the new dramatical World challenges

After decades of wondering about technology amazing progress, our expectations from future, which is becoming more and more uncertain, tend to prevail upon the usual benefits and comfort we are used to be with.

Such impressions are most probably determined by the role of the increasing complexity of World evolutions, now manifesting by the multi-crises we began to face and suffer from [3].

The role of complexity in the unpredictable World evolution is mainly linked with the evolution of our ecosystem, resulting from unprecedentedly complicated and unsustainable processes of this system, as we could count here the climate changes, social and geopolitical unbalances or Earth resources fading (we also earlier approached [11][12]).

As such premises were largely known, without saying that their analysis is no more necessary (on contrary), we consider, for a more efficacy approach, to also include the role of humankind nature/behaviour and evolution along with these processes.

In fact, it is not rarely when people say: How all these became possible? How we have arrived to this point/level of dramatism at Earth scale?

It is sure that the answers are not simple, but also the questions could be ...many more. Here we have to count not only the Covid 19 pandemic or Russia's aggression context, but all their consequences and correlations with **the prior premises of Earth ecosystem and humankind evolution, where climate changes, Earth resources fading or energy crisis were iceberg tips to be ... properly considered!**

We believe that, usually, the larger the humankind power, the probability of going to unsafe/unsustainable directions, or even failing the target, is slightly increasing.

Although it is not new, from a long history, we know that humankind potential has a dual face: to construct and to destroy.

As a matter of fact, we consider that, generally, the fundamental problem of humankind evolution was and remain just our ability to balance this duality for a sustainable/constructive

progress, but here **the news is that the actual levels of power, complexity and Earth resources, which humankind could use, arrived in a critical combination of parameters.**

With other words, this actual critical combination is just like a very sharp sword, for which the technology provided highly strong materials but humankind decisions positive potential, in spite of the science unprecedented progress, is highly impaired by the highly complex and complicated processes of Earth ecosystem.

In order to have a more realistic image of the factors to be approached for an optimization analysis, when estimating the actual premises, we consider to count perhaps the most influent, but difficult to control factors of the aimed balance: the ever changing/subjective role of human personality and the crucial multiplying role of technology, where *information and communication technology (ICT)* is the most prevailing.

More than these, the proliferation of ICT and its amazing expansion at Earth scale became the main driving factor of the human society by the complex consequences of ICT services, products and applications when supporting the Information Society (IS) on the way towards the Knowledge Based Society (KBS) [13][10][7][14][16][17][12].

This way we have just arrived to the point where the role of ICT in optimizing the Earth ecosystem and humankind evolution, aiming a sustainable World progress in the new dramatical context, is obviously crucial but the expected solutions are still faraway.

As **the ever changing/subjective role of human personality** in the decision processes (generally in governance) is, in its turn, related to the complex premises of education and human nature, its analysis would be perhaps an even more difficult issue, exceeding our paper aim, although most of people think that the World evolution is depending on leaders quality.

On the other side, we consider that the education is the main way to change the people toward a better World and the combination of human intelligence (HI) and artificial intelligence (AI), we already approached [6][9], is and will be more and more linked with ICT sustainable development.

Among the few certainties of the new normality, we are looking for, **the necessity of new paradigms for a multicriteria approach, along with the relativity of any optimization solution in a complex, complicate and interconnected Earth ecosystem of highly dynamic processes, should be included.**

For a concrete and realistic picture of this context of ICT sustainable development, we consider that among the relevant ICT advances, AI is the most complex but also promising.

Further, **any optimization** should address both measuring and metrics, which are real challenges to define and design for the complex and complicate subsystems of Earth ecosystem, but especially for those parts of the processes where ICT is largely involved.

A comprehensible example for the **multi-criteria approach and the relativity of AI development optimization**, is step by step and concretely presented by [1]:

“... AI industry group MLCommons released a new set of results for AI performance. The new list, MLPerf Version 1.1, follows the first official set of benchmarks by five months and includes more than 1800 results from 20 organizations, with 350 measurements of energy efficiency. The majority of systems improved by between 5-30 percent from earlier this year, with some more than doubling their previous performance stats, according to MLCommons. The new results come on the heels of the announcement, last week, of a new machine-learning benchmark, called TCP-AIx”.

