



Research Article

A Study on Factors Influencing Leadership in the Context of Digital Transformation

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Abstract

This paper extends a previous study regarding the importance of a digital leader in a digitalized era, by adding a new dimension to the set of skills a digital leader should have in the process of digital transformation. This new dimension targets holistic team management from a social point of view, by explaining, mitigating, or even preventing conflicts, while promoting a positive work environment. A digital leader will be able to accomplish this by using tools offered by neuroscience. Moreover, this paper aims to provide an overview of how neuroscience can be linked to leadership in the context of digital transformation, by identifying several neuroscientific factors of influence.

The paper starts with a theoretical approach of the desired skills of a successful digital leader, validated by using a targeted questionnaire. The authors further look at current literature regarding neuroscience, focusing on the business context, analyzing the SCARF model, and identifying in the existing literature the main points of view regarding the neuroscience factors influencing leadership. The main finding is that actions and reactions can be understood and explained using this model, and the neuroscience approach on leaders can individually profile team members.

The authors argue that the symbiosis between the skills and characteristics that a digital leader has, with the brand-new skills belonging to a neuro-influenced leader, would lead to a leader able to use neuroscience in their activity. This leader will have much more complex knowledge and abilities, adapted to the new challenges faced nowadays.

Keywords: Neuroscience, Digital Leader, Digital Transformation, Digital Skills

Introduction

It has become almost a truism to say that we live in an increasingly complex and changing world, with fewer certainties and more situations in which we need to make decisions based on ambiguous, uncertain, and incomplete data. The paradox is that to be effective in this modern world, we must fight against regulatory mechanisms that have evolved in our own brains and brought to perfection by the very need to survive in an ancient world. This old, different, simpler world had much more obvious threats and dangers, like survival by avoiding predators.

Today, instead of the simple choice of fight or flight from a predator, we must thoroughly think and choose how to deal with non-life threatening but unavoidable taxes and bills. There are short, medium, and long-term decisions that need to be made on incomplete data, with our subjective minds. At the workplace, we have organizational changes, procedures, culture, and group practices. Things happen at an accelerated speed, and we don't (yet) have a specialized organ in our brain to deal with them effectively.

In such a volatile environment, to adapt and be efficient, one needs to be able to at least adjust its behavior and attitude with the changes, if not to be one step ahead of them. Unfortunately, this requires a large amount of mental and physical energy. And as if that weren't enough, a strong part of the brain is going in exactly the opposite direction of change, because it's programmed to like peace and predictability, and to save energy. There is a simple equation: if you are not one of the few able to self-regulate by generating enough energy yourself, then you need to receive or take it from somewhere outside. In the business context, some leaders can give that energy to those who

follow them. These are not many, and organizations are increasingly willing to invest serious budgets to identify and assign them in the right place, thanks to the large return on investment they generate. Identification of such potentials or certainties in leadership, according to studies, can be achieved with the help of neuroscience.

Recent discoveries in the field of neuroscience have proven the neuroplasticity of the brain, and therefore our ability, as adults, to evolve, improving our performance in the organizational environment.

Why would there be a need for neuroscience when we talk about the organizational environment or about the people we work with? Why is the classic leader or the digital leader no longer enough when we talk about leading a team or implementing a change?

Traditional psychology has provided and continues to provide answers to this question. There is a dimension of personality in the Big Five model (Lim, 2020) called Openness, which partly explains why humans differ in their willingness to change, as a natural tendency and preference. On one end of the spectrum, there are those who are afraid and thus reject any change in routine, that take comfort in absolute predictability. On the other end are those who quickly get bored and are constantly looking for new and unique experiences, and the only constant is change. However, the fact that there is diversity on this spectrum does not provide relevant information or an actionable solution applied to the work environment.

Recent discoveries made with the help of neurotechnology (electroencephalograms, functional magnetic resonance scans, etc.) show that even the most flexible people, in terms of

availability, feel change, especially that unplanned by themselves, as real pain. The brain reacts to this through energy-intensive signals, seeking back comfort and familiarity.

To break this cycle requires significant energy resources, serious motivation for change, which will begin to come from within. As today's neuroscientists are stating, we need a source of energy capable of giving people the strength to build new neural pathways in their brains on which to base new behaviors, desired and expected.

Fortunately, great leaders can move us. They ignite passion and inspire us to give our best in certain contexts. They broaden our horizons to ideas and changes, provide us with the resources to make that effort to go in directions that are not comfortable for us to begin with. Without this push, most of us would conscientiously resort to the process of saving our own energy, and we would comfortably limit ourselves.

Literature Review

Current state of adoption of a digital leader in companies during a digital transformation process

The digital transformation processes

As stated in Akhtar et al. (2018) regarding digital leaders' skills in the process of digital transformation, businesses have begun to increasingly embrace the idea of transforming the way they operate, and those that have not done it yet are beginning to take it into consideration. The results of the Eurobarometer survey show that most respondents believe that digital transformation has a positive impact on the economy (75%), quality of life (67%) and society (64%) (European Commission, 2017). The International Data Corporation estimates that, by 2022, worldwide, \$2 billion will be invested in

technologies and services that will allow the opening to a digital transformation, the transformation in this direction of business environment being inevitable (IDC, 2018). But what does digital transformation mean? The process refers to the strategical adoption of digital technologies with the final purpose of improving processes and productivity, delivering better customer and employee experience, managing business risk and controlling costs (IDC, 2018).

