

# Improving Information and Communication Technology to Innovate the Paradigms of World Progress

## -Part 2-



**Prof. Eng. Ph.D. Victor GREU**

### **Abstract**

The paper analyses the role and the sustainable development of communications, as part of the ICT, considering the importance of the technology for the IS on the way towards KBS, facing the new challenges in the unprecedented World crises context and also the dramatical implications of the climate changes, Earth resources fading, geopolitical crises or social unbalances at least. To confirm our opinions and extract conclusions, the analysis considered some relevant examples. The collaboration to a documentary work [<https://www.crd-aida.ro/2024/03/victor-greu-echipamente-si-sisteme-romanesti-de-transmisiuni/>] analysed the evolution of communications in a local context, a point of reflection about the role and potential of Romanian research in (military) communications. The global/national progress is depending also on the available know-how and the knowledge refining, where, again, communications could have a prominent influence, in both education processes and military applications, where military engineers had and will continue to have a crucial role. At another significant event, on May the 17-th, we have celebrated the 75-th anniversary of Military Technical Academy (MTA) [<https://www.crd-aida.ro/2024/05/prof-dr-ing-victor-greu-onorat-de-academia-tehnica-militara-ferdinand-i-la-moment-aniversar-al-acestei-reputate-institutii-de-invatomant-si-cercetare/>]. It resulted that the essential role of the education/professors will further increase, in order to better “communicate” the knowledge for “communications systems” (and beyond), along with the interesting correlation between the technology advances (ICT/AI) and the added value of teaching the future specialists/engineers. Analysing the idea that “A picture is worth a thousand words”, we have concluded that it is important also that „**the relativity is following us all the time**”, as the images became more and more complex, while the ICT potential, to insert there more information, obviously increased, without considering the advances of AI which could add even fake data. Because all these have consequences beyond display/visual instruments, as all advanced equipments, based on ICT, have, including military ones, we definitely consider that the role of words, and further of professors, is increasing and is more and more difficult/responsible, in order to compress in the best ways the information/words to be associated with an image/system. As confirmation, we have analysed some elements, associated with picture/words, presented by [1], [2], [3] and [4]. A larger importance and actuality of such analyses is given by the actual technology advances challenges, especially by the AI and its prominent applications like Google searching algorithms. Beyond confirming our opinion that, in fact, **to determine the optimal amount of words/text nearly became a combination of art and precision, which is highly specific to humans**, a significant example of the evolution of the context, being connected with the dynamic relation word-image, could be seen watching the difficult progress of the AI to

generate essential words and further conclusions, from targeted data bases or context, in the frame of the ML technology, including LLM [1]. We have also analysed some telco business areas, where AI could improve the results, focused on operational issues [5].

***As final conclusion, we think that only by timely analyses of the potential benefits of the complex and too fast changing of ICT, along with more unexpected turbulences in the World we live in, we could have the best chances to refine the knowledge and react properly as the premises for progress/decline are shifting, in all Earth and human activity areas, but not forgetting that „the relativity is following us all the time”.***

**Keywords:** machine learning, large language models, fine-tuning, telecommunications industry, continuous education, knowledge refining, artificial intelligence, knowledge-based society

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

***Intelligence is the ability to adapt to change***  
**- Stephen Hawking**

## **1. Communications continue to be a flag for ICT and the innovation of World progress**

The actual and emergent and dynamic challenges, at Earth scale, lead to the necessity to use all the potential of the people and organizations for finding the best solutions and it is clear that *information and communication technology (ICT)* must have a crucial role for leveraging and harmonizing the mentioned humankind efforts, in order to refine knowledge all over the World with the adequate content and speed. This way, *the complex implications of ICT services, products, systems and applications could support the Information Society (IS) on the road towards the Knowledge Based Society (KBS).*

Consequently, the ICT development must be analyzed on multi-criterial optimization bases, considering also the usual (high) pace of the last decades and the fundamental World/market requirements for a sustainable-only progress in all domains of human activity.

Among criteria/factors, beyond the dramatical implications of the climate changes, Earth resources fading, geopolitical crises or social unbalances at least, the ICT high speed induced in many other industries/domains could generate, along with benefic consequences, new challenges in the actual and emergent unprecedented World crises context [7][14][16][17][18].

It is important to notice that one of the most complex implications of the mentioned high speed consists in the limitation of time required to identify, analyze and properly react to all the consequences of such model of development, at Earth scale, which is perhaps one of the less visible/considered causes of some of the actual World crises [11].

For years, communications and IT seem to be inseparable and the World is full with evidences of this fact, but the history could reveal that this was not the case for...decades and even centuries. Anyway, the automatic telephony exchange could be considered to be the first electric computer, so, perhaps, here started their „marriage” [8][22].

