

Proposed question for Independent Inquiry: Whether AI can
have its Own Creative Thinking?

Three keywords: Efficient, Cooperation, Replacement

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This context this research is to investigate the three keywords, with three images and to synthesize these with three artists/thinkers, this will form a question for my dissertation. The three words I will be looking are: Efficient, Cooperation, and Replacing. Researching into these words will help me to explore the impact of Artificial Intelligence within certain industries and from this, the impact of AI upon art and design will be discovered. This outcome will lead me to develop my research for my dissertation.

Efficient

In the Cambridge dictionary (2021), 'efficient' is defined as "working or operating in a way that gets the results you want without any waste". The concept of 'efficient' as being central to industry is stated by Gálvez (2019) as follows

Efficiency is the core idea underlying comparative advantage, the nineteenth-century economic theory developed by David Ricardo asserting that each place should specialize in what it does best and purchase the rest of its products on the wider market.

Introducing AI technology to industries can increase the efficiency of their processes, as it is a major factor of the production within business. For example, according to Jimenez (2018) "Machine automation produces quality products faster and more

efficiently, while providing critical information to help managers make more informed business decisions.” The keyword ‘efficient’ is therefore used in various industries, and one of the best examples of its use with AI is in within the agricultural industry. The reason for bringing artificial intelligence into agriculture is to increase productivity, save money and managing crops effectively, which could have positive impact on the environment. As the world has issues with “climate change, dwindling water supply for irrigation, increases in production cost” (Jung, *et al.* 2021) thus, the question can be raised whether AI is the answer to these problems.

- Reducing use of resources
- Save money
- Effective assessment
- Labour cost
- Health and safety (especially global pandemic)
- Easy communication (Efficient) Saves time

As highlighting the use of AI in the agricultural industry, the main overview is explained by Jung *et al.* (2021) that global food production and supply has currently been extremely disrupted by the COVID-19 pandemic. This potentially impacts the environmental and economic sustainability of today’s food systems and those of the future. The use of AI within agriculture may be potentially a way of opposing these

issues in the future. By showing the example of the use of AI agriculture, this might suggest that it could be an answer to the issues stated before. However, it could be considered that there are disadvantages to introducing artificial intelligence, which could be that people may lose brain capacity or their ability to solve problems by themselves. As well as artificial intelligence, Just-in-time (JIT) manufacturing is a process that relates to the keyword 'efficient'. According to Banton (2021), JIT is a “management strategy that aligns raw-material orders from suppliers directly with production schedules.” JIT is like AI, it increases efficiency in the manufacturing process.

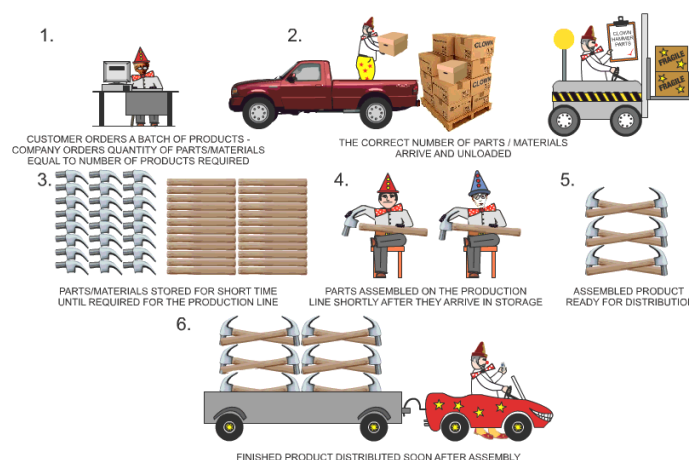


Fig: 1 *Just-in-time basic understanding* (Ryan, 2013)