Digital transformation is the process of rethinking the business model or business process in the light of the availability and accessibility of digital technology. This can be done by using digitalization that refers to the analog information that has been digitized and that can be integrated and then used in various software applications with good premises for automation. On the other hand, digitization is the transition from analog to digital formats or, simpler said, the process of collecting all available and then accessible information in a digital format.

For many businesses today, the main motivation for digital transformation is the chance to gain competitive advantage by improving the customer's experience (Dumitrescu and Buzatu, 2020). Though, it is necessary to understand that digital transformations imply both risks (pressure for employees, lot of requirements) and opportunities (innovation, job enrichment), which requires a holistic approach focused on needs (Grab et al., 2020). Since seeing the advance digital transformation has gained, as well as the challenge of proportions that it represents for organizations, it is inevitable to what are the critical factors that can help organizations turn the implementation of this process into a success.

First, one of the biggest challenges is to innovate for the future and not digitize

the past (Boros, Dumitrescu, and Burtica, 2018). That is why digital transformation is first and foremost a leadership challenge. A leader needs to inspire empower and understand teams and employees with a skill set and a digital mindset. As concluded by Scuotto et al. (2017), the digital technology advancement of businesses requires the implementation of new business models and may also have repercussions on the relationship between the organization and its customers. This means as well that the communication between organizations and customers increased due to digitalization, meaning the exchange of data between them is easier (Papa et al., 2018). All these changes represent a challenge and could create tensions between old values and procedures, which in the end may represent an obstacle in implementing new technologies (Del Giudice, 2019). It's all about a strategic process of change that transforms an organization's business models, about how it creates value for its customers or citizens, and how it captures that value; that is, how it monetizes it. It seems that companies which can grasp the challenges brought by digital transformation are as well able to provide a new value proposition to their customers, for a better and reliable data management (Grab et al., 2019). For this transformation, a change in the skills, competencies and in the cultural DNA of the organization is needed. Learning and organizational culture are, in fact, critical factors of digital transformation. At the beginning of the digital revolution, this was a technology topic, then it became a business topic, and today it is primarily a leadership topic (Cortellazzo, Bruni, and Zampieri, 2019).

For a deeper understanding, comparing the process of survival in a jungle and the living days may be a good exercise. The difference stands in the fact that the jungle is based on a process of evolution, in which you can anchor yourself to

predictable landmarks. What we are experiencing today is a revolution, and the reason why we can call it a revolution is precisely that we lack the predictability of benchmarks, especially those that impact at a societal level as well organizational. No industry, no company, no individual is immune to the threat of being disrupted. Down to the personal level, being relevant in a digital world is the main challenge encountered.

Organizations, which are facing digital transformations, and which had big expectations of benefits related to business and customers, have failed because they collided with the organization culture (Wokurka et al., 2017). Reorienting leadership in this world does not mean that traditional skills have been suppressed, but now they coexist within a mixture of new factors. Namely, to be a digital leader, one must become fluent in digital change acceptance: developing new digital skills, experimenting and taking risks and understanding how technology transforms society and turns into impact on business (LearningPro, 2020). Moreover, being a digital leader means understanding others' needs, anticipating conflicts, mitigating problems, making sure the team is happy and accomplished the tasks they have.

Digital Leader's Implication

In their article, Leonardus and Sasmoko discuss the importance of leaders in developing innovative business models, especially in the context of digital transformation, considering them digital leaders (Leonardus and Sasmoko, 2019). Thus, the digital leader involves a combination of the transformational leader's leadership style and the use of digital technology. Even though having a role of digital leader includes the usage of technology, the focus is still on strategy, structure and understanding the customer's needs (Briggs, J.). Digital leadership is defined as the combination

of a leader's culture and competence in optimizing the use of digital technology to create value for companies, while the key success factors for digital leaders are the visibility of the executive and supervisory committee, digital transformation being seen as the core and control (Sahin Danisman, 2015). In this context, the digital leader is assigned five essential characteristics to complete the transformational process - the leader must be *creative, thoughtful, visionary, inquisitive* and at the same time a *deep leader* (Zhu, 2015).

Therefore, the role of a digital leader is essential in leading the decision-making process as promptly as possible, but also in driving change of any kind (SCMedia, 2020). And to be able to drive this change, one of the main steps a digital leader must take is to build on the resources they have, starting with the human resource (VantageCircle, 2020).