Although, apparently, the main issue and criteria of the optimization is *energy efficiency* (**among the most important performance parameter for present and future ICT systems**), for AI unprecedented advances and expansion this is far from being enough to be considered, especially because of the inherent diversity and complexity of the potential AI applications Worldwide:

“In MLPerf’s inferencing benchmarks, systems made up of combinations of CPUs and GPUs or other accelerator chips are tested on up to six neural networks performing a variety of common functions—image classification, object detection, speech recognition, 3D medical imaging, natural language processing, and recommendation. For commercially available data center-based systems they were tested under two conditions—a simulation of real data center activity where queries arrive in bursts and “offline” activity where all the data is available at once. Computers meant to work onsite instead of in the data center—what MLPerf calls the edge—were measured in the offline state and as if they were receiving a single stream of data, such as from a security camera.”

Step by step, the above-mentioned complexity and expansion of ICT/AI applications are concretely revealed and practically considered in the measuring processes and this way the appropriate metrics are suggested for the **multi-criteria approach of AI development optimization**:

“Although there were datacenter-class submissions from Dell, HPE, Inspur, Intel, LTech Korea, Lenovo, Nvidia, Neuchips, Qualcomm, and others, all but those from Qualcomm and Neuchips used Nvidia AI accelerator chips. Intel used no accelerator chip at all, instead demonstrating the performance of its CPUs alone. Neuchips only participated in the recommendation benchmark, as their accelerator, the RecAccel, is designed specifically to speed up recommender systems—which are used for recommending e-commerce items and for ranking search results.

Beyond competition aspects, we observe the technology advances implications, as AI accelerator chips, which could make the difference in certain areas of applications:

“For the results Nvidia submitted itself, the company used software improvements alone to eke out as much as a 50 percent performance improvement over the past year. The systems tested were usually made up of one or two CPUs along with as many as eight accelerators. On a per-accelerator basis, systems with Nvidia A100 accelerators showed about double or more the performance those using the lower-power Nvidia A30. A30-based computers edged out systems based on Qualcomm’s Cloud AI 100 in four of six tests in the server scenario. However, Qualcomm senior director of product management John Kehrli points out that his company’s accelerators were deliberately limited to a datacenter-friendly 75-watt power envelope per chip, but in the offline image recognition task they still managed to speed past some Nvidia A100-based computers with accelerators that had peak thermal designs of 400 W each.”

Finally, we could notice that even with such complex benchmarks, in the actual dynamic ICT/AI context, it is very difficult to generally optimize/rank the technology advances, but they still provide means to evaluate the typical applications performance differences:

“With six tests under two conditions each in two commercial categories using systems that vary in number of CPUs and accelerators, MLPerf performance results don’t really lend themselves to some kind of simple ordered list like Top500.org achieves with supercomputing.

The parts that come closest are the efficiency tests, which can be boiled down to inferences per second per watt for the offline component. Qualcomm systems were tested for efficiency on object recognition, object detection, and natural language processing in both the datacenter and edge categories. In terms of inferences per second per watt, they beat the Nvidia-backed systems at the machine vision tests, but not on language processing. Nvidia-accelerated systems took all the rest of the spots.”

Another example, also presenting systemic covering and relevance at Earth scale, is referring to the implications of developing safe ICT applications for the huge industry of modern cars, aiming the proper protection/reliability against cyberattacks.

The crucial importance of cars industry must be also understood in the crises emergent context, but inherently from multi-criteria point of view (sustainability, energy, reliability, security etc.), being a special part of World critical infrastructure/services, as it is presented in [2]:

“These days, if something connects to an information stream, it’s vulnerable to cyberattacks. And since modern cars are essentially data centers on wheels, it’s easy to understand why they’ve piqued the interest of hackers. From infotainment systems and engine control units to steering columns and brake lines, almost everything in a vehicle tie into various computer-based subsystems.”

The complex dependence on ICT is then more than obvious and highly increasing, in the Earth ecosystem expansion, generating more complex challenges at different levels of development:

“The trouble is that each system offers multiple footholds for attackers to exploit. But that’s only half the problem. Cars connect over a number of interfaces — including USB, CAN bus, Wi-Fi, Bluetooth, cellular, and automotive ethernet. These interfaces give cybercriminals a veritable smorgasbord of attack options, making it a nightmare for your engineering and testing teams to secure.”