Still, it seems to be a long way from those times and the present ICT advances, including the huge applications of communications and AI (C&AI), but every step of the evolution counts [9][19].

Recently, we have collaborated to a documentary work [<https://www.crd-aida.ro/2024/03/victor-greu-echipamente-si-sisteme-romanesti-de-transmisiuni/>], analysing the evolution of communications in a local context, a point of reflection about the role and

potential of Romanian research in (military) communications, as we are still in the frame of anniversary, in 2023, of 150 years of military communications specialty (the „transmissions” military units).

For years, Romanian researchers realized projects and equipments intended to reduce/avoid the Romania army dependence on USSR technology and influence. The R4040 radio relay is a prominent, major system, where civilian (from Electronics Research Institute-ICE) and military specialists were involved. As member of National Agency for Science, Technology and Innovating (ANSTI), we worked with the research teams in endorsement commissions, including, among others, the R4040 project/system research phases [<https://www.crd-aida.ro/2024/03/victor-greu-echipamente-si-sisteme-romanesti-de-transmisiuni/>].

Equipments made in Romania, now not competitive, but still functioning, are also important because such local results could remember our national potential, for the young specialists, in these days when the national and NATO defence are so actual and the national innovating force is so efficiently proved by Ukraine.

On the other hand, the global/national progress is depending also on adding the available know-how and the knowledge refining, where, again, communications could have a prominent influence, in both education processes and military applications, where military engineers had and will continue to have a crucial role. As a matter of fact, recently, in Romania, we had also another significant event, as, on May the 17-th, we have celebrated the 75-th anniversary of Military Technical Academy (MTA) [<https://www.crd-aida.ro/2024/05/prof-dr-ing-victor-greu-onorat-de-academia-tehnica-militara-ferdinand-i-la-moment-aniversar-al-acestei-reputate-institutii-de-invatamant-si-cercetare/>]. In this context/event about MTA and communications, we have pointed the essential role that the education processes and the professors will further have in order to better “communicate” the knowledge for “communications systems” (and also beyond this system/technology), as we emphasised the interesting correlation between the technology advances (like ICT/AI) and the added value of teaching the future specialists/engineers.

Starting from the well-known idea that “A picture is worth a thousand words”, it is sure that many analyses could be done, but we have considered (in the same context/event) that it is important to also notice that „**the relativity is following us all the time**”, another idea that would generate longer discussions (to be eventually analysed), due to its dual meaning, without adding connections with Einstein theory.

Our opinion is based on a clear reality, as the actual images became more and more complex, as the ICT potential, to insert there more information, obviously increased, without considering the advances of AI which could add even fake information. Because this reality has similar consequences beyond display/visual instruments, as all advanced equipments, based on ICT have, including military ones, we definitely consider that the role of words, and further of professors, is increasing and is more and more difficult/responsible, in order to compress in the best ways the information/words to be associated with an image/system.

Relevant evidence of this context was given along with pandemic Covid 19, during online teaching (which remains all the time an alternate teaching solution), but there is no doubt that the most important reality is given by the difficulties of AI actual advances (including ChatGPT) to represent in words the human thinking.

It is also worth to notice that, although communications (and ICT) are very fast developing and became ubiquitous everywhere on Earth, often we could observe that people, sometimes, do not ... communicate as they should, from many reasons, this way leading to the necessity of improving this matter, not only by teaching, but also by actions with clear messages, as we have recently presented (***With the military communications specialists you have always something to communicate or About the art of communicating inspired by facts with message***) [3].

Perhaps, a good confirmation of our above opinions is expressed by the next elements, associated with “A picture is worth a thousand words”, but also indirectly reminding (as „all the time”) the relativity, is given by [2]:

*<< As a content writer, I frequently have to convey complex ideas in a specific number of words – sometimes in a short headline and often in a long article. If I am working with a graphic designer on a brochure, flyer or presentation, there is often a conflict between the ideal number of words that they want to include, and the quantity of copy that I need in order to convey all the necessary information. We sometimes debate the idea that “a picture is worth a thousand words” when the designer wants to use larger pictures and cut down the text, while I maintain that pictures rarely convey the entire message.>>*

It is important to notice here the necessity and actuality of compression, but also the difficulty to determine the optimal amount of words/text:

*„So, let’s deconstruct this idea. A few minutes of Google research reveals that the expression was made up by an advertising executive in the 1920s. Fred R. Barnard claimed that it was an ancient Japanese proverb. How lucky we are today to have Google to help us debunk such myths! Google is one of the reasons that a picture is no longer worth 1,000 words. If you want your online content to be found using search engines, you need more words not less. If you place your text within images, charts and info-graphics, Google will not index those words. They will not help to attract search traffic to your masterpiece. Google’s algorithm checks the quantity and quality of the text on any web page, and considers longer articles more credible and valuable than shorter pieces of text.”*

