DIGITAL TRANSFORMATION GENERATES A NEW BUSINESS PARADIGM: "HUMAN-MADE IN THE AGE OF ARTIFICIAL INTELLIGENCE "

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Abstract
The aim of this paper is to contribute to the identification of the future of work in the age of artificial intelligence (AI) by providing answers to the question of "how can a creative business compete with other businesses using creative artificial intelligence algorithms?". By analyzing the recent developments in the field of artificial intelligence we have identified that AI has done a large breakthrough in the field of creativity. In our opinion, one of the most promising approaches in achieving artificial intelligence creativity is the use of "generative" models that are created by humans and are self-training using large amounts of data from one domain like images, sounds, and text. We consider that AI will work side by side with humans in helping them make better decisions in the first phase of the digital transformation of organizations that are integrating AI in their day to day functioning. However, we consider that in time these AI systems will become better than humans because they are trained on larger data sets and thus they will get better even on performing creative tasks. Therefore, we are asking the following question: How human beings possessing human creativity will be able to compete with artificial intelligence? We are analyzing how creative jobs such as design and content creators, will compete with artificial intelligence creativity in the context of digital transformation. Also, we are recommending what strategies they should apply to add value to human-made creativity. By competing with artificial intelligence creative people will be enabled to pursue new business strategies in the context of digital transformation. We are arguing that this approach will lead to a new form of "hand-made" business model, and to a new paradigm called "human-made in the age of AI", made possible by the development of cloud technology. A massive change started some centuries ago when due to the first industrial revolution humans have created business models capable to add higher value to hand-made products compared to machine-made products. We consider that now, in the current period of the fourth industrial revolution, is the appropriate time for creative arts and business to add value to their products and compete with AI by adopting new strategies and business models in the context of digital transformation. Examples for such new types are described based on existing companies.

Keywords
Artificial intelligence (AI); computer creativity; human-made; age of AI; co-creating; future of work

Introduction

As digital transformation is happening across industries it provides opportunities for businesses generated by different technologies. According to Calp (2020), digital transformation represents the ability of a business to "provide more effective and efficient services, in line with the opportunities provided by rapidly developing information and communication technologies, and changing social needs" (Calp, 2020). The technologies used by businesses in their digital transformation lead to new opportunities like competitive advantage and value creation (Calp, 2020). But these technologies and innovations also produce changes in the business environment from customer engagement to employee satisfaction. One of the important aspects of digital transformation is the future of work because as technologies advance, humans will need to adapt and retrain to new jobs. And this is happening because jobs will be enhanced by artificial intelligence systems and machines for co-creating or will disappear if they are repetitive and can be fully automated.

We begin this study by taking into consideration that what is currently known about the future of work in the age of artificial intelligence and is hypothetical will become a reality and questions like "What if?" will become "and now what?". It is true that artificial intelligence will create new jobs and that humans will have to become creative in adapting to new jobs, but we have a very hard time when attempting to describe these new jobs. As for now, humans are using machines for co-creating, and for example, humans can choose a product from multiple generated ones. But as information technologies advance and systems will become better there will be no more need for human supervision, because systems will be able to generate new products within specific parameters. Also, in regards to creativity, we have to point out that artificial intelligence is evolving fast in the area of creativity with laboratories like OpenAI and DeepMind driving this progression. Given this evolution we explore what it will take for humans that possess creative skills like writing, drawing, and music composing to compete with artificial intelligence generated the same outputs. Before we discuss human creativity and what can be done to help create jobs and add value to human jobs, we need to discuss about computer creativity and how it has evolved in the last years.

Computer creativity

Creative behavior is defined as "the creative act, or a set of acts, of humans, which is made explicit through behavior" (Puccio & Cabra, 2011). Although it is focusing on the domain of cognition and thought it is a human action that yields output that is deemed original and useful. Therefore, creativity is a human behavior that permits one to act unobstructed from self or externally imposed constraints in pursuit of self-expression, invention, discovery, design, and problem-solving.