Current state of adoption of a neuroscience influenced leader in organizations during a digital transformation process

Neuro-leadership's implications

The term “neuro-leadership” was first used in 2006 by David Rock, CEO of Results Coaching Systems. It arose from the need to better understand what we can do to be better leaders so that we can effectively lead both others and us, by engaging with what our brain tells us about being human. It came at a time when, with the rise of research technologies, neuroscientists were able to observe live human brains (e.g., using functional magnetic resonance imaging (fMRI) scanners). By using these technologies, they discovered a lot of information about how our brains work. This is how the term of neuro-leadership took shape.

Building further on this idea, it is important to mention that the field of neuro-leadership explores the neural basis of leadership and management practices and gathers results from different sources. Among them, we can mention cognitive and integrative neuroscience, social cognitive and affective neuroscience, neurobiology, and other fields of neuroscience. The scientific world hopes that by developing a science for leadership which borrows from the physiology of the mind and brain, it will become more accessible to those leaders interested in developing and improving both themselves and others, especially, knowing that the focus of neuro-leadership is on people rather than leadership functions or management and emphasizes how we connect and relate to each other.

The digital leader facing neuroscience and the digital transformation process

As digital transformation is currently at its infancy for many industries, it is very important for organizations to learn from the top digital performers in their field and then change and adapt to succeed (Martinez-Caro et al., 2020). One of the reasons that rather few companies have a well-defined digital strategy is that at the C-level / management team there are no leaders with digital skills: 72% of the board members do not have digital skills, as stated by Russell Reynolds Associates (2019). They support caution and not innovation, and the impact on organizations is harsh. This effect is called ‘digitally illiterate leaders’ (Russell Reynolds Associates, 2019).

According to a report made by McKinsey Digital (McKinsey and Company, 2018), digital performance and digital leaders are key elements for companies to remain competitive on the market.

Hence, it was noticed during the time that we are in the very early days of digital

transformation and, therefore, it is normal that digital leaders “outperform their digital followers and digital laggards in the sophistication and quality of their Digital Quotient” (McKinsey and Company, 2018).

Nevertheless, the adoption of the digital leader inside any company that faces a digital transformation process is part of the management strategy. Based on recent research, team leaders are challenged to pay more attention in understanding both how technology can increase the process quality and how the human resource can become part of the digital implementation process, by building a good knowledge base (Fogoros et al., 2020). But this understanding must reach more complex dimensions to be able, as a leader, to understand the emotions of the team and to build on them to obtain positive results. Paul Willmott proposes three important steps that should constitute the base of any process from any company who is intent on getting involved in a digital transformation process. First, it is the alignment between overall corporate strategy and the digital initiatives the companies are perusing. Second, is the ability of driving a fast and agile culture through the help of digital leaders. Third is getting the right organization factors in place (talent, people, processes, structure, and systems that really make a difference when it comes to performing in this new world) (McKinsey and Company, 2018).

In theory, these should be the key elements for success. But because studies regarding the adoption of digital leaders (second step proposed by Paul Willmott (McKinsey and Company, 2018)) in digital transformation processes are limited and that there is no evidence or enough data, it is hard to conclude that the success of digital transformation process comes from the adoption of a digital leader (with all the skills and characteristics with which it must come bundled) (Hamill,

2019). We need to take another step forward and treat the complexity of a digital leader from a neuroscientific point of view. Thus, combining the two attributes of being a digital leader and the perspectives of neuroscience, as two complementary components working seamlessly, yields a complex portrait of a new digital leader.

The physics of neuroscience

As with almost all aspects of technology, neuroscience sees continuously increasing progress. The field touches many areas, and has many pioneers and discoveries worth mentioning, out of which we only touch a few more recent ones. It was only a decade and a half ago when Karl Deisseroth made a splash when his dubbed ‘optogenetics’ technology allowed research to target individual brain circuits and control them to a degree using light (Deisseroth, 2010). Improving on this technique, using fluorescent molecular dyes, he exposed for the first-time intact brain circuits that span the entire brain. Functional magnetic resonance imaging has improved in the past decade up to a point that it is possible and feasible to create automated three-dimensional reconstructions of the live brain, and study physically what circuits activate in different situations – like strong emotions that could happen in the workplace for example. These MRI machines have the resolution to discriminate down to 1 mm (a 1-mm³ block of brain contains ~ 20,000 neurons) with machines planned to exceed 10 Tesla, bringing the resolution to 0.1mm. Further adding to that, using magnetic nanoparticles could potentially boost resolution up to an equivalent 30 Tesla (Choi, O.S., 2017).

Jumping in the present time (at the time of writing, late 2021), we discover more fields of science that build upon one-another. One such major boost came to Artificial Intelligence, a field which has long been based on neuroscience. But this

time around, it was A.I. that helped neuroscience mark another milestone that will help scientists make sense of the brain's 80+ billion neurons interconnected by 100+ trillion synapses: in mid-2021 Google, in collaboration with the Lichtman laboratory at Harvard University and Connectomics (Shapson et al., 2021), have released a landmark dataset named "H01" contains a 1.4-petabyte sample of human brain tissue (a petabyte is 2 to the power of 50 bytes, a size almost incomprehensible only a decade ago) which wouldn't have been achievable without A.I.'s help. The human cortex H01 sample was sequentially scanned using an electron microscope with nanoscale resolution, digitally reassembled, and researched for preliminary ideas on the anatomy of the human cortex. It contains approximately one cubic millimeter of imaging data, with tens of thousands of rebuilt neurons, millions of neuron fragments, 183 million annotated synapses, 100 proofread cells, and numerous more subcellular annotations and structures - this endeavor would not have been possible without the help of current processing hardware and A.I.