As shown in this diagram, Just-in-time will benefit businesses, as it “reduces costs by minimizing warehouse needs. Companies also spend less money on raw materials because they buy just enough resources to make the ordered products and no more” (Banton, 2021). Although, this process requires employees to be trained

well so that they are flexible enough to be prepared for sudden changes in order of the production. Lean management or production is also having an idea of 'efficient'. Lean management is defined by Laurent (2020) as "a method of managing and organizing work with the aim of improving a company's performance, particularly the quality and profitability of its production processes." Another point by Laurent (2020) again, is that the process can be made more efficient through the use of lean management by minimising non-essential activities, this includes operations, transport, waiting or overproduction. This approach is very dependent on management that provides best conditions in which employees can work. Thus, the two main aims can be filled, which are customer satisfaction and employee success. Therefore, efficiency will be created in this management. By combining these two with AI will create more efficiency in the processes. When it comes to design, Phillips (2018) described that AI is about optimizing speed. Working with AI can benefit designers by enabling them to produce faster and at less cost, because of increasing speed and efficiency. The power that AI offers is the rapidity of analyzing huge amounts of data and the design adjustment this creation suggests. With an AI design, a rapid design prototyping can be achieved by scanning basic sketches, boundaries can be set with relevant product information in relation to the company design systems to enliven an appropriate prototype. This suggests, therefore, that AI

is beneficial in the design field where it creates efficiency in the design process and saves both money and time.

Cooperation

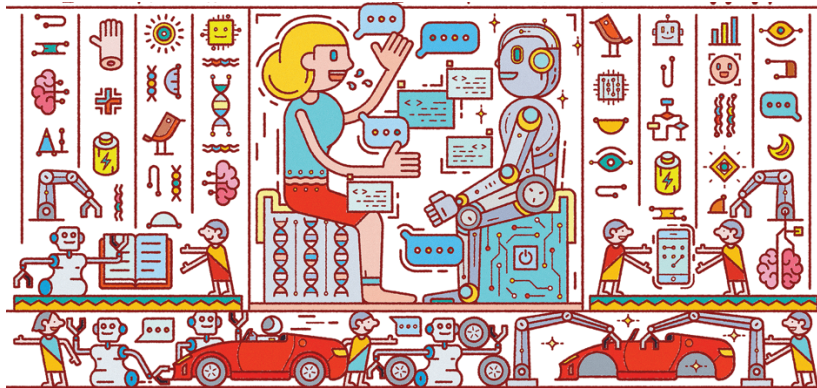


Fig: 2 Collaborative Intelligence: Humans and AI Are Joining Forces (Cheng Liao, 2018)

‘Cooperation’ could be considered as a keyword directly relating to artificial intelligence, because in today’s time, it is going to be vital that we coexist with artificial intelligence. The word ‘cooperation’ is defined by the Cambridge dictionary (2021) as ‘the act of working together with someone or doing what they ask you’.

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Bertino *et al* (2020) described that “With success, cooperation between humans and

with the growth of AI, humans may be giving the power to make decisions to machines, this will involve compromise where we will have to work cooperatively with the AI. The idea that AI helps humans is explained by John Maeda during an interview with Goff-Dupont (2020):

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Computational thinking has four flavors, one of which is decomposition. As I talk about in *How To Speak Machine*, computers have the capacity to loop through a function or task forever without getting tired. Plus, they log detailed results as they go along.

So for humans, the takeaway here is to decompose a gnarly problem into smaller components. Are there partial solutions you can try over and over, iterating a little bit each time until you land on the right one? What if you simulate isolating and changing one variable at a time? Seeing the ripple effects helps clarify how all the pieces relate to each other. Mimicking computational thinking can go a long way toward modeling a living system. It opens up an entire universe of possibilities.

Fouse, et al (2020) reports that The Defense Advanced Research Project Agency's (DARPA) has funded research into national security, which has highlighted the potential of AI in this role. It emphasises that machines must sense and communicate with the world around them:

- Find solutions through reasoning to any problems
- To consult with humans before acting on those decisions
- To learn
- To explain the reasoning for their decisions
- To abide by rules and ethical behavior
- To adapt to active and demanding environments