The practical larger importance and actuality of such analyses is given, unexpectedly, by the actual technology advances challenges, especially by the AI and its prominent applications like Google searching algorithms:

*„The new AI Google algorithm looks at how informative and relevant your text is, rather than how many times your keyword is mentioned. Nevertheless, it is important that the keyword phrase you have chosen to optimize each page for search appears in the heading, in the page URL, and several times within the page text. You can also please Google by varying your text to use synonyms for your keywords that Google recognizes, because that is a more natural and sophisticated way to write than repeating the same phrases multiple times.*

*More than this dynamic balance of image and text information, the role of customer experience and influence on the optimization solutions and further on AI progress is a factor to be considered:*

*“Of course, Google also values images. Search engine results typically include relevant images, but the Google spider usually identifies which images are relevant according to the ‘metatext’ that accompanies each image. When uploading images to the internet to accompany a story or to illustrate a page, it is crucial to optimize your pictures for search. This includes*

*giving the photo a title that is a helpful search phrase, and adding a description and ‘alt text’, which is the text that shows up when a picture is blocked. It is also helpful to give your image a relevant name before you upload it to the website, because this cannot be changed later. Photos that are only identified by the string of numbers allocated by the camera or phone on which they were taken will remain anonymous on the internet. Optimizing your images can help to bring searchers to your content. If the image is interesting and correctly titled and tagged, it can attract attention more quickly than the non-pictorial search engine results on the page. It helps that Google often shows relevant images in a prominent position on the search engine results page, and there is no denying that people’s eyes are drawn toward images on a page full of text.”*

Beyond confirming our above opinion that, in fact, **to determine the optimal amount of words/text nearly became a combination of art and precision, which is highly specific to humans**, a significant sample of the evolution of the context, being connected with the dynamic relation word-image, could be seen watching the difficult progress of the AI technics to generate essential words and further conclusions, from targeted data bases or context, generally in the frame of the machine learning (ML) technology, including Large Language Models (LLM), as basic AI [1]:

*„Large Language Models have revolutionized the Natural Language Processing field, offering unprecedented capabilities in tasks like language translation, sentiment analysis, and text generation. However, training such models is both time-consuming and expensive. This is why fine-tuning has become a crucial step for tailoring these advanced algorithms to specific tasks or domains.”*

Generally, in practice, improving the models and algorithms is a dynamic approach of different technics/concepts, as *pre-trained language models* and *fine-tuning* are.

*“LLMs are a specific category of Machine Learning meant to predict the next word in a sequence based on the context provided by the previous words. These models are based on the Transformers architecture and are trained on extensive text data, enabling them to understand and generate human-like text. The best part of this new technology is its democratization, as most of these models are under open-source license or are accessible through APIs at low costs.”*

Irrespective the way *pre-trained LLM* is implemented, using open-source or Application Programming Interface (API), a further improvement is possible by *fine-tuning*:

*„Fine-tuning involves using a Large Language Model as a base and further training it with a domain-based dataset to enhance its performance on specific tasks.*

*Let’s take as an example a model to detect sentiment out of tweets. Instead of creating a new model from scratch, we could take advantage of the natural language capabilities of GPT-3 and further train it with a data set of tweets labeled with their corresponding sentiment. This would improve this model in our specific task of detecting sentiments out of tweets. This process reduces computational costs, eliminates the need to develop new models from scratch and makes them more effective for real-world applications tailored to specific needs and goals.”*

Entering such complex areas/targets like language translation, sentiment analysis or text generation, fine-tuning could implement different technics, targeting specific objectives:

*„Supervised Fine-tuning*

*This common method involves training the model on a labeled dataset relevant to a specific task, like text classification or named entity recognition. For example, a model could be trained on texts labeled with sentiments for sentiment analysis tasks.*

#### *Domain-specific Fine-tuning*

*This approach focuses on preparing the model to comprehend and generate text for a specific industry or domain. By fine-tuning the model on text from a targeted domain, it gains better context and expertise in domain-specific tasks. For instance, a model might be trained on medical records to tailor a chatbot specifically for a medical application.”*

In the diversity of practical applications, still, there are also limit cases or targets, which could lead to unusual technics or limited results:

#### *„Few-shot Learning*

*In situations where it's not feasible to gather a large labeled dataset, few-shot learning comes into play. This method uses only a few examples to give the model a context of the task, thus bypassing the need for extensive fine-tuning.*