Understanding the brain is possibly one of the biggest challenges before us, but we are taking big steps towards this goal. These steps yield benefits in many areas, including our target one: the work environment in the context of a digital transformation. We are on the way to understand how the brain works and how behavior can thus be shaped.

Practical Neuroscience Tools

David Rock came up with a tool named the SCARF model, to help remember the areas most affected by threat or reward (Rock, D., 2020). The acronym SCARF comes from 5 "buttons" in the brain that, when pressed (voluntary or involuntary), subconsciously influence behavior in various social situations. Therefore, one

can use these buttons to influence the reactions of those around but also to better control one's own.

The five domains of the SCARF model of human social experience are: status, certainty, autonomy, relatedness, and fairness. This model assesses the differences in people's social motivation. Some people are more sensitive to status threat and rewards, others to certainty and relatedness. Having SCARF needs satisfied drives engagement and retention (Weller, 2019). This conceptual model enables people to display more adaptive behaviors, based on how mental experiences occur over time (Rock and Cox, 2012).

The SCARF model has the great advantage of helping people adapt more easily through clear and easy-to-remember language. The purpose of this language is to improve the ability to label, to re-evaluate emotions with the final purpose of helping to regulate social threats and rewards (Ochsner, 2008). Social threats, such as the fear of appearing unprepared in front of colleagues, can lead to inhibition of creativity, critical thinking, cognition, collaboration, and even high-quality perception. Having a memorable language for rewards and social threats allows us to observe these experiences in several points that we cannot do otherwise: before, during or after an event that produces emotions.

- Before: prediction: SCARF can help predict whether a threat will occur and thus enable the possibility of changing our choices or activities accordingly. In his book, James Gross (Gross, 2015) proposes a model regarding how emotions unfold, called "situation modification", referring to the predictability that the SCARF model can offer.

Before an emotional event occurs, SCARF allows people to predict in advance the impact that an action may have on others. For example, before announcing the possibility of integrating a digital transformation process within the team, a manager may realize that the team members could perceive this information as a threat status. In this case, the threat could be smoothed by increasing people's sense of security by giving them more information, treating the problem in a transparent way, increasing the feeling of autonomy by involving the team in the way the process is going to happen even building together a deployment plan. Knowing SCARF helps mitigate or even eliminate the threats that an interaction might cause.

- During: regulation: during a situation such as a threat occurring in real time, emotions could be adjusted using SCARF. Studies have shown that awareness or re-evaluation of emotions can help manage and even reduce them and therefore increase executive functions (Tyng, Amin, Saad, and Malik, 2017). During a threat or emotional event, SCARF provides an easy-to-remember framework for labeling and re-evaluating people's responses. Adjusting emotions during the event is not easy, as strong emotions reduce the ability to self-regulate (Ochsner, 2008). For example, when somebody is excluded from an activity, he/she perceives this as a threat around status and familiarity. Research shows that this response stimulates the same area of the brain that is

affected by physical pain. In other words, the brain sends the signal that we are in danger. Furthermore, when we feel threatened (physically or socially), the release of the stress hormone cortisol affects thinking – it cancels creativity and drastically reduces productivity; we simply can no longer judge rationally, which leads to an increase in the feeling of threat. With SCARF, people can better identify the cause of a threat response through labeling. They can change their response to an event by re-evaluation. By doing this in the heat of the moment, where possible, the digital leader influenced by neuroscience can help people make better choices and reduce social conflict.

- After: explanatory: after an emotional event, such as a conflict between team members in a particular social situation that inhibits full free speech, the feeling that one or more members of the team might be experiencing can be that of unfairness. It does not mean that the adaptive responses are going to be increased in the moment, but for sure there is a great possibility of reducing uncertainty and ongoing conflicts over time. Having this knowledge, people can choose different strategies for future interactions with others. Therefore, with enough awareness, people may be able to move from using SCARF after, during and then before an event: from explanatory to regulatory to predictive, as distinctions become easier to access from moment to moment.

To summarize, SCARF model can impact people:

- **Before an event: prediction.** SCARF provides an increased ability to minimize negative emotions and maximize positive ones ahead of time in oneself and others. Distracting threats will be mitigated and overall motivation increased.
- **During an event: regulatory.** SCARF increases the ability to regulate one's own and others' emotions, thus, increasing creativity, perception cognition and collaboration.
- **After: explanatory.** Briefly, SCARF is a cognitive, heuristic tool to understand the potential impact of one's actions on others, and their associated reactions, thus enabling to view and select different choices of action. Being easy to remember makes SCARF especially useful because it can be easily accessed when cognitive resources are low (Rock and Cox, 2012).