Perhaps it could not appear among the first solutions, but, for the original equipment manufacturers (OEMs), the standardization at the United Nations (UN) level is surely more and more necessary, as the diversity and complexity increase in every industry, but here the impact is quite fundamental:

“The World Forum for Harmonization of Vehicle Regulations, UNECE WP.29 is a wide-ranging strategic initiative to bring OEMs into lockstep on various vehicular regulations, from the headlights to the exhaust pipe. In June 2020, WP.29 adopted a new framework to combat cybersecurity risks on passenger vehicles. The group’s work resulted in a pair of regulations — instructing automakers to implement measures to:

Manage vehicle cybersecurity risks.

Mitigate risks along the supply chain by securing vehicles in design.

Detect and respond to security incidents across the vehicle fleet.

Provide safe, secure software updates that do not compromise vehicle security.

Think of this high-level guidance as a proverbial carrot, while the included regulations are a stick.”

From this impressive list of requirements, we could notice that optimizing such complex and dynamic industry/domain is involving a lot of interdependent processes, along with associated human inputs/outputs which are surely relative and time sensitive factors.

This way we consider that the ICT optimal development analyses should be extended by deeper refining of context knowledge and multi-criteria optimization at Earth scale and humankind behaviour level.

2. The long and complicate ways toward wisdom when refining knowledge at Earth scale, facing multi - crises challenges

Traditionally, when incertitude prevails, wisdom is sometimes associated with keeping the routine/behaviour in thinking and acting, but now the times are changing that approach, as deeply refining knowledge should become mandatory in our fast and turbulently changing World.

After the above examples, it is clear that there is a long and difficult way to exhaustive optimization solutions, this conclusion exceeding, unfortunately, the impact of ICT development or the modern cars industry, as ones of the most dynamic and prolific branches of World economy, which generate huge implications on all humankind activities and evolution.

Using one of the special features of ICT development, we consider that a systemic approach should include the proper information management in order to maximize the efficacy and efficiency of optimization analyses, i.e., to **refine knowledge** in a continuously manner regarding the **multi - crises challenges** implications on short and long term, but taking into account the unprecedented high level of incertitude and changing which must alter the actual paradigms of development.

Again, as a very good example, the protection of modern cars, although a planetary issue with dynamic challenges, considering the increasing complexity and the extended proliferation, is only a facet of World picture, but still relevant here by the impact of ICT involved applications and their fast advances.

In fact, **all the World seems to be a fast and complicated car, moving still faster by the ICT impact, but sometimes we wonder where to and which are the chances to safely get there!**

Anyway, it is sure that there are many lessons to be learned from the cars example/case, as the *modern car* (especially the emerging self-driving one), along with the smartphone, are perhaps the most relevant symbols of humankind technology progress, where ICT advances impact is more than essential.

Recalling the mentioned essential role of the proper information management in the modern cars huge industry, the information context and risk factors evaluation are also considered by [2] as:

“But for original equipment manufacturers (OEMs), cybersecurity is anything but a trivial matter. In fact, a single cyberattack can cost an automaker as much as \$1.1 billion.

But the sheer monetary impact isn’t the only thing keeping business leaders up at night. The effects of a cyberattack extend far and wide — including potential legal / compliance fines, brand reputation impact, and crippling market capitalization losses...

OEMs must establish and implement a cybersecurity management system (CSMS) that implements risk-driven engineering processes for vehicular components, subsystems, and assemblies.”

Further, the common threat/challenge, for intelligent cars, but also for the rest of the World led by ICT advances, is clearly pointed:

“A good CSMS requires an extensive evaluation of applicable threats — which is otherwise known as a Threat Analysis and Risk Assessment (TARA). TARAs enable OEMs to identify, implement, and verify mitigations before pushing fixes to components and systems via software updates. But what if a new threat emerges? Engineering teams need a repeatable response that prioritizes speed and accuracy. A CSMS gives them the tools to promptly evaluate and mitigate emerging threats while ensuring their corrective actions didn't inadvertently expose something else to attack.”

Finally, the concrete ways to attend the needed target in the complicate and changing environment of hostile factors is found:

<<How can automakers fight back against cybercriminals?

Now that the standards are written and the regulations adopted, the next question seems all too obvious. “Where do we go from here?”

Given the state of the threat landscape and the incoming regulations, it's easy to understand the uncertainty. But ISO / SAE 21434, WP. 29, and UN R155 aren't a threat. They're a playbook to beating cybercriminals at their own game. But what does that mean? Well, for automakers, that means attacking your own vehicles — before someone else gets the chance. It all comes down to thinking like the enemy. Where a cybercriminal seeks to exploit system and component vulnerabilities, automakers can perform controlled cyberattacks to test vehicular security (in alignment with their CSMS). This practice is generally referred to as automotive penetration testing and encompasses multiple test types — including functional cybersecurity testing, fuzz testing, and vulnerability testing.>>

From here it is clear that practical sets of measures should be followed and continuously improved in processes of check and act type.