#### *Overfitting*

*Training the model with a small dataset or undergoing too many epochs can lead to overfitting. This causes the model to perform well on training data but poorly on unseen data, and therefore, have a low accuracy for real-world applications.*

#### *Catastrophic Forgetting*

*When fine-tuning a model on a specific task, there's a risk of the model forgetting the broad knowledge it originally had. This phenomenon, known as catastrophic forgetting, reduces the model's effectiveness across diverse tasks, especially when considering natural language skills.”*

**Beyond any considerations about performances, efficiency or efficacy, it is worth to observe the difficult and long way of AI and its advances branches, toward human intelligence and capacity of even generating essential words and conclusions from dynamic context.**

## **2. Continuous education and AI are leveraging the future ICT steps**

„Every day the World is changing” became a normality long time ago, but the increasing and amazing speed of dramatic changes became a mark of ... every day, as, for example, unfortunately, often we hear the news announcing that „the last month was the hottest since measuring...”.

Among other challenges we have to face, adapt to changes is the most important, as also Stephen Hawking suggested (*Intelligence is the ability to adapt to change*), but how to keep the pace with changes and strive to make only intelligent moves are for sure the most complex and complicate decisions to take.

Transposing this general challenge in the ICT domain, we have to recall that IT and communications became long time ago sides of the most dynamic part of the World progress and they became inseparable, in synergic combinations of equipments and systems which impact all industries and all human activity fields [23].

On the other side, in spite of inherent growing complexity, ICT main sides (IT & C) benefit from their mutually support for improvements.

Still, to fully use this support, people and companies have to fulfil another mandatory condition/feature of the actual complex ICT development: the continuous education/instruction - as part of the complex processes we have repeatedly mentioned, which is deeply linked with **the necessity of knowledge refining, a crucial feature of IS toward KBS** [13][15].

As a matter of fact, even this continuous education is not a new challenge/purpose for humans, but here again, **our days rise more dynamic requirements as the new technologies explode, especially for the specialists and also for the users of ICT equipments, systems or services, i.e., for everyone and everywhere on Earth.**

That is why, innovate the ways for future World progress is strongly depending on education/competence and ICT, naturally including AI as its most advanced field [20][21][24].

A very actual mention should be noticed about the link education/competence and AI, as one could naturally ask why these elements would count more than other factors on innovate the progress.

As AI is the most dynamic field of ICT and has a crucial impact on business and our jobs and lives, reaching the complete benefits of it requires the appropriate knowledge in its design, implementation and use processes (not mentioning the critical infrastructure impact or its misuse).

This way we have just arrived at the point where the competence/education of the humans implied in ICT, perhaps similarly with other industries, is essential in order to use AI and generally their own devices in an efficient manner, first including the management of development.

Finding the right approach for keeping the pace with ICT amazing rhythm is not simple and it is a continuous process of adapting to the changing context, as it is also presented by [4]:

*“Engineers with the right competence mix, hard and (!) soft, are in demand across domains, from IT to Internet of Things, from app development to big systems, and from IT to automotive, medical, and robotics. There is even a legal obligation to grow professional competences because each major standard demands learning and proof of learning.*

*With clients, we observe notable gaps especially in systems engineering, architecture, configuration management, test, and development processes. In today’s distributed teams, soft competences are highly demanded, such as communication skills, culture empathy, and awareness on social and ethical implications of work.”*

It is worth to notice that the approach of the competence problem should be seen in the holistic image where professional skills and culture/ethical factors are included and lead to the larger and complex processes of knowledge refining we have mentioned above, going throughout the IS/KBS:

*“The business environment remains uncertain and rapidly evolving. To thrive in this time of continuous change, companies and each single engineer need resilience to accept sudden changes and agility to immediately exploit the emerging opportunities. This demands a continuous learning to adapt to change and to adopt new practices. With practically all industries being in heavy digital transformations, competent software and computer engineers are the limiting factor.”*

Although it is important to see the whole context, this is just the starting point, as the implementation of the desired actions toward competence is depending on dynamic/changing premises, leading to diverse solutions:

*“Tools and techniques to grow your own competences are shifting. Classic classroom formats are not relevant anymore in times of distributed teams. Increasingly, engineers use online formats for trainings. ... Search tools, podcasts, and online videos dominate the access to new information. It looks as if individual engineers prefer free formats, even at the cost of not knowing about the reliability of contents of such formats. One reason is the decreasing investment of their employees into formats with higher quality such as trainings. Many companies consider training and competence growth a cost factor, rather than an investment. In the project heat, trainings are cancelled first.”*

The overall contributions of telco, as prominent part of ICT, for the progress of World economy and companies, could be also increased by using the general advances of ICT, first including the AI for improving the appropriate development/management strategies.

