THE ACADEMIC WORLD FACING TRANSITIONS

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ABSTRACT

The socio-economic world is affected by several changes, including companies' digital transformation, initiatives on environmental and energy transitions, health, and economic crises. Consequently, the academic world is also in a transition phase that needs to be analysed.

Our purpose in this paper is to provide analysis and proposals for concrete actions, possibly enabling academics and those involved in education to face the disruption that afflicts research and education.

Keywords: Education, Research, Disruption, Machine Learning, Big Data.

INTRODUCTION

The socio-economic world is currently affected by several significant changes, including companies' digital transformation (resulting in their dependence on tech companies, cyber risks, etc.), and the various initiatives on environmental and energy transitions (modifying business models). Some references concerning these changes can be found, for example in Ganguly et al., (2017); Andersson et al., (2018); Bank of England (2019); BNP Paribas (2019); Carter & Mainelli (2018); Mishra (2019 a,b).

The health crisis linked to the Covid-19 had just precipitated the setting in motion of several facts: Economic and financial crises, social and political tensions, accelerating digitalization in education and retail, etc.

The changes impact the academic world that feeds human resources for businesses and organizations in transition.

Teacher-researchers and educators must reinvent their missions to avoid disruption, which generates both challenges and opportunities: Singh (2017); Accenture (2018); Iberdrola (2020).

This paper will bring analysis elements and concrete recommendations, inspired by both literature (academic work and professional reports) and the authors' practice, hoping that this can be useful for various involved parties such as researchers, educators, decision-makers, and managers, etc.

To understand future research, lines of inquiry relating to FinTechs and Digital Finance (mainly for researchers) have already been launched, as in Gomber et al., (2017) and Kavuri & Milne (2019).

In coherence with the academic world in the face of the world's various transformations, in this paper, we propose two essential tracks that are "*Research on Research*" and the "*Coupling between Education and Research*". As we have developed in a separate work, other more technical avenues are also possible such as:

1. Risk factors/emerging opportunities,
2. Platforms,

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3. Intelligent Financial Products,
4. Adjustment to Market Frictions,
5. Development of Custom Solutions,
6. Interest in "*Explainable Machine Learning*,"
7. Revisiting Model Analysis, and
8. Predictive Analysis.

These eight tracks developed by the authors differ mainly from those in Gomber et al., (2017) and Kavuri & Milne (2019), based primarily on considerations related to organizational behavior, stakeholder interactions, and technology innovations.

Working on the well-being of organizations and companies is one thing. However, it also seems crucial for us that researchers pay attention and put the order in the universe they know well. They would have to do better in the academic world they navigate rather than in organizations and economics where they should have less influence, and their opinions are often put on the margins.

As the world of education, especially teacher-researcher, must be reinvented, Accenture (2018) and Iberdrola (2020), it seems crucial for us to focus on the above mentioned two themes: Research on Research (R/R) and the Coupling of Education and Research (CER).

On the one hand, the idea is that one must develop appropriate training to provide the right human resources for the trades in transformation or emerging or upcoming. On the other hand, this development can only be done adequately based on some appropriate specific research.

In Section 2, we present the rationale behind the R/R. Then, in Section 3, we decipher the education facing various transitions while suggesting a fundamental tool, the CER. Finally, we conclude in Section 4.

RESEARCH ON RESEARCH

With the Big Data or Data Science Revolution, we are currently witnessing the fact that

1. The volume of knowledge available (thanks to new technologies) continues to grow exponentially,
2. Research is becoming more and more specialized in all directions, and
3. The issues (which directly affect the socio-economic world) are increasingly numerous, interdependent, and complicated.

The just described situation should not leave the researcher indifferent. Indeed, some established knowledge will cede their places to others. Thus, among the questions is: What kind of knowledge now produce, so that they will not be forgotten too quickly and serve at least to some pressing needs of society? Underlying this interrogation is the very logic of academic publications and research themes that must be questioned and reviewed.

