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Designing the Drivers to Boost Digital Creativity and Enable Digital Maturity

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ABSTRACT

With the world rapidly changing and the accelerated growth of emerging digital tech-nologies, creativity has become more fundamental than ever before (Corazza, 2017). Digital Creativity is the ability to creatively and strategically apply digital technologies to innovate, thereby harnessing human-centered technological innovation to solve complex problems (Bruno and Canina, 2019). In this transitional era, design ena-bles and empowers people's creative design skills and mindsets. As educators, how can we concretely support learners in training and developing these creative abilities to face contemporary challenges and harness digital transformation opportunities? Within the framework of the DC4DM European project, the paper will describe the steps that led to the collection, selection and clustering of the essential Digital Crea-tive Abilities considered as actual "drivers" that would enable creators to face Digital Transformation.

Keywords: Digital creativity, Design futures, Drivers of change, Future skills, Human skills

INTRODUCTION

The contemporary era is marked by the astounding progress and develo-pment of digital technologies which have shown to be extremely powerful and to have ubiquitous features (Zaki, 2019). They spread and transform fast, challenging the status quo by disrupting almost every sector, field, or industry, bringing a degree of uncertainty and complexity.

Digital technologies are causing impressive changes also among organizati-ons transforming drastically the competitive landscape (Zaki, 2019). Today, companies are called to rethink their norms and values, embracing digital transformation and harnessing technology's potential. A strategic approach is essential to digitalise operations and processes as well as to attract and retain digital talent capable of managing technological innovations. To thrive in the digital era, indeed, companies will have to empower their human capi-tal's skills to unleash people's full creative potential as well as to react and adapt to new ways of working and new types of jobs (Dondi et al., 2021) It will be necessary for companies and organizations to re-skill and up-skill their workforce to face proactively the Digital Transformation (Zahidi et al., 2020) Research by the McKinsey Global Institute (2021) has shown that in short-/medium-term futures there will be an increasing demand for higher

cognitive skills which include technological, social, and emotional competencies to gain competitive advantage in the highly digitalized professional world (Dondi et al., 2021). Higher order abilities will add value to human labor making it unattainable or irreplicable through automated systems and intelligent machines. Achieving digital competence to make confident and critical use of technologies as well as possessing the capability to employ the potential of digitalization have been acknowledged to be the key abilities for contemporary reality (DQ Institute, 2019). Nevertheless, there is an observable lack of specific educational programs at higher educational level aimed at providing people with these skills which is favoring a notable skill gap. Thus, it becomes imperative to design training and reskilling programs to empower people with not only technical skills, such as the ability to employ successfully technological tools, but also with those abilities proper of humans. Among others, creativity, critical thinking, resilience, flexibility and complex problem-solving as well as the overarching emotional intelligence represent the main human abilities that will be essential for the future professional world (Leopold et al., 2018).

It is thus necessary to rethink and implement the current educational models to align to the ongoing changes and technological disruptions as well as prepare people to enter the current unstable world of work.

The goal of the *"Digital Creativity for developing Digital Maturity Future Skills"* (DC4DM) European project[1], is exactly to provide an original and innovative educational model to empower individuals to deal creatively and strategically with Digital Transformation. The DC4DM model has been designed to support the attainment and training of human Digital Creative Abilities – herein DCAs - essential for learners to become more aware and responsible professionals.

By applying the DC4DM model, learners will grow into new professional figures called Digital Maturity Enablers (DMEs) equipped with a future-oriented mindset and capable of mastering strategically and ethically the potential of emerging digital technologies. DMEs will be the future digital talent that will help companies navigate Digital Transformation and lead their way towards a full Digital Maturity. The DC4DM model integrates and focuses on several Digital Creativity skills that have been identified as in line with the needs of digitally maturing companies and that, thus, must be considered relevant for training future digital talents. This paper will therefore present how the main skills have been included and arranged to design the drivers that represent the main pillars to achieve a Digital Maturity. Section 2 presents the structure of the DC4DM model and how the skills relate with it while section 3 goes in deep by discussing the specific skills integrated. The Drivers resulted from a co-design session between a multidisciplinary team of educators are described in section 4.