Still, as in the cases of other ICT advances, the performances of AI do not directly lead to their successful implementations in different domains, especially in the complicate context of the World actual crises, an issue that is also evident for telco [10].

Beyond the systemic and general approach of using AI to support telco development, the increasing potential of AI could leverage solving the more complex and real time operational problems of the telecommunications industry, which naturally expand as the new technologies are deployed (as 5G, IOT etc).

Without entering operational telco details, like performances, reliability or real time reconfiguration, some business areas where AI could improve the concrete results are also presented by [5]:

*„Operations in the telecommunications industry is often said to be one of the most complex aspects of the business to run, and the most successful telcos tend to be those that outperform at this task. It requires a simultaneous, coordinated, and dynamic approach across business units, each of which alone would be a giant business to run. In recent years, artificial intelligence has had the potential to simplify the task by optimizing various functions that make up operations. Telcos are only just beginning to utilize that promise, with operators finding success with AI solutions that help optimize service operations journeys, such as the in-store customer experience, call center use, and deployment of employees in stores, call centers, and the field.”*

As the World crises appear and affect ICT too, the use of AI as progress enabler for telcos by identifying new areas for AI applications with this purpose, but with higher efficiency, is further benefic:

*„The intensely challenging economic landscape that telcos have had to navigate in recent years makes the prospect of investment in new solutions daunting. The value at stake, though, is potentially quite significant. Leading telcos have already begun to deploy AI in their field and service operations. So too have upstart digital attackers entering the landscape as networks become increasingly software defined and cloud based. Remaining competitive will necessitate keeping up with both the technology and the front-runners.”*

Considering also the competition and the new business models challenges, investment decisions became critical and also the leveraging contribution of AI in optimizing costs and uncertainty processes:

*„To stay ahead, operators will need to make critical investment decisions around customer and employee experience. At the same time, they need to offer efficient and effective processes to keep costs down while increasing retention of both customers and employees. These are the very areas where front-runner telcos are deploying AI solutions and finding success. As the following use cases illustrate, those solutions fall into several categories: smart scheduling and forecasting; store-of-the-future experiences enabled by machine learning–driven personalization and other basic operational efficiency; self-healing in which problems are either preempted or solved automatically; and smart coaching...”*

Last, but not the least, the management of human resources and operational processes, using the complex field data AI only could get and use, is one of the most interesting areas of optimization:

*„On the field force journey, telcos have to perform a balancing act between customers, employees, and external forces over which they have little control. Smart AI coaching solutions can help improve the performance and service levels of frontline workers and their supervisors, as well as the experience of customers and employees. These sophisticated tools use machine-learning algorithms to generate performance insights along with coaching resources that rely on employees’ normalized performance metrics as inputs. The result is timely and situationally relevant digital instruction, as well as celebratory nudges, to help encourage desired behaviors.”*

**Our opinion is that, far from being sufficient in the highly dynamic and challenging World context, the ideas/solutions from such examples of of ICT/telcos improvements by AI support, which could be also considered in other industries, confirm the AI/ICT potential of „self healing”, but, in the time, may reflect their limits against the more and more complex crises we have to face.**

**On the other hand, we think that only by timely analyses of the potential benefits of the complex and too fast changing of ICT, along with more unexpected turbulences in the World we live in, we could have the best chances to refine the knowledge and react properly as the premises for progress/decline are shifting, in all Earth and human activity areas, but not forgetting that „the relativity is following us all the time”.**

### **3. Conclusions**

The ICT development must be analyzed on multi-criterial optimization bases, considering also the usual (high) pace of the last decades and the fundamental World/market requirements for a sustainable-only progress in all domains of human activity. Among criteria/factors, beyond the dramatical implications of the climate changes, Earth resources fading, geopolitical crises or social unbalances at least, the ICT high speed induced in many other industries/domains could generate, along with benefic consequences, new challenges in the actual and emergent unprecedented World crises context. One of the most complex implications of the mentioned high speed consists in the limitation of time required to identify, analyze and properly react to all the consequences of such model of development, at Earth

scale, which is perhaps one of the less visible/considered causes of some of the actual World crises [11].