Excessive specializations can hinder research, dissemination, and even the creation of new knowledge. Undoubtedly, researchers justify the seriousness and level of their work through peer judgments. Despite this, we are witness of between oneself here, and the knowledge thus produced may just serve the interests of a few and remain useless for the well-being of many.

If some produced in-depth knowledge were likely to advance the common interest, it would be a matter of concern to popularize them. This must be done at least in the direction of

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specialists in other fields so that the synergy between knowledge advances a broad segment of society.

The issue is primarily to find common factors between the various offers of knowledge and then confront these factors to the multiple challenges that arise from the socio-economic world. For example, concepts that are ahead of Machine Learning Algorithms (MLAs) are now identified as being at the crossroads of many knowledge offerings and using case requests from various applications.

Once the factors mentioned in the previous paragraph have been determined, the next step is the follow-up of the events that occur each part of the whole knowledge. Indeed, knowledge is constantly in motion and tends to be more and more sharp and specific. Then there should be people who follow these evolutions and report them to others who are busy elsewhere.

Digital Transformations (DTs) and Environmental and Energy Transitions (EETs) reveal issues requiring comprehensive approaches and specific local approaches, possibly technically complex. Possible references can be tracked in the following: Andersson et al., (2018); Financial Stability Board (2017); Ducruet & Roux (2019); Dunz et al., (2019); Jagtiani et al., (2018); Rolnick et al., (2019); UNEP-FI (2018a); UNEP-FI (2018b); UN-Environment Inquiry (2019); UNEP-FI (2019) and Sachs et al., (2019).

The interdependence between energy, the environment (natural), and the economy makes it necessary to have a holistic view, which stakeholders can share and exploit. Comprehensive initiatives and guidelines, developed at the summit and likely approved by citizens, are likely to fail or even fail: Chenet (2019). Indeed, these directives may be economically unsustainable or even counterproductive. The effects and technical details could not be sufficiently integrated through macroeconomic models based on developing and reinforcing the directions and intentions taken upstream; Le Guenedal (2019). In particular, the emergence of the Covid-19 pandemic is leading to unprecedented economic upheaval, so that all models established and advocated a few years before will need to be reviewed. Therefore, the conclusions drawn and thought to serve as a guide in future actions are questionable.

Faced with the complexities of the issues that impact them, stakeholders such as researchers, educators, and even companies/industry (in search of a new business model) are at least interested in having a synthetic and explicit view of the interdependencies between the various research, increasingly specialized, that is being done. Indeed, each of these stakeholders, being too committed to the challenges that burden them, does not necessarily have both the material time and the level of knowledge to go and see what is happening around.

This situation, just been mentioned in the previous paragraph, accredits the need for a new branch of research that we refer to as Research on Research (R/R). R/R can be led by researchers or educators who will mobilize their efforts to analyze, decipher, synthesize and above all popularize research across various fields, which are somehow connected at least concerning issues related to global initiatives as with the EETs and DTs mentioned above.

The complexities around the current issues that the various stakeholders will have to face are coordinated and multidisciplinary. The latter's practical implementation is not always easy to fulfill, as it mobilizes many materials and human resources, and the differences in sensitivities and cultures between researchers are obstacles.

The R/R contributes to the failure to benefit from this effective multidisciplinary action and allow stakeholders to operate more efficiently, rather than just undertaking actions in isolation, which is liable for being disconnected from the overall issue.

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The convergence of knowledge towards using concepts ahead of MLAs means that current research should need multidisciplinary collaboration. The R/R helps to achieve this requirement.

Although some are not always conscious Accenture (2018); Iberdrola (2020) and Brammer & Clark (2020), disruption affects the academic world and especially Research and Researcher. The latter will now have to reinvent to exist effectively but not just continue as before, for example, in the limited logic of academic publications between peers and while staying in the mono-disciplinary framework as he has followed throughout his thesis cursus.