DC4DM EDUCATIONAL MODEL: AIMS AND STRUCTURE

The DC4DM model highlights the most relevant competencies to be empowered and provides an educational box (EduBox) collecting and systematizing

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[1]www.dc4dm.eu

the most useful tools and methods to train cross-functional teams to face the complex real-world challenges brought by Digital Transformation. By employing the DC4DM model and through the acquisition of a set of fundamental creative abilities, digital talents are prepared to face the diversity of uncertain futures, anticipate possible scenarios, and take full advantage of the innovation capacity of digital technologies. Such fundamental creative abilities are aligned with the companies' needs for more digitally knowledgeable human assets to start moving towards a Digital Maturity.

So, what kind of talents and competencies does a digitally maturing company seek?

It has been observed that digitally mature organizations focus their resources on the application of five key practices. A company that aims to undertake a digital maturing path should focus on (1) increasing cross-functional team collaboration, (2) fostering innovation in the workspace by nurturing digitally minded cultures, visions and experiences, (3) supporting life-long learning opportunities by creating enjoyable environments, (4) scaling small digital experiments into broader initiatives that have a business impact, and (5) planning a long-term strategy to face the changes that are currently emerging in the digital landscape (Kane et al., 2017). Starting from the analysis of the identified key practices it was necessary to determine which are the DCAs – namely, creative, and strategic competencies - that individuals should develop to wisely adopt and manage digital technologies helping companies move towards Digital Maturity.

By analysing and comparing four main Competence Frameworks (Dondi et al., 2021; DQ Institute, 2019; Bacigalupo et al., 2016; Vuorikari et al., 2016) outlined by international companies and policymakers it has been possible to select twenty-four DCAs considered the major enablers of the identified five key practices. The frameworks include not only a broad range of skills related to the social, cognitive, and emotional individual sphere but also disciplinary procedural attitudes and values that determine how knowledge and skills are used to face challenges. To order and better integrate them in the DC4DM model, the twenty-four creative abilities have been subsequently clustered in four main dimensions called *Cognitive area*, *Digital area*, *Cross-functional Team area,* and *Strategic Vision area*. The four dimensions introduced just now will be presented and described in detail in section 3.

DCAs Organization Within the DC4DM Model

As mentioned previously, the DC4DM model fosters the individual empowerment within teams composed of students with different knowledge and know-how to turn young professionals into the future leaders of the Digital Transformation. Therefore, it focuses on enhancing cross-collaboration abilities as well as future-oriented skills to enable learners to successfully work together and strategically move towards the best possible futures.

The DC4DM model is structured along three core phases called *Preparation* (Pre-Process), *Application* (Process) and *Consolidation* (Post-Process), described below.

In addition to these three fundamental phases, the model is built upon three major pillars which include the future, ethical and sustainable thinking skills considered relevant when designing for uncertain digital futures. *Digital Sustainability, Digital Ethics and Technology Foresight* are, indeed, the main drivers of change to be leveraged and taken into consideration when dealing with new technologies and their potential impacts.

Phase 1 – Preparation (Pre-Process): this phase of the model includes the propaedeutic knowledge and skills that cross-functional teams are required to acquire before entering and going through the subsequent Process phase. Within the Pre-Process, the essential twenty-four DCAs, mentioned in the previous paragraph, are clustered into four areas called: I) *Cognitive*, II) *Digital*, III) *Cross-functional Team,* and IV) *Strategic Vision.* Indeed, individuals are required to develop and nurture the propensity to be creative valuing individual knowledge which is crucial for team collaboration since it holds individuals accountable for their role in a digital maturing company. To identify the opportunities as well as the potential risks that emerging technologies might disclose, to facilitate data-driven decision-making and manage information abundance, digital intelligence and literacy become essential abilities to be fostered and cherished. Moreover, it is paramount to develop the ability to establish trust within team members considering other people's skillset and various educational or professional backgrounds. To foster team trust it is also beneficial to empower the propensity to share knowledge within cross-functional teams to create a common ground and a shared mental model among team members.