For years, communications and IT seem to be inseparable and the World is full with evidences of this fact. Recently, we have collaborated to a documentary work [<https://www.crd-aida.ro/2024/03/victor-greu-echipamente-si-sisteme-romanesti-de-transmisiuni/>], analysing the evolution of communications in a local context, a point of reflection about the role and potential of Romanian research in (military) communications, as we are still in the frame of anniversary, in 2023, of 150 years of military communications specialty (the „transmissions” military units). For years, Romanian researchers realized projects and equipments intended to reduce/avoid the Romania army dependence on USSR technology and influence. The R4040 radio relay is a prominent, major system, where civilian (from Electronics Research Institute-ICE) and military specialists were involved. As member of National Agency for Science, Technology and Innovating (ANSTI), we worked with the research teams in endorsement commissions, including, among others, the R4040 project/system research phases [<https://www.crd-aida.ro/2024/03/victor-greu-echipamente-si-sisteme-romanesti-de-transmisiuni/>]. Equipments made in Romania, now not competitive, but still functioning, are also important because such results could remember our national potential, for the young specialists, in these days when the national and NATO defence are so actual and the national innovating force is so efficiently proved by Ukraine.

The global/national progress is depending also on adding the available know-how and the knowledge refining, where, again, communications could have a prominent influence, in both education processes and military applications, where military engineers had and will continue to have a crucial role. As a matter of fact, recently, in Romania, we had also another significant event, as, on May the 17-th, we have celebrated the 75-th anniversary of Military Technical Academy (MTA) [<https://www.crd-aida.ro/2024/05/prof-dr-ing-victor-greu-onorata-de-academia-tehnica-militara-ferdinand-i-la-moment-aniversar-al-acestei-reputate-institutii-de-invatamant-si-cercetare/>]. In this context/event about MTA and communications, we have pointed the essential role that the education processes and the professors will further have in order to better “communicate” the knowledge for “communications systems” (and also beyond this system/technology), as we emphasised the interesting corelation between the technology advances (like ICT/AI) and the added value of teaching the future specialists/engineers. Analysing the idea that “A picture is worth a thousand words”, we have concluded (in the same context/event) that it is important also that „**the relativity is following us all the time**”, as the actual images became more and more complex, as the ICT potential, to insert there more information, obviously increased, without considering the advances of AI which could add even fake information. Because this reality has similar consequences beyond display/visual instruments, as all advanced equipments, based on ICT have, including military ones, we definitely consider that the role of words, and further of professors, is increasing and is more and more difficult/responsible, in order to compress in the best ways the information/words to be associated with an image/system. Evidence of this context was given along with pandemic Covid 19, during online teaching (which remains all the time an alternate teaching solution), but there is no doubt that the most important reality is given by the difficulties of AI actual advances (including ChatGPT) to represent in words the human thinking.

It is also worth to consider that, although communications (and ICT) are very fast developing and became ubiquitous everywhere on Earth, often we could observe that people, sometimes, do not ... communicate as they should, from many reasons, this way leading to the necessity of improving this matter, not only by teaching, but also by actions with clear messages, as we have recently presented (***With the military communications specialists you have always something to communicate or About the art of communicating inspired by facts with message***) [3].

As confirmation of our above opinions, we have analysed some elements, associated with “A picture is worth a thousand words”, but also indirectly reminding (as “all the time”) the relativity, presented by [2]. A larger importance and actuality of such analyses is given, unexpectedly, by the actual technology advances challenges, especially by the AI and its prominent applications like Google searching algorithms.

Beyond confirming our opinion that, in fact, **to determine the optimal amount of words/text nearly became a combination of art and precision, which is highly specific to humans**, a significant example of the evolution of the context, being connected with the dynamic relation word-image, could be seen watching the difficult progress of the AI technics to generate essential words and further conclusions, from targeted data bases or context, generally in the frame of the ML technology, including LLM, as basic AI [1]. In the diversity of practical AI/LLM applications, including *fine tuning*, still, there are also limit cases or targets, which could lead to unusual technics or limited results. **Beyond any considerations about performances, efficiency or efficacy, it is worth to observe the difficult and long way of AI and its advances branches, toward human intelligence and capacity of even generating essential words and conclusions from dynamic context.**

As IT and communications became long time ago sides of the most dynamic part of the World progress and they became inseparable, in synergic combinations of equipments and systems which impact all industries and all human activity fields, ICT main sides (IT &C) benefit from their mutually support for improvements, but, to fully use this support, people and companies have to fulfil another mandatory condition/feature of the actual complex ICT development: the continuous education/instruction - as part of the complex processes we have repeatedly mentioned, which is deeply linked with **the necessity of knowledge refining, a crucial feature of IS toward KBS** [13][15]. Although this continuous education is not a new challenge/purpose for humans, but here again, **our days rise more dynamic requirements as the new technologies explode, especially for the specialists and also for the users of ICT equipments, systems or services, i.e., for everyone and everywhere on Earth.** That is why, innovate the ways for future World progress is strongly depending on education/competence and ICT, naturally including AI as its most advanced field. As AI is the most dynamic field of ICT and has a crucial impact on business and our jobs and lives, reaching the complete benefits of it requires the appropriate knowledge in its design, implementation and use processes (not mentioning the critical infrastructure impact or its misuse).