The researcher should realize that he can play an essential role through the insight and support toward specific stakeholders, including companies, decision-makers, and regulators, Ratten & Jones, (2020).

One should be aware that currently, anyone with the willpower, given the information and knowledge available, could become an expert at something and make himself more beneficial for society's progress. Some consulting companies and savvy individuals have undertaken and directed their actions toward providing real missing needs from the socio-economic world. We can think, for example, of people who develop content on YouTube.

Therefore, the traditional activity of the researcher is somewhat threatened. Funding the production of knowledge disconnected from reality (consequently with little use to society as a whole) no longer seems justified. In a world in transformation, research must be oriented to added-value activities since the resources are now limited, especially with the economic crisis resulting from the Covid-19 pandemic, and who is the end horizon is not yet clear.

The missions of the teacher-researcher are now being expanded. Besides, from continuing to persevere in the field, he has proved himself to be academically productive, the teacher-researcher should also be concerned with popularizing his themes. Indeed, he must defend these last toward non-specialist audiences or non-academic stakeholders, provided that these themes have efficient implications. The research teacher should commit himself to a specific type of research coupled with his educational mission, as we will detail below. Nevertheless, it is also essential for the researcher to position some of his research themes towards issues that fall within current societal problems.

For example, with DTs and ETTs, the Finance researcher focused mainly on narrow themes as a description of organizations' behavior or market players, emphasis on specific technical points such as valuation or asset allocation. At present, he should be open to other considerations that he is not familiar with: technological, scientific, etc. See, for example, Bank of England (2019); BNP Paribas (2019); Financial Stability Board (2017); Jagtiani et al., (2018); Jung et al., (2019) and Oxford Sustainable Finance Programme (2018). With cost reductions and demands for efficiency and effectiveness, the trend is to move towards the process and decision-making automation of some traditional businesses. This automation involves collaboration between those with business knowledge and engineers who master the technologies and uses of the data, Taddy (2018) and Gu et al., (2020). This collaboration aims to break down processes and decision-making into basic tasks that the machine can simply process.

ML extracts knowledge from the data, but as just described, they are tools for automating processes and decision-making related to business practices. Within the framework of the EETs, MLAs provide practical technical solutions to climate problems: Rolnick et al., (2019); Oxford Sustainable Finance Programme (2018); Nassiry (2018).

These solutions can be seen as complements or alternatives to global approaches, based mainly on macroeconomic models and policy choices, challenging to implement and appreciate

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Pindyck (2017) and Grandjean & Giraud (2017). Also, quite recently, it can be noted that MLAs have become interesting tools to extend and increase computational powers in various fields: Mathematics, Physics, Biology, Economics, Finance, etc. as can be seen for example in Weinan et al., (2017); Dimitri Bourilkov (2019); Coulombe et al., (2019); Webb (2018); She & Grecu (2018) and Zetzsche et al., (2018).

The previous three paragraphs give credence to the idea that the ML can be a theme to be carried out in the framework of R/R. Therefore, it appears that to align with the needs and recognition of society or stakeholders, research must be performed over a form multidisciplinary. Pure academic recognition (by peers) is no longer sufficient and even tends to be unessential.

From the point of view of the entrepreneurial practice, what counts is transforming bits of knowledge picked and bringing real solutions or actionable ideas facing the problem under consideration. Having publications is an academic rite for peer-to-peer legitimacy, but the economic value of which is increasingly questioned in the changing world and where resources are becoming increasingly scarce as teacher-researchers fail to reinvent themselves and function differently.

Multidisciplinary research with a real purpose, appreciated and beneficial for non-academic stakeholders, should be easily monetized. By participating in this type of research, the researcher would have society's legitimacy and subsequently be strengthened in activities as a pathfinder and knowledge builder.

EDUCATION COUPLING WITH RESEARCH

Traditionally, research is present to build new knowledge, but also

1. to feed previous knowledge (deny, improve, extend)
2. to guide practices (deciphering issues, developing models or methodological approaches, developing experiments or prototypes), and above all
3. to serve education needs (bringing basic knowledge closer to practice in professional practices).