Mixing the skills of a digital leader with the knowledge of a neuro-influenced leader

Businesses have been working in a context of ever-increasing rate of change, even more-so with the current upheaval brought on by the 2019 pandemic. Thus, the role of a leader is becoming more and more important, to steer the team, the business in the sea of change. To perform, it is no longer sufficient for a leader to be a model to those around, to show empathy, team spirit and to understand the process he/she is leading. To be a leader in a digital world one must understand the technical aspects to a sufficiently detailed level while also having an overview of the digital process,

to deeply understand how people function, what can activate them and keep them active and motivated to successfully deliver the process. To all of this, add the work-from-home aspect that has been forced due to the pandemic circumstances, coming with its own set of challenges. For example, the impossibility to anticipate an eventual conflict, to see/feel when dealing with a worker that loses motivation, the added difficulty of information transfer in an online environment, the possible misunderstandings that sometimes come from reading an email or a chat reply to the wrong way, and so on.

Considering that work-from-home, even if in a hybrid/partial format, just like the pandemic, is here to stay, and has permanently affected the work environment, there is a powerful incentive for businesses to adapt. Therefore, a leader whose skills extend up to neuroscience is not a leader who can only understand the technical process, who can promote innovation and help people grow, but a leader who can understand their emotions, actions, and reactions. This leader understands a reaction not only psychologically but also physically as a brain process, whose deep understanding gives him/her a new set of tools to work with dealing with much finer and ambiguous cases like forecasting one's behavior and actions.

The next section of this paper discusses the integration of the skills and characteristics that a digital leader should have with the insights of the tools used in neuroscience. Understanding how digital knowledge can meet the perspective of neuroscience, it will be easier to make use of our brain and to explore skills and emotions as to obtain maximum productivity and minimum impact both on the personal and professional level. These valuable findings are going to be reflected in a positive way in day-to-day performance, during a difficult change

process (digital transformation), in the interaction with the others by providing a good state of mind. Thus, the return of investment can be significant for any company that faces competition daily.

The applicability of SCARF model initiated by a digital leader influenced by neuroscience

We first present the SCARF model and then show how it can be practically applied in a digital transformation process.

- **Status:** refers to the position that a person occupies in a company. It is not just a hierarchical position, but it also refers to the impact, plus the value that a person can bring. When the position of employees is not clear - they do not know what to do, their tasks change without explanation - they feel that their status is threatened and it is difficult for them to concentrate, their brains are often on alert. For example, such an alert occurs when evaluating performance or giving feedback. Usually this is the moment when employees become defensive and look for arguments and justifications for mistakes previously made.
- **Certainty:** although "the only certainty in this world is change", there is a need for things in a company to be as clear and predictable as possible. Often, the unknown can have more harmful effects than a previously known risk. If it is a time of change and uncertainty (e.g., a digital transformation process), the brain goes on alert, does not feel safe and is out of focus. In this case, an increased level of certainty can be created by the digital leaders through frequent, sincere, and transparent communication, setting clear expectations and goals. The safer we feel at work (psychological and

emotional security), the more involved and dedicated we will be.

- **Autonomy:** everybody likes to have options and possibilities when deciding. For a leader, it is important to help employees realize that they have options and control over their job and how to handle daily tasks. For example, a digital leader influenced by neuroscience can make use of the transformational leadership style by avoiding micro-management. Moreover, he/she can show one of the most important skills that a digital leader proved to have - direction - by delegating increasingly complex tasks to employees, helping them to open new perspectives and constantly grow.
- **Relatedness:** relationships and collaboration are a vital part of a productive team. For a digital leader influenced by neuroscience, it is important to look for ways to connect with employees and help them interact with each other. When the work environment is friendly and employees feel accepted, the brain's alert system calms down. That's why it is important to use the "weapon" of change-oriented leader by showing creative ideas to make people feel part of the team so they can dedicate themselves to work and to obtain collective results.
- **Fairness:** finally, people feel an innate sense of fairness and equality in social interactions. We prefer what is justified to what is biased to a party. To talk about fairness, it is important for a digital leader to promote equity through transparency. For example, when making decisions, the leader can communicate the thought process behind one choice over another. Because otherwise the employees that do not get the full picture, usually start to invent alternative

stories that increase the chances of people feeling neglected.

All five of these areas (status, certainty, autonomy, familiarity, correctness) can have an impact on a person's perception of a social situation, whether threatening or rewarding. They can be seen as emotional switches that can be either moved to one side and have the feeling of threat or to the other side and have the well-being generated by the reward.

Understanding how these buttons work (regardless of one's will) will lessen the negative impact of perceived threats, control primitive reactions, and continue to relate positively and constructively to those around, even if sensitive areas have been "touched".