As, finding the right approach for keeping the pace with ICT amazing rhythm is not simple and it is a continuous process of adapting to the changing context, we have also analysed a relevant example/confirmation, presented by [4], concluding that the competence problem should be seen in the holistic image where professional skills and culture/ethical factors are

included and lead to the larger and complex processes of knowledge refining we have mentioned above, going throughout the IS/KBS.

Beyond the systemic and general approach of using AI to support telco development, the increasing potential of AI could leverage solving the more complex and real time operational problems of the telecommunications industry, which naturally expand as the new technologies are deployed (as 5G, IOT etc). We have also analysed some telco business areas, where AI could improve the concrete results, focused on operational issues and less on performances, reliability or real time reconfiguration, as presented by [5]. **Our opinion is that, far from being sufficient in the highly dynamic and challenging World context, the ideas/solutions from such examples of ICT/telcos improvements by AI support, which could be also considered in other industries, confirm the AI/ICT potential of „self-healing”, but, in the time, may reflect their limits against the more and more complex crises we have to face.**

**Finally, we think that only by timely analyses of the potential benefits of the complex and too fast changing of ICT, along with more unexpected turbulences in the World we live in, we could have the best chances to refine the knowledge and react properly as the premises for progress/decline are shifting, in all Earth and human activity areas, but not forgetting that „the relativity is following us all the time”.**

## REFERENCES

- [1]Josep Ferrer, *The Best Strategies for Fine-Tuning Large Language Models*, KDnuggets, May 15, 2024, <https://www.kdnuggets.com/the-best-strategies-for-fine-tuning-large-language-models>
- [2]\*\*\*, *Is a Picture Worth a Thousand Words?*, 2023, <https://ourbestwords.com/marcom-writing/>
- [3]Victor Greu, *With the military communications specialists you have always something to communicate or About the art of communicating inspired by facts with message*, EconPapers, Romanian Distribution Committee Magazine, 2023, vol. 14, issue 4, [https://econpapers.repec.org/article/rdcjournl/v\\_3a14\\_3ay\\_3a2023\\_3ai\\_3a4\\_3ap\\_3a55-76.htm](https://econpapers.repec.org/article/rdcjournl/v_3a14_3ay_3a2023_3ai_3a4_3ap_3a55-76.htm)
- [4]Christof Ebert, *Industry Trends 2024: Innovation Needs Competence*, April 2024, [WWW.COMPUTER.ORG/COMPUTER](http://WWW.COMPUTER.ORG/COMPUTER)
- [5] Jorge Amar, Tomás Lajous, Shreya Majumder, and Zachary Surak, *How AI is helping revolutionize telco service operations*, 2022 McKinsey & Company, <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/how-ai-is-helping-revolutionize-telco-service-operations>
- [6]Victor Greu, *Improving information and communication technology to innovate the paradigms of World progress-(Part 1)*, Romanian Distribution Committee (affiliated to the “International Association of the Distributive Trade”-scientific association – A.I.D.A. Brussels) Magazine(international; electronic; covered in RePEc International Data Base), Volume 15, Issue 1, Year 2024.
- [7]Kathy Pretz, *IEEE Discusses 6 Simple Solutions to Climate Change at COP27*, IEEE Spectrum -The Institute, Jan 2023, [https://spectrum.ieee.org/6-solutions-to-climate-change?utm\\_source=feedotter&utm\\_medium=email&utm\\_campaign=theinstitutealert-020723&mkt\\_tok=NzU2LUdQSC04OTkAAAGJydzxSHpuq5OM3DCG1vf09lo7cS9SF4diB](https://spectrum.ieee.org/6-solutions-to-climate-change?utm_source=feedotter&utm_medium=email&utm_campaign=theinstitutealert-020723&mkt_tok=NzU2LUdQSC04OTkAAAGJydzxSHpuq5OM3DCG1vf09lo7cS9SF4diB)

orTarLno1KsPH--DxoBUdWtlSl7n1JnvJ-xzsuSpD5nTSp4emRYFU-PhQVmCqj5VigYPQwsBCo

[8]Sudip Misra, Chandana Roy, Thilo Sauter, Anandarup Mukherjee, Jhareswar Maiti, *Industrial Internet of Things for Safety Management Applications: A Survey*, IEEE Access ( IF 3.476 ) Pub Date: 2022-07-27, <https://www.x-mol.net/paper/detail/1566136228154413056>