On the other side, our analysis, which aims more general and large covering approaches, using the ICT potential at Earth ecosystem scale, have to consider and benefit from the comprehensive frame of the information security standards.

The fundamental frame of the information security standards, given for example by ISO 27001, the world's best-known standard for information security management systems (ISMS), provides a coherent and *holistic approach*, as it is also presented by [4]:

“Organizations that adopt cyber resilience through confident vulnerability quickly emerge as leaders in their industry and set the standard for their ecosystem. The holistic approach of ISO/IEC 27001 means that the entire organization is covered, not just IT. People, technology and processes all benefit.

When you use ISO/IEC 27001, you demonstrate to stakeholders and customers that you are committed to managing information securely and safely. It's a great way to promote your organization, celebrate your achievements and prove that you can be trusted. “

Although we do not intend to detail the ISO/IEC 27001 potential, it is worth to notice that its less visible part is crucial, as *“the entire organization is covered, not just IT. People, technology and processes all benefit”*, i.e., here we have the evidence that the link between information and all the Earth ecosystem is essential, real and functional, as the information is the operational element of the systemic approach.

This way, the understanding of refining knowledge, i.e., the highest way/level of benefit from information, is clear, as we have to approach introspections on how the most complex actual challenges could be identified and step by step treated using actual data/information/knowledge, new models and ...imagination.

Going beyond the traditional, but fundamental approach of the information security standards, given for example by *ISO/IEC 27001*, for the considered ICT role in the World dramatic/crises context and emergence, as we already have mentioned [3], the analyses must be further focused on resilience of the associated complex systems, i.e., the appropriate models of the Earth ecosystem context.

As we have pointed [16], engineering and designing complex and interconnected systems is becoming a major goal of the actual ICT development and this approach is successfully also presented by [5]:

“For modern day engineering systems, designing for resilience or testing resilience at the design phase, poses a significant challenge. Due to the interconnectedness and embeddedness of these systems in a nested system of systems [2]–[4], it gets increasingly difficult to adopt the traditional approach of testing a system in isolation for resilience. Here, isolation refers to engaging with stress testing using a restrictive set of prede-termined input parameters and system specific conditions [5].”

Here we have to notice that, as mentioned also in the case of modern cars industry, **testing procedures are not enough if the knowledge is not continuously refined, i.e., using actual data, new paradigms and ...human innovation/imagination.**

In concrete approaches, refining knowledge means that we have to change paradigm, use data of actual crises and challenges, along with needed support:

<<Supporting the argument for a need to develop alternative methodologies to approach engineering system resilience, Gheorghe and Katina [1] quote “the dwindling applicability of ‘old’ methods and tools cannot be expected to address increasing 21st century concerns.” The underlying assumption to this assertion is that being complex, these systems demonstrate complexity traits such as adaptation, self-organization, and emergence; and these system traits inherently conflict with the purpose-driven approach of engineering system design that looks for convergence of behaviors and consistency of design and performance [7].
>>

Beyond these technical/logical ingredients, in order to get wisdom solutions, perhaps the most difficult of them is to identify and introduce those human weighting factors (as behaviors) that meet the wisdom which corresponds to the actual context and provides the sustainable evolution and sometimes even the surviving requirements for the Earth ecosystem and humankind progress.

The complexity of such optimization, including, indirectly, human factors, though our model of weighting factors could seem too sophisticated, is in fact further confirmed:

“A complexity perspective prompts engineering systems’ research to reason why a system behavior exceeds what is intuitively the sum of its individual parts [8]. Prime examples of these, that will be expanded later on, are transportation infrastructure that not only connect existing places, but shape the commuting patterns, the supply chains, the emergence of new conurbation, and so on. Another question that may arise is whether embeddedness or interconnectedness is actually to be blamed for loss in resilience [9, p. 13]. Elsewhere in

complex natural system research, it has been established that in natural ecosystems, which are proven to be highly nested and interconnected, there exists an inherent ability to survive and bounce back [1]. “

More than these, a ray of hope could be imagined, as *there exists an inherent ability to survive and bounce back*, but, in addition, **we should also consider the need to be in natural ecosystems, i.e., to benefit from their potential of adapting and surviving.**

In a concrete manner, using also the huge potential of AI/ICT, we have to count our differences versus a natural ecosystem and mitigate the consequences, focusing on **climate changes, Earth resources fading etc.**

In conclusion, we consider that, for meeting “wisdom”, in such complex and dramatic World context we live in, deeper and timely analyses should continue, keeping in mind the necessity to achieve what it seems that we have lost: the (natural) chances of our Earth ecosystem ...to adapt and survive.