Although creativity is a human behavior that allows us to imagine new ways and aspects, it is very difficult to define even if there are similarities between domains there are also differences. For example, creativity in games like chess and go is different from art and design. This is why human creativity is so important compared with anything else. We have identified that a new branch called "Computer Creativity" (CC) has emerged in recent studies in the field of artificial intelligence As defined by Veale et al., CC "studies

and exploits the potential of computers to be more than feature-rich tools, and to act as autonomous creators and co-creators in their own right" because in this system the "creative impetus should come from the machine, not the human, though in a hybrid CC system a joint impetus may come from both together" (Veale, Cardoso, & Pérez, 2019).

According to them, computer creativity (CC) is a field at the intersection of "artificial intelligence, psychology, cognitive science, linguistics, anthropology, and human-centered related sciences" with the main focus on system building. We consider that CC also is intersecting with the field of philosophy, ethics, sociology, and neuroscience. However, in their approach, Veale, Cardoso, and Pérez (2019) define computer creativity (CC) as an experimental science and engineering discipline because it connects the study of creative behavior to algorithms and structures by building computer working systems.

The purpose of creating a computer creative system is to build the future of intelligent computing by transforming computers from passive tools into active creators. To build a computer, creative system researchers must analyze the criteria on which a solution to a problem is considered creative. Veale, Cardoso, and Pérez (2019) mentioned that in 1963 Newell, Shaw, and Simon have defined the following criteria's for identifying problem solution as creative: the solution must be novel, useful, reject conventional categories, must come from intense motivation by exploring a wide range of conceptual space, and last but not least must clarify a problem and this requires illumination and insight. Having these five criteria, it is very difficult to give a clear definition to computer creativity explaining why computer creativity researchers are following a different approach, characterized by first, ignoring the objective definition of creativity and employ an ad hoc definition; second, identifying current computational algorithms by adopting a "metaphorical foundation of creativity"; and third, by "identifying an archetypal area of creativity" (Veale, Cardoso, & Pérez, 2019). Given the fact that computer creativity is a research area anchored in engineering, the novelty and value output produces by such systems can and should be evaluated only by humans. One of the main goals for researchers in the area is to develop computer creativity systems that produce output evaluated by humans as creativity. Their fundamental belief is that machines can become creative only by using algorithms and knowledge structure and that they do not need humans for that.

However, in the current technological context computers are just generating outputs that humans need to evaluate in terms of utility, of value if the product can be sold at a market acceptable price. And for now, this can't be considered human-level creativity because computers are not aware of the value they are creating, in fact, they are just generating content. A computer creative system must be able to filter its outputs for quality, understand the value it is creating, articulate, and justify the value exactly as human creators do (Veale, Cardoso, & Pérez, 2019).

On one hand, humans are still holding to the idea that only humans can be creative and that such systems that generate outputs are just mimicking creativity because they are made of algorithms based on computer programmer's creativity.

On the other hand, this type of creativity mimic is also seen in humans and is known as "pastiche" because "computers unknowingly resort to the same kind of stylistic mimicry that is knowingly exploited by uncreative human artists" (Veale, Cardoso, & Pérez,

2019). The pastiche systems are useful for humans working with machines in co-creating because they allow the possibility of exploring multiple variations of the same product. From the viewpoint of computer creativity researchers' pastiche is a useful point in this field, and a stepping stone for achieving the main goal and that is in developing true computer creative systems that will achieve "human-level creativity" (Veale, Cardoso, & Pérez, 2019). For example, an artificial intelligence system that is trained on large data set of classical music will be able to generate a variation of such music and can delight the human listener because these systems produce good outputs. A good example of this is mentioned by Daniel Susskind (2020) in his book "A World Without Work: Technology, Automation, and How We Should Respond" referring to an experiment which was run at the University of Oregon, USA, where the listener thought they were listening to Bach music but it was actually music written by a computer program named EMY. Professor Douglas Hofstadter who organized the experiment commented that if humans will have composed the classical music it would have been called creative, but because it was generated by a machine it feels wrong to be called creative (Susskind, 2020). According to Professor Hofstadter, human creativity works differently compared to machines, and that is because machines cannot feel the way humans do (Susskind, 2020).