Although some are not aware of it, the world of Education and Research is experiencing a disruption, Arnett (2014) because of digital and data technologies, Accenture (2018) and Iberdrola (2020). The initiatives for Environmental and Energy Transitions (EETs) and crises related to the Covid-19 pandemic leave no choice to the status quo.

In fact, in recent years, we are witnessing an explosion in the supply of information and knowledge through the digital, at the cost of Attention and time (AT), therefore significantly lowering financial cost. The traditional roles of the school (standardized and uniform masses training with an increasing and exorbitant financial cost) and of the educator (supposed to master and possess the knowledge that the learner would need) are being disrupted, Brammer & Clark (2020) and Ratten & Jones (2020).

On the one hand, we are now witnessing low-cost training, which is increasingly personalized and best meets learners' specific needs in their job quests. These training pieces are either delivered physically by reputable institutions (Stanford University, Columbia University, etc.) or unconventional institutions (School 42, Microsoft, etc.) or digitally disseminated by trainers who have specialized in aligning educational offerings with the professional realities.

On the other hand, despite primary knowledge offerings established and supported by research for decades, the classical educator seems increasingly out of step with the changing world's immediate needs. Sometimes tutorials seem better to meet the learner's immediate needs,

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although they do not have characteristics supported by academic materials as in the past. These tutorials go directly to the essentials and do not dwell, for example, on details of references that do not add value for the practical perspective.

It is also a fact that for at least two decades, successes in economic activities have been driven by people coming out of the academy (not with fancy degrees) but who have been able to grasp the meaning of the world's evolutions. These leaders have used their common sense and willingness to succeed by relying on the opportunities offered by new technologies associated with digital and data.

It appears that at present, with their standardized training, their diplomas supervised by entities (such as the state), and with academics trained in the same mold, traditional schools have apparent difficulties in adequately coping with the challenges and opportunities of the changing world with DTs and EETs.

The functioning of the world of education (national or general) and research should be reviewed or reinvented. This is a huge task that we do not pretend to be able to do here. Nevertheless, we strive to bring at least a few points to feed the reflection.

For convenience, our present analysis focuses only on the academic teacher-researcher's situation, who has had an essential role in the transfer of knowledge and the construction of knowledge.

Nevertheless, in general, those responsible for education, including school heads, are also affected by the disruption. They will have to be more inventive regarding the changing world and not just stay in a sheep movement as they were quite often until now. The point is that the content to do administrative management often relies on what is done around and does not seek to go into details and understand the academic world's intricacies. In the meantime, the various transformations' opportunities leave open a field of possibilities allowing for differentiation, which might be converted into strengths for the educational institutions.

When it comes to education, there is the transmission of knowledge on the one hand and the development of knowledge content on the other. Here we focus on the latter aspect, although the pedagogical aspect is also important and widely studied.

Especially now with the containments associated with the Covid-19 pandemic, the transmission of knowledge through digital attracts much attention and becomes an issue for educational institutions Brammer & Clark (2020), and Ratten & Jones, (2020). Educational institutions are rethinking the educational modalities and spaces to the point that elaborating the content is fade away. Addressing the material and digital sides of pedagogy, despite the associated costs, seems to become school heads' new motive.

However, points of detail and subtlety, such as the development of training content, do not seem to be the primary concern of school heads. One possible explanation is that they cannot identify the appropriate responses in terms of training to provide facing the world's various transformations.

We argue that developing knowledge facing the DTs and EETs is complex and requires detailed research work for which the teacher-researcher can actively undertake. Nevertheless, the transmission and development of knowledge are intimately linked. The background is the puzzle of how increasingly complex the knowledge can be transmitted to learners, whose attentions are increasingly dissipated and have limited learning time as they are busy with too many things (for example, with the various hard and soft skills).