In the Pre-Process phase it is possible to recognize the main abilities pertaining to the three pillars (Sustainability, Ethics and Technology Foresight): 1) developing a future-oriented mindset to envision new digital application; 2) raising awareness on responsible and ethical digital innovation; 3) understanding the value of digital technologies for sustainable innovation (SDGs).

Phase 2 – Application (Process): this phase represents the core of the model, and it showcases an original version of the Design Futures approach born from the integration of Futures and Design Thinking. It is a divergent and convergent process built on stages, steps, activities and thinking styles, and it enables a strategic application of emerging digital technologies. At each step of the Design Futures process, specific DCAs are necessarily employed to improve individuals and teams' performances. These DCAs are the ones trained in the Pre-Process area. A *human-centred approach* makes the difference in enabling sustainable innovation (SDG), and an inclusive, better future for all. It is also remarkably valuable to seek digital innovation, adopt digital technologies to serve human needs and strategically solve the complex challenges of our century.

From an ethical, sustainable, and forward-looking perspective, it is also desirable to 1) develop the ability to analyse driving forces to map possible alternative future scenarios; 2) raise awareness on the potential implications of emerging digital technologies and 3) ensure a common understanding of the ethical and sustainable consequences that might derive from the developed digital solution.

Phase 3 – Consolidation (Post-Process): in this third and last phase, team members have ultimately reached a shared knowledge gained through the employment of specific tools during the Process phase. This *shared mindset* is made possible by the development and use of those skills that allow to create a continuous learning loop. In this phase, individuals need to further improve and nurture the skills they acquired in the Pre-Process and Process to continue learning as well as transfer the skills to other people within the organisation. The Post-Process skills will help people to iterate and keep adding value to their abilities becoming essential assets to the organisation they are part and the system as a whole. Once the core DCAs are acquired and practiced throughout the Pre-Process and Process phases, people are expected to have gained the utmost ability to build and foster a collaborative working environment to continue nurturing the previously gained skills. Learners have become fully aware professionals and competent changemakers able to identify and master the major challenges of the current digital world.

The following paragraph will explore in detail the four dimensions included in the Pre-Process presented.

THE FOUR DIMENSIONS: SYSTEMATIZING DCAS IN THE PRE-PROCESS

As anticipated in section 2, the twenty-four creative abilities identified as essential to face the Digital Transformation have been organized within the Pre-Process phase and systematized into four dimensions called *Cognitive*, *Digital*, *Cross-functional Team*, and *Strategic Vision*. Indeed, as shown, cross-functional teams benefit from the unique mix of skills and talents each member brings to the project. In the Pre-Process phase it becomes important to consider both the individual and team dynamics dimensions and prepare the groundwork for the following application stage. The following paragraphs will thoroughly describe the four areas and the underlying motivations of their creation.

Cognitive Area

Creativity is an individual propensity outlined by personal capabilities, personality, and cognitive processes. It involves a skillset that encourages a creative attitude and mindset as well as the ability to think differently, when necessary to accurately remember and recall information, and ultimately link and connect different concepts and ideas.

The DCAs that fall under the Cognitive are all aimed at nurturing individual creativity which in turn will enable individuals to build upon each other's idea and prepare individuals for a great team collaboration. This area's main objectives are listed below.

1. Develop the ability to generate original and diverse ideas, to imagine beyond the existing reality, to connect and fuse existing concepts generating new ones *(Creative combination and imagination)*.

2. Develop curiosity and an open attitude to observe and see things from different angles without judgements, being free to express and explore desirable world (*Adopting different perspectives*).
3. Develop the ability of analysing and reflecting on things, connecting knowledge from different domains making critical judgements on ideas and facts (*Analytical and critical thinking*).
4. Develop the self-awareness of our own level of knowledge and technical skills and actively work to manage and update our skillset (*Self-confidence and self-awareness*).
5. Develop strategies to create a network of stakeholders with diverse knowledge and technical skills which can be adopted according to the digital challenge at hand (*Translating knowledge and storytelling*).
6. Develop the ability to solve the complex challenges of our century with a strategic approach that consider the environment and the humans and society needs/desires (*Humanity Problem solving*).