Artificial intelligence creativity

In the last years, AI has become one of the most important research fields and moved from academia to business deployment. As small and large businesses started to implement artificial intelligence in a wide variety of applications, the impact of this technology on the lives of humans has started to show. The artificial intelligence field is broad having a lot of uses like analytics, computer vision, chatbot's and by leveraging large quantities of data that helps us get an insight about the world (Kamath et al., 2019). In recent years many studies have been conducted in the field of creative artificial intelligence, leading to the growth of this technology in the media industry and creative industry. This happens because the researchers and companies have access to low-cost computational platforms and to large datasets which datasets are composed of sounds, images, and texts. From a technical perspective, artificial intelligence refers to the study and design of rational agents that can demonstrate tasks we can associate with humans like learning and finding solutions, reasoning, intelligent-behavior, and rationality (Sewak, 2019; Kreutzer et al., 2020).

In the creative industry, artificial intelligence has made a huge step and is used broadly from generative art images to non-photorealistic images and style transfer. At this point, it is very important to mention the "Generative Adversarial Network" (GANs) create by Ian Goodfellow because a lot of the existing generative artificial intelligence creativity is based on this. The GANs algorithm uses a generator that generates sample images and a destructor that discriminates between real images and the generated ones; this allows the generator to improve itself in time (Brown, 2020). One of the most important steps in this direction has been made by Google with "DeepDream" with the help of a "convolution neural network". These algorithms use an image as an input to find patterns and enhance them resulting in a dream-like hallucinogenic image (Caramiaux et al., 2019).It is important to mention that DeepDream was designed to help researches understand how neural networks work because in this network each layer deals with features at different levels of abstraction and the new image are generated based on the

layer chosen to enhance (Caramiaux et al., 2019).This results in the fact that the network is showing the seer what has been seen in that specific part of the image like objects in trees.

In business, this type of artificial intelligence algorithms are used to edit images by using filers, modifying content, enhancing the quality, and photo retouching, and here it is important to mention that these algorithms can retouch photos at an expert level. This points out the importance of integrating ethics into IA algorithms, indicating that is a created image, not a real one. One negative consequence is the proliferation of the so-called "fake news" based on retouched video images, such as a photo or short videos. These artificial intelligence algorithms enable photographers to produce high-quality image-enhancing (Caramiaux et al., 2019). In business that requires photo manipulation, there are artificial intelligence algorithms used for image inpainting which is a technic that refers to the reconstruction of damaged or missing parts of an image. Also Caramiaux et al. (2019) mention Yan (2016) for proposing a Deep Convolutional Generative Adversarial Network that can predict semantic information in images and correctly replace missing parts in images. For example, if an eye is missing from a model in an image the network can correctly generate a place for the missing eye.

In industries like games and movies, artificial intelligence is used to simplify the creation process of content with the help of generative design. Artificial intelligence is cooperating with designers by producing a variety of solutions from which the designers have the possibility to choose the most appropriate solution (Caramiaux et al., 2019). Also is very important to mention that these algorithms in the game industry can generate new game levels. This is helping the game industry in reducing cost in content creation and also storage and bandwidth (Caramiaux et al., 2019).