Developing the content of "*tailor-made knowledge*" for education is not simple. First, one should be clear about the target. Do we want to build knowledge that allows the learner to face

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traditional trades or trades under a process transformation, new businesses that have recently emerged, or jobs that are not yet in good visibility as it stands? Developing training content for the learner also requires contextual considerations. For example, the spirit and scope of continuing education for a learner already in professional activity should differ from that of a learner in initial training who prefers to rake through a global culture.

Putting away the inherent difficulties coming from the alignment of the trade needs with the training offer, it also appears that different content versions must be created depending on the type of learners. Some need to immerse themselves in the environment and the stakes. Some learners need to move towards understanding mechanisms as they prepare to be operational in their professions. Some need to acquire deeper elements, both technical and organizational, to pursue entrepreneurial approaches.

Changes in trades (as is seen in Finance), concepts, and techniques related to new technologies and data were not necessarily part of the educator or teacher-researcher's monoculture training. While the use of DTs calls for the convergence of several types of knowledge and techniques, thus being relevant to multidisciplinary.

As a result, a large number of structuring elements can be used later as training materials. For example, one can be content just in the context of training to present the use cases and explain the issues. This is the type of first-order training that a Business School can adopt by default. A second possible order is to insist on technical parts (for example data manipulation, or algorithms) that the learner may need in his functional business practice. A third possible order is to explain mechanisms (such as decomposing a process or decision-making into elementary executable tasks via appropriate algorithms). A possible fourth-order, more useful for a learner with an entrepreneurial approach, is to go towards the mechanism of value creation through the combinations of several elements (data, algorithmic concepts, strategies, and business models).

Structured knowledge materials on DTs and EETs, coming from research and directly ready for use, such as those used for conventional training, should not yet exist. What we have here and there are scattered elements that the educator or teacher-researcher cannot directly into a training course. The teacher-researcher himself may need to self-train or train himself elsewhere before transferring some of the elements he has learned in the right conditions.

The deciphering of various research studies (on technological and scientific advances, on the behaviors of organizations and society, on trades, on education) may allow us to form ideas to reshape reasonable, appropriate educational offerings. It is in this sense that R/R, we have presented above, is becoming practical.

Conversely, current needs and shortcomings in education may, in turn, feed into new themes for research. The deciphering of the realities of use cases and their transposition to the four types of training order as developed above leads us to research useful to build education materials in phase with the changing world.

Therefore, the academic researcher can take advantage of deciphering what is happening and elaborating on new courses that align with society's needs (detected during decryptions). Otherwise, if the researcher fails in the CER undertaking, it is directly the consulting companies or the trainers, having shaped appropriate expertise, providing educational solutions aligned with the world transformation.

It makes sense to postulate the need to take an interest in the CER as currently a vital activity the classical research teacher could or should undertake to sustain his existence. There is indeed a problem of existence (or even legitimacy) for the researcher.

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On the one hand, the introductory classical courses that the teacher-researcher is used to teach may be online available at a lower cost and may be no longer relevant to the learner's needs. The contents of some classical courses no longer correspond to the immediate realities of the world changes. While the realities encountered are not yet really part of the knowledge elements established in the available literature. While the facts encountered are not yet really part of the knowledge established in the available works, the CER should help fill this gap.

On the other hand, the classical non-assigned research themes, which the researcher undertakes, can remain uninterested in the socio-economic world's global demand. Simultaneously, the latter is ready to subsidize anyone bringing relevant and actionable solutions to its acute issues.

Within the CER, the researcher can no longer work in isolation or stay with colleagues in the same discipline as the world's environment becomes increasingly complex and global, the researcher should open up and collaborate with other non-academic stakeholders (companies and professionals)

Education and training will have to accompany the changing world, and consequently, the development of the corresponding related educational content should always be in motion. The Big-Data revolution has brought so many things and changes that are still evolving. This is no longer the case in the traditional setting, where the taught courses had already more or less stable and have been approved both in theory and in practice. At present, there are more and more successful experiments for which one cannot be so indifferent, given both their fundamental practical contributions and their potential development of new concepts.