3. Conclusions

The increasing complexity of World evolutions, now manifesting by the multi-crises we began to face and suffer from, leads to unpredictable challenges for our ecosystem, resulting from unprecedentedly complicated and unsustainable processes of this system, as we could count here the climate changes, social and geopolitical unbalances or Earth resources fading (we also earlier approached [11][12]).

As such premises were largely known, without saying that their analysis is no more necessary (on contrary), we consider, for a more efficacy approach, to also include the role of humankind nature/behaviour and evolution along with these processes, in order to find how we have arrived to this point/level of dramatism at Earth scale and the ways toward appropriate solutions. It is sure that the answers are not simple, but also the questions could be ...many more.

Here we have to count not only the Covid 19 pandemic or Russia’s aggression context, but all their consequences and correlations with **the prior premises of Earth ecosystem and humankind evolution, where climate changes, Earth resources fading or energy crisis were iceberg tips to be ... properly considered!**

We believe that, usually, the larger the humankind power, the probability of going to unsafe/unsustainable directions, or even failing the target, is slightly increasing. More than these, from a long history, we know that humankind potential has a dual face: to construct and to destroy.

As a matter of fact, we consider that, generally, the fundamental problem of humankind evolution was and remain just our ability to balance this duality for a sustainable/constructive progress, but here **the news is that the actual levels of power, complexity and Earth resources, which humankind could use, arrived in a critical combination of parameters.**

With other words, this actual critical combination is just like a very sharp sword, for which the technology provided highly strong materials but humankind decisions positive potential, in spite of the science unprecedented progress, is highly impaired by the highly complex and complicated processes of Earth ecosystem.

In order to have a more realistic image of the factors to be approached for an optimization analysis, when estimating the actual premises, we consider to count perhaps the most influent, but difficult to control factors of the aimed balance: the ever changing/subjective role of human personality and the crucial multiplying role of technology, where *information and communication technology (ICT)* is the most prevailing.

As **the ever changing/subjective role of human personality** in the decision processes (generally in governance) is, in its turn, related to the complex premises of education and human nature, its analysis would be perhaps an even more difficult issue, exceeding our paper aim, although most of people think that the World evolution is depending on leaders quality.

On the other side, we consider that the education is the main way to change the people toward a better World and the combination of human intelligence (HI) and artificial intelligence (AI), we already approached [6][9], is and will be more and more linked with ICT sustainable development.

Among the few certainties of the new normality, we are looking for, **the necessity of new paradigms for a multicriteria approach, along with the relativity of any optimization solution in a complex, complicate and interconnected Earth ecosystem of highly dynamic processes, should be included.**

For a concrete and realistic picture of this context of ICT sustainable development, we consider that among relevant ICT advances, AI is the most complex but also promising.

Further, **any optimization** should address both measuring and metrics, which are real challenges to define and design for the complex and complicate subsystems of Earth ecosystem, but especially for those parts of the processes where ICT is largely involved.

Addressing these issues, we have analysed a comprehensible example for the **multi-criteria approach and the relativity of AI development optimization**, concretely presented by [1].

Approaching this way both AI measuring and metrics, although, apparently, the main issue and criteria of the optimization is *energy efficiency (among the most important performance parameter for present and future ICT systems)*, for AI unprecedented advances and expansion this is far from being enough to be considered, especially because of the inherent diversity and complexity of the potential AI applications Worldwide. Beyond competition aspects, we noticed the technology advances implications, as *AI accelerator chips*, which could make the difference in certain areas of applications.

Finally, we could notice that even with such complex *benchmarks*, in the actual dynamic ICT/AI context, it is very difficult to generally optimize/rank the technology advances, but they still provide means to evaluate the typical applications performance differences.

Another example, also presenting systemic covering and relevance at Earth scale, referred to the implications of developing safe ICT applications for the huge industry of *modern cars*, aiming the proper protection/reliability against cyberattacks.

The crucial importance of cars industry must be also understood in the crises emergent context, but inherently from multi-criteria point of view (sustainability, energy, reliability, security etc.), being a special part of World critical infrastructure/services, as it is presented in [2].