As digital transformation is happening across the business world, also news and media business are experiencing artificial intelligence on all levels from content production to consumption as it can be seen in the next example. An article from Bloomberg has mentioned that the Eurovision 2020 was a competition between artificial intelligence generated songs. The Eurovision 2020 competition was between 13 teams, each one being made up of an artist, academics, and computer sciences specialist. The winner of the Eurovision2020 competition was a team from Australia called "Uncanny Valley" with the song "Beautiful World". The Australian team has managed to create a song generated by an artificial intelligent algorithm. The winning artificial intelligence algorithm was trained on data from previous Eurovision competitions and sample sounds of koala, kookaburras, and Tasmanian devil noises to reflect the Australian specific wildlife (Thomson, 2020).

Artificial intelligence for co-creating content

Businesses are entering the stage of co-creating during their digital transformation because humans and artificial intelligence are working side by side in creating new designs. This type of artificial intelligence is called "generative" artificial intelligence and according to Brown (2020), it is part of the "collaborative" artificial intelligence because collaborative AI changes the way humans work with machines and allows machines to become co-creative alongside humans.

Brown (2020) mentions that the company Autodesk has designed a system that uses generative design and that is applied in architectural and engineering design. This system uses GANs to generate alternative designs based on a single original design and using designer constraints like weight, cost, and size (Brown, 2020). Also, researchers at the University of California have developed an artificial intelligence system using GANs for dental crown design. By using the x-rays of their patients they can produce a dental crown that fits perfectly in the patient tooth line and has been able to outperform dental crown designed by humans (Brown, 2020).

With the help of generative design, businesses will be able to semi or fully automate product design (Brown, 2020). Using this type of generative artificial intelligence humans will be able to design and create stronger and lighter robots, aircraft, better products, and also use their algorithm in architectural construction for a better design of the building structure.

One of the main players in this field is ”OpenAI”, a research laboratory based in San Francisco, USA. They have trained a large scale unsupervised language model GPT-2 that has achieved state-of-the-art performance on many language modeling benchmarks without task-specific training. According to Radford et al. (2019), GTP-2 is a large “transformer-based language model with 1.5 billion parameters, trained on a dataset of 8 million web pages”. GTP-2 is able to predict the next and previous words in texts but has also other capabilities like “the ability to generate conditional synthetic text samples of unprecedented quality, where we prime the model with input and have it generate a lengthy continuation” (Radford et al., 2019). Also, GPT-2 is able to perform a rudimentary reading, generate coherent paragraphs, machine translation, question answering, and summarization (Radford et al., 2019).

Another deep neural network created by ”OpenAI” is called ”MuseNet” which can combine 10 different instruments to generate 4 minutes of musical compositions (Payne, 2019) and (Vaswani et al., 2017). Although”MuseNet” has no understanding of the music it generated, it can discover patterns by predicting the next token in hundreds of thousands of MIDI files. “MuseNet” is able to generate music with styles from Mozart to the Beatles (Payne, 2019). According to Payne (2019) “MuseNet” has also some limitations because it generates the musical notes by calculating the probabilities across all possible notes and instruments and because of this when you ask the model to add a musical instrument it will try to arrange to your instrument choice but it can also choose a different instrument (Payne, 2019). Also when using this model for music generating it is recommended to choose instruments and music styles closely related and try not to pare for example Chopin with bass and drums (Payne, 2019).

“MuseNet” is not the only deep neural network for music created by OpenAI, they have also created another one called “Jukebox” which is a neural network that can generate music with rudimentary singing. According to (Dhariwal et al., 2020) “Jukebox” is able to take as an input music genre, artist and lyrics and generate music samples produced from scratch. “Jukebox” trained on a large dataset of 1.2 million songs, paired with their corresponding lyrics and metadata (Dhariwal et al., 2020).

Another major player in the artificial intelligence field is Microsoft as in their developer build conference they have announced the building of an artificial intelligence supercomputer. For training of this new artificial intelligence model it is needed an

advanced infrastructure, high bandwidth networks, and also the tools needed to train across interconnected computers. This supercomputer is built in a collaboration with OpenAI and will be hosted in the Azure. The supercomputer built by Microsoft ranks among the top five supercomputers compared to the top 500 supercomputers in the world and it benefits from all the capabilities of modern infrastructure (Langston, 2020). According to Microsoft chief technical officer Kevin Scott, the new supercomputer will enable the development of new artificial intelligence applications that will go beyond what is now considered narrow advances in artificial intelligence models (Langston, 2020).