The development of pedagogical content creates challenges and opportunities that the teacher-researcher can or should undertake. Suppose he does not have sufficient technological knowledge or is not comfortable with techniques (such as coding) or new technologies and related concepts (such as Machine Learning algorithms for example). In that case, the research teacher could outperform in the decryption of organizations' structures and behaviors, which are very useful to the learner at a first step. The more technological or technical part could be entrusted to a (non-academic) stakeholder with a better knowledge of the trades and the appropriate human resources needs.

The CER is a way of diversification for the researcher, confined to research topics toward peers' interest. In the last century, higher education institutions pride themselves on having teacher-researchers publishing in top academic journals. Now in the 21st century, when various disruptions of all kinds are hitting the socio-economic world, to continue to exist, educational institutions need teacher-researchers capable of offering training in line with the needs of learners. Moreover, this form of adaptation of the researcher shows agility as deserving (or even more) than a publication remaining just in the context of peer controversies.

This coupling CER can also constitute an essential bulwark to survive in the face of threats from non-academic actors, who find a substantial potential activity to undertake in the face of the world's traditional actors' education failures.

CONCLUSION

This work has been done in the spirit of bringing actionable ideas, especially for the teacher-research, as we are, to integrate appropriately and to face the breaks related to DTs and EETs. Instead of focusing on the usual academic approaches such as empirical approaches, interviews, analyses of work in the literature, we followed a common approach in the field of

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start-ups. Given the vast amount of knowledge currently available at the right price of attention and time, the claim of authorship of ideas matters little. The critical point is to have the agility to transform bits of information compiled here and there into actions and objects, really making progress.

This work can be seen as the result of a Research on Research (R/R), as we have developed through this work.

Eventually, some readers may not subscribe to some of our ideas. However, sharing them in this text allows us at least to advance the discussions if we like the controversy. The main point is that some of the ideas put forward here are genuinely actionable, as we have already experienced and implemented in our teaching and research activities.

Other proposals are certainly lacking and can be incorporated to enrich those presented in this document. For example, our analysis on the CER is just focused on developing the training content, which is equally related to pedagogical modalities. The latter is also relevant at this time of pandemic in which digital technology is entering into force in educational activities.

We have tried to provide (structuring) elements regarding this development of training content in the various transitions framework (as DTs, EETs) that currently animate the world. Our analysis shows that this development poses significant challenges for the teacher-research. These are new challenges, other than what he had so far as research concerns. The researcher should position himself concerning his challenges, conditioning his usefulness or even his career.

Our analysis shows that the development of training content, in the face of DTs and ETTs, is not always suitable to be carried out individually. For more efficiency, the best is to use a multidisciplinary collaboration. However, the latter's implementation is not always easy to perform, and this is where one may need to call on R/R.

In this changing world, we have recalled that several elements from various disciplines tend to be simultaneously called upon to face the complex challenges that genuinely affect the socio-economic environment. Many of these elements converge on the MLAs and their associated concepts. The theme around MLAs naturally becomes a significant example of what can be carried out within the framework of R/R.

R/R can be conducted individually, with much hard work, but probably the most appropriate framework should be in collaborative research, as it uses multidisciplinary.

The teacher-research commitment to R/R or the CER, which we have promoted in this paper, are new directions that do not follow the traditional peer-to-peer publications. Until now, the teacher-researcher's academic careers depend heavily on his publications, as these are easy criteria that school leaders can apply, just doing administrative management and without going to understand all the subtlety and the substance of research and education.

With the disruption that is now hitting the academic world, it is high time for teacher-researchers and school heads to change their model and define new evaluation metrics, other than publication criteria in supposedly reputable newspapers. It is up to researchers to reinvent themselves and find possible metrics for their careers. Indeed, how can we give credit to researchers who claim to propose ESG performance criteria for companies if they fail to define adequate performance in their activities?

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