The complex dependence on ICT was proved, this way, more than obvious and highly increasing, in the Earth ecosystem expansion, generating more complex challenges at different levels of development, even when considering the standardization at the *United Nations (UN)* level, which is surely more and more necessary, as the diversity and complexity increase in every industry.

From the resulted list of requirements for achieving a proper protection/reliability against cyberattacks, we could notice that optimizing such complex and dynamic industry/domain is involving a lot of interdependent processes, along with associated human inputs/outputs which are surely relative and time sensitive factors.

This way we consider that the ICT optimal development analyses should be extended by deeper refining of context knowledge and multi-criteria optimization at Earth scale and humankind behaviour level.

Although, traditionally, when incertitude prevails, wisdom is sometimes associated with keeping the routine/behaviour in thinking and acting, now the times are changing that approach, as deeply refining knowledge should become mandatory in our fast and turbulently changing World.

Using one of the special features of ICT development, we consider that a systemic approach should include the proper information management in order to maximize the efficacy and efficiency of optimization analyses, i.e., to **refine knowledge** in a continuously manner regarding the **multi - crises challenges** implications on short and long term, but taking into account the unprecedented high level of incertitude and changing which must alter the actual paradigms of development.

As a very good example, the protection of modern cars, although a planetary issue with dynamic challenges, considering the increasing complexity and the extended proliferation, is only a facet of World picture, but still relevant here by the impact of ICT involved applications and their fast advances. In fact, **all the World seems to be a fast and complicated car, moving still faster by the ICT impact, but sometimes we wonder where to and which are the chances to safely get there!**

There are many lessons to be learned from the cars example/case, as the *modern car* (especially the emerging self-driving one), along with the smartphone, are perhaps the most relevant symbols of humankind technology progress, where ICT advances impact is more than essential.

Recalling the mentioned essential role of the proper information management in the modern cars huge industry, the information context and risk factors evaluation must be also considered, for intelligent cars, but also for the rest of the World led by ICT advances. Finally, concrete ways to attend the needed target in the complicate and changing environment of hostile factors could be found by practical sets of measures which should be followed and continuously improved in processes of check and act type.

Our analysis, which aimed more general and large covering approaches, using the ICT potential at Earth ecosystem scale, also considered the comprehensive frame of the information security standard, given by ISO 27001, the world's best-known standard for information security management systems (ISMS), which provides a coherent and *holistic approach* (meaning that the entire organization is covered, not just IT [4]), i.e., here we have the evidence that the link between information and all the Earth ecosystem is essential, real and functional,

as the information is the operational element of the systemic approach. This way, the understanding of refining knowledge, i.e., the highest way/level of benefit from information, is clear, as we have to approach introspections on how the most complex actual challenges could be identified and step by step treated using actual data/information/knowledge, new models and ...imagination.

Eventually, for the considered ICT role in the World dramatic/crises context and emergence, the analyses must be further focused on testing the resilience of the associated complex systems, i.e., the appropriate models of the Earth ecosystem context. This way, engineering and designing complex and interconnected systems become a major goal of the actual ICT development and this approach is successfully also presented by another relevant example [5].

As also it was seen in the case of modern cars industry, **testing procedures are not enough if the knowledge is not continuously refined, i.e., using actual data, new paradigms and ...human innovation/imagination.** In concrete approaches, refining knowledge means that we have to change paradigm, use data of actual crises and challenges, along with needed support.

Beyond these technical/logical ingredients, in order to get wisdom solutions, perhaps the most difficult of them is to identify and introduce those human weighting factors (as *behaviors*) that meet the wisdom which corresponds to the actual context and provides the sustainable evolution and sometimes even the surviving requirements for the Earth ecosystem and humankind progress, as it is, indirectly, confirmed by [5] too.

Still, a ray of hope could be imagined, as *there exists an inherent ability to survive and bounce back*, but, in addition, **we should also consider the need to be in natural ecosystems, i.e., to benefit from their potential of adapting and surviving.**

In a concrete manner, using also the huge potential of AI/ICT, we have to count our differences versus a natural ecosystem and mitigate the consequences, focusing on **climate changes, Earth resources fading etc.**

In conclusion, we consider that, for meeting “wisdom”, in such complex and dramatic World context we live in, deeper and timely analyses should continue, keeping in mind the necessity to achieve what it seems that we have lost: the (natural) chances of our Earth ecosystem ...to adapt and survive.

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