[9]Florin Enache, Victor Greu, Petrică Ciofîrmae, Florin Popescu, *Model and Algorithms for Optimizing a Human Computing System Oriented to Knowledge Extraction by Use of Crowdsourcing*, 2020, 13th International Conference on Communications (COMM), (Politehnica University of Bucharest, Military Technical Academy, IEEE Romania), (COMM 2020 is covered in IEEE Explore Database and ISI Web of Science in the Conference Proceedings Citation Index)

[10]\*\*, *The AI-native telco: Radical transformation to thrive in turbulent times*, February 2023, <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-ai-native-telco-radical-transformation-to-thrive-in-turbulent-times>

[11]Victor Greu, *Searching the right tracks of new technologies in the Earth race for a balance between progress and survival*, Romanian Distribution Committee (affiliated to the “International Association of the Distributive Trade”-scientific association – A.I.D.A. Brussels) Magazine(international; electronic; covered in RePEc International Data Base), Volume 3, Issue1, Year 2012.

[12]Giuliano Punzo et al, *Engineering Resilient Complex Systems: The Necessary Shift Toward Complexity Science*, IEEE SYSTEMS JOURNAL, VOL. 14, NO. 3, SEPTEMBER 2020

[13]Victor Greu, *Information and communications technology is merging data science and advanced artificial intelligence towards the core of knowledge based society -(Part 3)*, Romanian Distribution Committee (affiliated to the “International Association of the Distributive Trade”-scientific association – A.I.D.A. Brussels) Magazine(international; electronic; covered in RePEc International Data Base), Volume 12, Issue 3, Year 2021.

[14]Samuel K. Moore, *How and When the Chip Shortage Will End*, IEEE Spectrum, Volume: 58, Issue: 6, Jun 2021

[15]Victor Greu, *Information and Communications Technologies are Learning from Nature’s “Research” to Push the Performance Limits*, Romanian Distribution Committee (affiliated to the “International Association of the Distributive Trade”-scientific association – A.I.D.A. Brussels) Magazine(international; electronic; covered in RePEc International Data Base), Volume 5, Issue 1, Year 2014.

[16]Andreas Poltermann, *Education for a Knowledge-Based Society? A Concept Must be Rethought*, 17 April 2014, <https://rs.boell.org/en/2014/04/17/education-knowledge-based-society-concept-must-be-rethought>

[17]Robert W. Lucky, *Deep Complexities in EE*, IEEE Spectrum, May 2018

[18]Raj Kumar Hansdah, *Scientific Progress Without True Wisdom Will Cause More Harm Than Good*, <https://www.beaninspiner.com/scientific-progress-without-true-wisdom-will-cause-more-harm-than-good>, Updated: October 21, 2021

[19]Victor Greu et al, *Human and artificial intelligence driven incentive-operation model and algorithms for a multi-purpose integrated crowdsensing-crowdsourcing scalable system*, Proceedings of International Conference Communications 2018, (Politehnica University of Bucharest, Military Technical Academy, IEEE Romania), June 2018(COMM 2018 is covered in IEEE Explore Database and ISI Web of Science in the Conference Proceedings Citation Index).

[20]\*\*, *Chaos to Control: Validating Distributed, Disaggregated Digital Transformation (WHITE PAPER)*, 2020, <https://learn.keysight.com/network-security-test/chaos-to-control-validating-distributed-disaggregated-digital-transformation>

[21] Siobhan Treacy, *Three Ways Engineers Are Improving the Planet Smart technology can help combat global warming and create a better future*, JUL 2019, <https://spectrum.ieee.org/three-ways-engineering-are-improving-the-planet>

[22] Victor Greu, *Communicate on ... Communications - From a Conference every 2 years to the need to communicate everyday and everywhere*, **Romanian Distribution Committee** (affiliated to the “International Association of the Distributive Trade”-scientific association – A.I.D.A. Brussels) **Magazine** (international; electronic; covered in RePEc International Data Base), Volume 5, Issue 2, Year 2014.

[23]\*\*\*, *Keysight Predicts: Top Technologies Expected to Grow Substantially in 2023*, 2023-02, [https://www.keysight.com/blogs/keys/thought-leadership/2023/02/10/keysight-predicts-top-technologies-expected-to-grow-substantially-in-2023?elq\\_cid=3286481&cmpid=ELQ-24271](https://www.keysight.com/blogs/keys/thought-leadership/2023/02/10/keysight-predicts-top-technologies-expected-to-grow-substantially-in-2023?elq_cid=3286481&cmpid=ELQ-24271)

[24] **Eric Heim**, *Knowing When You Don't Know: Engineering AI Systems in an Uncertain World*, 2021, [https://www.sei.cmu.edu/our-work/projects/display.cfm?customel\\_datapageid\\_4050=311708](https://www.sei.cmu.edu/our-work/projects/display.cfm?customel_datapageid_4050=311708)