SCARF and neuroscience influence on leadership

There are numerous connections between SCARF and leadership. In many corporations around the world the relationship between a leader and those under him is often lacking. An interesting study by Segalla (Segalla, 2010) shows that people tend to have more faith in strangers than in their manager. This fact can be explained by SCARF and a multiplicative effect: first, the reality that a person has a manager creates a status response by simply being on a lower status step. Secondly, uncertainty arises by sometimes ambiguous expectations from the manager or, by a manager that makes many changes in a short period of time. A manager has control, and most of the time, the final saying; thus, autonomy can be reduced. By being on a higher level, a manager has different circles (e.g., for communication, knowledge access, etc.) and thus relatedness is invariably affected. Finally, a manager is most often better paid than those under, even though he or she is seen by them directly not working as hard. With all five areas under threat, team members tend not to

collaborate as well, to lose objectivity to other's state of emotions, to lose interest and creativity. Therefore, those who lead need to mitigate these situations.

This can be done in several ways, attacking one or more of the affected areas. For example, relatedness can be increased by focusing on common objectives, but mostly by being authentic and open, and by creating a positive experience for team-members (Forbes-Zeller, 2020). Certainty can be increased by transparent access to information, message clarity, by autonomy allowed by the leader, when possible. Even though leadership is seen sometimes as a threat, a leader has typically a high information level, abilities, and knowledge, and can transform these threats in pleasant experiences and can unequivocally develop good leader-team relationship based on moderate stress and collaboration (Rock and Cox, 2012).

Research Objectives

Regarding the research question of this study, starting from these discoveries that seemed vital for the organizational environment, especially for leaders who are going through a process of digital transformation, this paper expands on the previous study which addressed the importance of the digital leader in a digital transformation process (Trifan, Olaru, and Fogoroş, 2020). Moreover, this paper focuses on the complexity of the role of a digital leader and what can be done to get as close as possible to a successful digital transformation using the "weapons" of neuroscience.

To begin, the skills and characteristics of a digital leader are very important, especially for companies with an IT profile. Getting closer to an ideal portrait of a digital leader assures us to a degree of the success of the changes and processes happening in the dynamic world of business. Having technical

knowledge, previous experience, being a value creator, inspiring people and empowering the team by one's own example, are important, if not mandatory skills (part of them), but they are no longer enough. To be a successful leader that delivers value, it is important to have the knowledge that can help understand one's own feelings and those of your team. Knowing how the brain works, what explains the reactions of those around, especially in critical situations, can help improve conflict resolution, mediation and overall management of the team. It also leads to being a better mentor or coach for the team and improve one's change management skills, especially when the company goes through a demanding digital transformation process.

The paper's research objectives are the following:

1. See how the digital transformation process is being perceived inside surveyed companies in Romania and how important it is for both organizations and employees;
2. Outline the portrait of a digital leader with all the knowledge he or she should have to sustain a successful digital transformation;
3. Analyzing the literature regarding the definition of neuroscience and its understanding of psychological processes affecting emotional responses in human-interactions;
4. Evaluating the opportunity and effectiveness of understanding neural processes and their application by a digital leader within a digital transformation process;
5. Identifying in the existing literature the neuroscientific factors influencing the digital leader.

Research Methodology

We started with a survey of the current literature regarding the importance of a digital leader in a digital transformation process.

Given that there is not enough data on the effects that a digital leader has on a company that goes through a process of digital transformation, and neither on the skills and main characteristics that the digital leader should have to be able to lead a process of transformation, the approach used in this paper is that of the questionnaire. The aggregation of responses to targeted questions should either provide supporting evidence regarding the digital leader and its characteristics and role in the transformation process, or, contrarily, infirm the authors' hypotheses.

The questionnaire was created on an online platform to be accessible and easy to use and includes 13 research questions. The survey was filled-in by 183 professionals (both managers and non-managers), most of them coming from companies with an IT profile in Romania, during a four-week period in August 2020.

The number of responses is sufficient to draw statistically significant conclusions. All questions were subjected, depending on their type, to appropriate statistical tests. Whenever a test fails to meet the threshold, the implications of that question (or part of question) are discarded.

The first questions establish an understanding of the respondents' positions, from both managers (55.74%) and non-managers (44.26%), all participants having higher education and ~10% of them being MBA graduates (this was not a question; the questionnaire was directly given to an MBA graduate class).

The other questions are related directly to the paper's research objectives.

Having previously researched and defined the digital leader portrait by means of literature research and by validating findings using a questionnaire we investigate the current literature about neuroscience. We show that it has a strong physical foundation, and that advances in technology will lead to stronger proven correlations between the physical inner working of the brain and its generated behavior. We dive deeper by focusing on frameworks, namely the SCARF model, that could be helpful within our digital leader context. Moreover, we will identify in the existing literature the neuroscientific factors influencing the digital leadership. We show by practical examples how a digital leader would benefit from the lessons and methods offered by neuroscience in the digital transformation process.

Research Results

The perception of the digital transformation process and of the digital leader

To obtain relevant information, the authors examined the existing literature, as well as the latest published studies on the impact of a digital leader in the implementation process. They investigated in-depth what are the sets of skills and essential characteristics that a digital leader should have, how important is the digital leader within an IT company,

including how much professional experience and technical knowledge matters to support a successful transformational process.