Until now researchers and experts have built artificial intelligence models designed for a single task such as objects and speech recognition. But a new type of multitasking artificial intelligence model is emerging that will allow a single artificial intelligence model to perform multiple tasks. The new artificial intelligence model can learn and absorb knowledge, concepts, language nuances, and exceed at multitasking like moderating content in live gaming chats, summarizing a lengthy speech, and generating code from GitHub scouring (Langston, 2020). As Kevin Scott has announced the purpose of this artificial intelligence model is to allow businesses to deploy artificial intelligence at scale. Also, Microsoft has developed the Microsoft Turing models which are large artificial intelligence models used to improve language understanding and tasks across Microsoft products like Office and Dynamics. According to Kevin Scott, artificial intelligence will become in the future a platform by taking broad data sets and artificial intelligence models and learning to do general tasks (Langston, 2020).

Digital servitization

Servitization is defined by Neely (2013) as "the innovation of the organization's capabilities and processes to better create mutual value through a shift from selling a product to selling Product-Service Systems". There is also needed to define the idea of a "product-service system" as "an integrated product and service offering that delivers value in use". In this respect, a "'servitized organization' is an organization that designs, builds, and delivers an integrated product and service offering that delivers value in use" (Neely, 2013). Servitization can be defined as a transformation from product to services orientation business (Kohtamäki et al., 2020). Businesses that deploy digital technologies that help them create and design new products must also develop capabilities to size these new opportunities by offering better services like maintenance, research and development, and customer services. In the current period when humans are working side by side with machines, it has become very important for businesses to offer better servitization. The value must be captured with its help because digitalization enables innovation and businesses are deploying different technologies. Kohtamäki (et al., 2020) mentions that servitization is required for a business to achieve higher financial performance, too.

According to Kohtamäki et al (2020), we are in the age of "digital servitization" where businesses move from standalone products to maintenance, services, and performance-based offerings using digital technologies. According to Leon (2015), businesses are able to achieve a competitive advantage using Artificial Intelligence by offering a balanced mix between product creation and services because servitization is integrated into the

product lifecycle and it manifests strongly in advanced services and product customization.

Human-made in the age of artificial intelligence

With the advancement in creative artificial intelligence, the digital transformation of every business is happening and these algorithms will continue to become better over time as computing power will grow and breakthroughs in the field will happen. For now, humans and artificial intelligence are co-creating but the question is: what will happen when these algorithms will not need the humans' decisions anymore?

That could be the end of some creative business or could be the chance to adopt new business models. We consider that one of the big impact factors here is customer relationships because it is important to know that there are things that an artificial intelligence system will not be able to do, even if it is programmed to do. In our opinion, creative businesses will be able to survive the next age only by offering better "servitization", influencing their clients to choose them over their competitors, and their products/services over those generated by an artificial intelligence system. Businesses will have to rethink their business model and add human creativity as their core by adding value to products designed by humans compared to artificial intelligence ones. Just like how hand-made products had greater value over industrialized ones so can human creativity will have greater value over artificially generated creativity.

Conclusions

Given the fact that researchers are advancing fast in the space of creativity and creative systems, this research attempts to shine some light on what is to come. As for now computers and systems are co-creating alongside humans. This paper is a conceptual study for the future of work and based on the literature found on subjects that depict the level of advancement in the field of artificial intelligence. This research is just the beginning and can be the stepping stone on what is to come for the future of work and human creativity. This is why we propose a new paradigm that is "human-made in the age of artificial intelligence". As systems are continuing to evolve we need to create new business models that help better promote human creativity and help businesses add bigger value to their products/services compared to the ones generated by an artificial intelligence system.

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