Digital Area

In the current technology-driven world, digital competencies are core requirements for individuals that need to prepare to enter the future workforce. Thus, in this context, Digital intelligence becomes an essential ability. It is the ability to understand and take advantage of the potential of emerging digital technologies as well as to gain new knowledge and develop new skills to deal with digital technologies improving operational efficiency, quality of the outcomes and positioning. It requires people to envision their potentialities and possible impacts as well as to define include them in their strategic thinking. Moreover, digital intelligence enables people to navigate, sort and assess data in an era of information abundance. It includes being aware that digital information created on online platforms can have a strong influence on knowledge and the public opinion and that it can be potentially misused.
    This area's main objectives are listed below.

1. Develop the ability to envision the potential of a certain digital technology and that it can have a significant positive or negative impact on organisations (*Ethical and Sustainable thinking, Healthy use of technology*).
2. Develop the ability to analyse and interpret data providing meaningful information that can facilitate decision-making and drive the formulation of new strategies informed by the capabilities of digital technologies (*Data literacy; Envisioning tech opportunities*).
3. Develop the awareness of the sources from which data and information are collected and the ability to critically evaluate them by examining reliability and credibility (*Information literacy*).
4. Develop the ability to manage and easily return big amount of complex and interconnected information and to think visually organising them through visual representation (*Data literacy*).
5. Develop the ability to communicate and collaborate effectively through digital channels. (*Digital collaboration*).

Cross-Functional Team Area

As mentioned previously, trust lies at the heart of teamwork and, since it influences how knowledge is shared, interpreted, and integrated by team members, it also represents the groundwork of cross-functional collaboration. The heterogeneity that characterizes cross-functional teams tends to lower the level of trust among team members, especially considering the members' different professional backgrounds. Therefore, keeping a high level of trust that plays a major role in a context of cross-functional collaboration and leads to higher levels of productivity and effectiveness (Forbes, 2019) improving communication and interpersonal relations. When there is trust, team members feel more encouraged to raise questions and think critically which in turn leads to better decision making.

The main objectives pertaining to this area are listed below.

1. Develop the propensity to be aware of the importance of building team trust to ensure a maximum level of team performance integrating interpersonal trust and trust of other's competencies, knowledge, skills, actions, and behaviours (*Enabling trust*).
2. Develop the propensity and willingness to be vulnerable to others' actions and ideas, to care for each team member, to have a positive expectation that each member can perform task appropriately *(Empathy, Positive mood)*.
3. Develop the ability to build bonds with other members, acquire awareness of interpersonal differences and commonalities, be open to others' personality and ideas (*Cooperative behaviour*).
4. Develop the ability to manage relationships with others, to communicate and negotiate with others, to accept heterogeneity and cultural differences within teams, cultivating tolerance to one another and a sense of community *(Relationship management; Propensity to share knowledge)*.
5. Develop and understanding of the external environmental factors that affect trust. (*Enabling trust*).

Strategic Vision Area

Being able to systematically think about the future is an ability that creators should acquire to thrive in the uncertain current times. Anticipating future technological developments can help people make more informed decisions as well as discern the challenges and the opportunities that might emerge over time in medium/long timespans. Therefore, a strategic gaze towards what is yet to come is essential for Digital Maturity Enablers to handle disruption and complexity to envision possible futures. In fact, the creative abilities to make sense of emergent changes and give shape to the unknown must be part of the new skillset to unlock technology's potential and take advantage of the impact they might deliver on the societal, environmental, political, and economic level. Employing and practicing a strategic vision is thus advised for those who want to challenge themselves with the multiple opportunities opened by new digital technologies.

Below is a list of the main objectives yearned for by this area.