For this purpose, a targeted questionnaire had been used to ensure that the results presented were based on real data and tested for statistical significance. 183 people from different companies familiar with the concept of digital transformation and who have a technical profile (both managers – 55.74% and non-managers – 44.26%) answered the questionnaire's research questions (Trifan, Olaru, and Fogoroş, 2020).

By considering the results analyzed following the questionnaire, when a company would like to hire / assign a leader able to lead both a digital transformation process as well as his/her team, it is mandatory to search for the following characteristics and skills:

1. Transformative vision: should have a great understanding of market and trends, business acumen and being a problem solver;
2. Change oriented: skills like open-minded, adaptable, innovative, creative, are desirable to have;
3. Provide vision and purpose;
4. A decent amount of technical knowledge;
5. Should build upon previous experience in handling digital transformation processes;
6. Provide a clear vision, sound strategy.

Table 1: Two-tailed, single sample t-test, with the population mean $\mu = 7$, at 95% confidence

t-test	t-value	p-value	Significant at $p < .05$?
Transformative vision	6.403271	< .00001	Yes
Change oriented	5.722189	< .00001	Yes
Direction	3.608387	.000398	Yes
Inspirational leadership	1.419777	.157383	No
Understands technology	0.542344	.588245	No
Forward looking	0.57823	.563824	No

Source: Authors' own research

Considering statistical significance values, if the first three characteristics are required for a digital leader to have, the last three are preferable, but not mandatory.

The leadership style that is expected from a digital leader is the transformational

one while the actions recommended for a digital leader to embrace are to use data driven analysis, set vision and not aspiration, develop customer or citizen-based strategy, outline coherent action, and focus on outcomes.

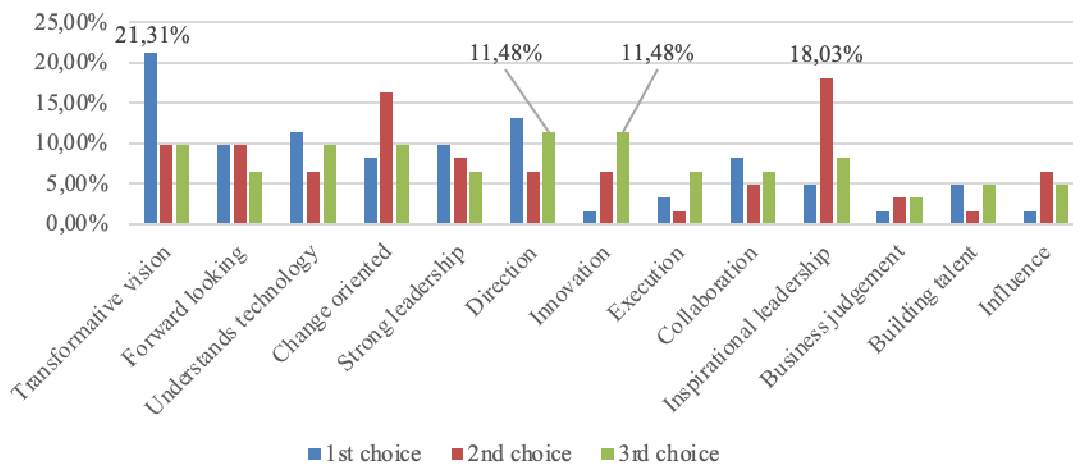


Figure 1: Preference proportion for each skill as being chosen 1st, 2nd or 3rd

Source: Authors' own research

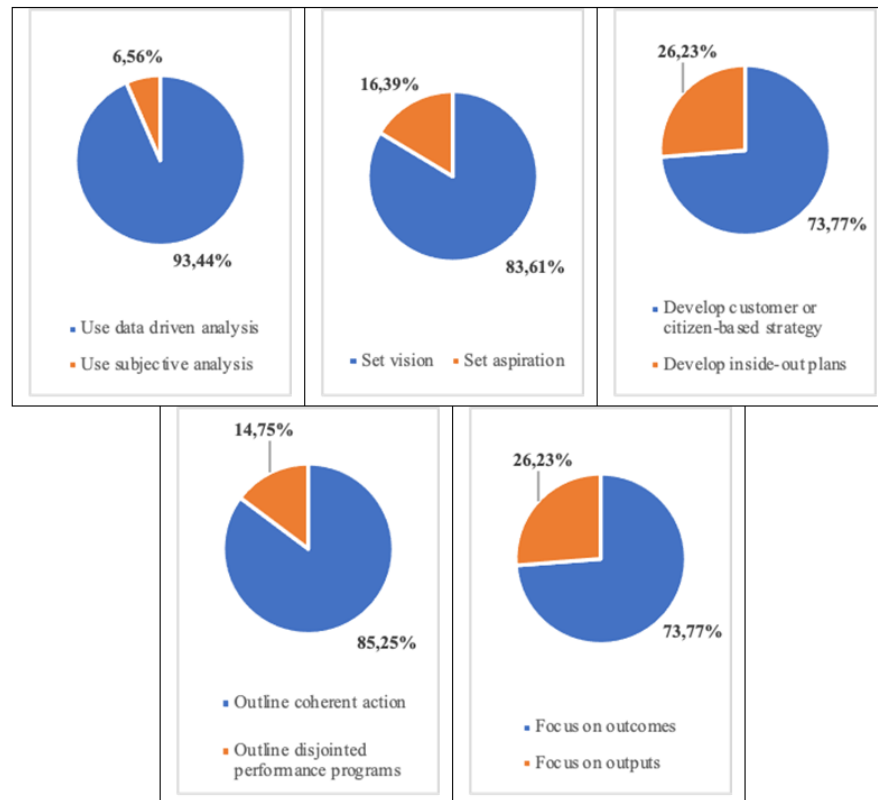


Figure 2: Choice between the first or second sentence completion

Source: Authors' own research

The neuroscientific factors influencing leadership

Highlighting the symbiosis between the skills and characteristics that a digital leader has, with the brand-new skills belonging to a leader from the neuroscience point of view, we will examine some opinions of known authors with the aid of the existing literature.

From a practical perspective, we established that a digital leader should have a transformative vision, be change oriented and give direction. Moreover, we concluded that the most desirable

leadership style used by a digital leader is the transformational one.

Second, from a neuro-leadership perspective we learn that the brain's organizing principles are to minimize threats and maximize rewards. As observed in table 2, showing empathy, growth mindset, self-compassion and ethical decision-making processes are factors influencing the leaders from a neuroscientific point of view. The brain is a pattern matching machine - patterns are learned that lead to unconscious repetitive behavior, avoiding threats and departure from the comfort zone.

Table 2. Main points of the neuroscientific factors influencing leadership

No.	Source of research	Main points on the neuroscientific factors influencing leadership	Comments
1.	Balthazard et al., 2015	<ul style="list-style-type: none"> • Need of advanced cognitive and emotional capacity • Self-complexity • Requisite cognitive complexity 	Required to enact effective leadership responses and usage of knowledge about themselves combined with social situations
2.	Juhro, S.M.andAulia, A.F., 2017	<ul style="list-style-type: none"> • Agility • Transformational leadership • Manage resistance • Simplify the vision • Create a sense of urgency to transform • Emotional intelligence • Social intelligence 	Leaders and followers help each other to improve the motivation and morality of both parties by coaching, counseling, and mentoring
3.	Gottfredson, R.K. and Rein, C.S.	<ul style="list-style-type: none"> • Growth mindset • Performance-approach orientation • Learning and orientation 	Sets higher goals and engages in greater effort to achieve them
4.	Riva et al., 2021	<ul style="list-style-type: none"> • Empathy • Intuition • Intentional attunement 	Leaders must emphasize with their followers to understand their desires
5.	Waldman et al., 2011	<ul style="list-style-type: none"> • Form emotional bonds with followers • Moral reasoning and ethical decision-making processes 	Drive emotions associated with motivation, excitement, and commitment from leaders to followers
6.	Siegel, D.J., 2020	<ul style="list-style-type: none"> • Self-compassion is essential in overcoming inevitable obstacles 	The integration of sensory input that facilitates learning is essential for organizations

Source: Authors' own research

Combining the two sets of skills and knowledge, a leader can predict, prevent, and treat any kind of difficult, emotionally loaded situation that a team might go through in its transformation process. This symbiosis helps increase the success rate of two major areas of interest of any company: change management and risk management.

Conclusions

This paper managed to provide two important aspects of what an ideal leader

should look like in the context of digital transformation and/or any kind of changes that a business may face.

First, the authors of the paper provided a holistic overview on the desired skills and leadership style of a successful digital leader (the digital leader portrait), validated by a qualitative research method based on a targeted questionnaire.

Second, the authors of the paper extracted and analyzed from the literature the definition of neuroscience,

its understanding of psychological processes while looking for an explanation of an underlying foundation in the physical processes of the brain. Moreover, the vast field of neuroscience was restricted to that of the digital leader and investigate how it affects and how it could be used to help in a digital transformation process.

Furthermore, the current literature regarding neuroscience is analyzed, focusing on the business context, and analyzing the SCARF model and its applications. The main finding is that actions and reactions can be understood and explained using the SCARF model (Status, Certainty, Autonomy, Relatedness, and Fairness).

A leader can individually profile team members, focusing on factors that lead to better interaction, conflict management and resolution, and general positive environment. Therefore, the complexity of the digital leader influenced by neuroscience role can be approached from different angles. From the digital leader-skills' perspective, we note transformative vision, change-oriented direction, technical knowledge, previous experience. After that, from the digital-leadership style, we note the transformational leader. Finally, we highlight the digital leader with neuroscientific factors of influence.

Highlighting the symbiosis between the skills and characteristics that a digital leader has, with the brand-new skills belonging to a leader influenced by neuroscience, would lead to a new kind of leader. We strive that this paper will help future leaders and organizations to take into consideration our findings and will channel other researchers into a deeper analysis on the subject.

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