1. Develop the ability to perform decision-making activities in uncertain situations in which the available information is scarce or ambiguous. This subsequently leads individuals to improve their propensity to take risks to overcome such high levels of complexity and unpredictability (*Coping with uncertainty, ambiguity, and risk).*
2. Develop the capability to explore driving forces and analyse trends to give space to future scenarios leveraging on emerging technological opportunities. Through the generation of possible alternative futures, creators can inspire and encourage people to turn their future vision into action *(Envision future scenario).*
3. Develop the ability to think strategically and resourcefully about the future and orient thinking and actions towards future being aware that the decisions taken in the present will have an impact on tomorrow *(Future-oriented mindset).*
4. Develop the propensity to spot new opportunities and understand the value of digital technologies to meet sustainable long-term social, cultural, and economic goals. Moreover, individuals should be able to recognize the value of an idea to generate innovation (*Sustainable development, Driving change and innovation).*
5. Develop the ability to assess the implications of technological applications and plan design actions to counteract negative consequences and foster positive impacts (*Impact strategic management).*

THREE FUNDAMENTAL DRIVERS OF CHANGE

Ethical, sustainable and Futures thinking as well as their related creative abilities have proven to be crucial to tackle the ongoing digital transformation. As a matter of fact, for the next generation of professionals to become fully aware Digital Maturity Enablers, it is necessary to consider Ethics, Sustainability and Futures as actual "drivers" of change. For this reason, as highlighted in the previous paragraph, the DC4DM model, besides the three fundamental phases, is based on major pillars Digital Sustainability, Digital Ethics and Technology Foresight. Assuming that some basic pillars allow creators to deal effectively with Digital Transformation, the DC4DM model groups the twenty-four previously introduced DCAs into the so-called Drivers, outlined by a multidisciplinary team of educators and researchers with different backgrounds through a co-design session. Drivers can be defined as clusters of creative abilities that enable learners to gain awareness on paramount topics such as *Digital Ethics, Sustainability,* and *Tech Foresight.* By training the DCAs encompassed in these Drivers, learners will be empowered to use responsibly emerging technologies and grow into fully knowledgeable professionals. Below are listed the three Drivers and their respective creative abilities. As notable, each Driver is described through an overall learning objective that highlights its importance and value.

Table 1. Drivers.

Driver	Learning Objective	DCAs
Ethics	A Digital Maturity Enabler can identify and understand ethical challenges and implications of digital innovation, to drive digital strategy, to adopt an ethical attitude/behaviour during the design and implementation process.	Empathy Relationship management Ethical and sustainable thinking Future-oriented mindset Healthy use of technology
Sustainability	A Digital Maturity Enabler can design the future through/with digital technology aiming at improving and guaranteeing the well-being of the planet and its communities, among which the human ones, to see and think from the perspective of other organisms (beyond human), balancing resources from environmental, economic, technological, socio-cultural, and political level.	Humanity Problem Solving Impact Strategic Management Ethical and sustainable thinking Sustainable development Healthy use of technology Positive Mood
Tech Foresight	A Digital Maturity Enabler can be continuously updated on technological development, to understand the feasible and viable opportunities from different angles that they could open in the future as well as their implications, to envision new scenario of application out of them.	Envisioning tech opportunities Envisioning future scenario Impact strategic management Adopting different perspectives Future oriented mindset

Table 1 presents the Drivers.

The DCAs included in each Driver can be trained simultaneously using specific tools and activities some of which were already existing whereas others were conceived and designed purposely for the DC4DM project. All the educational materials to train the creative abilities encompassed in the Drivers have been collected and systematized in an open-source toolkit – one of the DC4DM project's intellectual outputs - available on Miro for both educators and learners. The ones listed above are clusters that - as researchers - we consider the major Drivers of change. Nevertheless, educators and teachers are welcome to create their own Drivers by mixing and matching the twenty-four essential DCAs.

CONCLUSION

The paper retraces all the steps undertaken in the DC4DM project to collect, analyse, sort, select and ultimately cluster the compelling creative abilities to thrive in the digital age. The new generation of professionals should train and nurture such DCAs to creatively envision possible alternative futures enabled by digital technologies and driven by reinvented human values.

Indeed, the major aim of the DC4DM model is purposely to enable and empower learners to, on the one hand, develop the mindset that allows them to detect the potential of digital technologies and, on the other hand,

acquire the necessary competencies to consciously create human-centred digital solutions. Furthermore, the model seeks to stimulate individuals' creative self-enhancement and the ability to share knowledge with people with different backgrounds and expertise fostering cross-functional communication and a digitally minded culture. Training the future-related skills to gain an anticipatory thinking approach is paramount to generate long-term strategic visions and help companies face complex challenges by envisioning future scenarios.

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