And they must do all of this. When it comes to design, AI can enhance the process in certain ways. For example, *Fusion360* is the design software which we are using in

our study, it has a system of 'Generative Design', in which the computer will create an object based on our manufacturing and cost requirement needs. This shows that AI can be helpful in the design area. Phillips (2018) also explains that AI can assist with day-to-day tasks including product localization and promoting products in a multitude of languages. For example, Netflix is already utilising AI to successfully complete such tasks, wherein the system analyses the master version, and the personalized graphics are produced in a suitable language. Thus, all that remains for the designers are for them to assess graphics and decide whether they are appropriate and adjust them manually, if necessary. AI also can help create complex 3D VR images much more quickly. This could be used within the fields of VR, AR, and MR. Again, this saves the designers' time as AI system can generate a variety of designs that they can choose from. Phillips (2018) also suggests that "leveraging those design opportunities is not going to happen by magic, but by designers co-creating with AI as our creativity sits in the crosshairs of art, science, engineering, and design." This suggests that it won't happen as soon as we think, but by bringing together different areas of the design process AI will develop a more important role. This is evidenced by Aue (2018), who states that artists are also influenced by collaborating with the machine learning algorithms of AI to change their artwork and their relationship with it, instead of using it just as a tool for making. This

means that the artificial intelligence brings a new opportunity to the design industry.

Collaborating with AI can boost designers' creativity, which "artificial intelligence is meant to help people have an easier, more fulfilling life and not to take it away.

Especially in the field of product design and development" (Shanin, 2021). In the future, we designers may potentially treat AI as our work partners, instead of a machine that will take our jobs.

Replacement

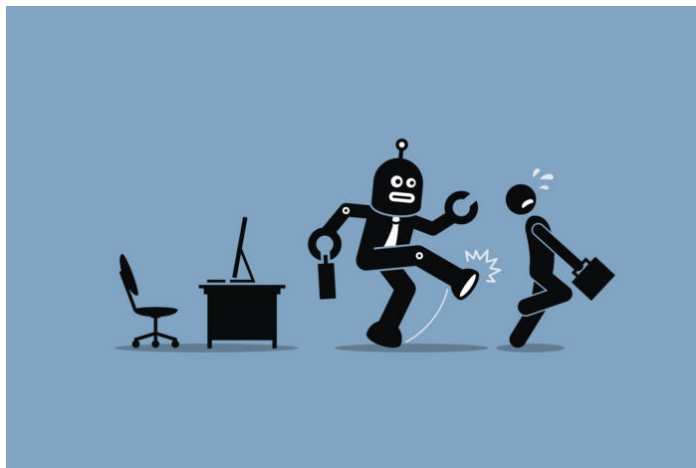


Fig: 3 *How CIOs can get buy-in for a job-destroying AI revolution* (Zammuto, 2018)

While artificial intelligence has many benefits, the issue of replacement can be considered as occurring with development of technology in general, as it has already taken some of the jobs which were previously done by human hands, this also applies to AI as well. According to Huang and Rust (2018) AI currently threatens human service jobs, despite being a progressive tool. There are already jobs being replaced by AI, especially in manufacturing and service industries, which could lead

to financial difficulties for those whose jobs have been replaced. It has been suggested that even managers can be replaced by robots and the results of research into this implies that almost 46% of volunteers follow the instructions of robots, even though a human has more perceived authority. Chui, Manyika, and Miremadi (2015) discovered that a high percentage of the tasks carried out by people earning high salaries, such as senior managers, portfolio managers and doctors can be automated. This could cause impact on the employment on the human resources as well as the economic. While the development of the AI brings opportunities, they also bring social issues. Within the creative industry, there is the project called '*The Next Rembrandt*' (2016). The project involved observing the paintings of Rembrandt van Rijn's pixel by pixel, to "get this data, they analyzed a broad range of materials like high resolution 3D scans and digital files, which were upscaled by deep learning algorithms to maximize resolution and quality" (The Next Rembrandt, 2016). I believe that this suggests that once they have learned the algorithms within the artwork, there could be an AI creative practitioner. Therefore, this could go possible with product design as well. However, "it will replace the designers of today, not the designers of tomorrow" (Oh, 2019). Although, there are disadvantages of replacing humans with AI within the design industry. Primarily, AI is

lacking the capability of creativity that humans originally possess. There are things which AI struggles within designs, which are:

- Understanding nuances
- Creating original content
- Filter biases

Oh, (2019) reports that historically, human emotions have helped us as a survival mechanism. Emotions have protected us from danger, and we can read people's emotions based on their tone of voice, body language and forms of social communication. Therefore, understanding human emotion is particularly challenging for AI. From an art and design perspective, creating would need an extremely large datasets of images from technology organisations and other institutions. However, many firms may not have the technology that meets these requirements. Even if AI has created the artwork, the question that must be asked is 'does this piece hold emotional power and artistic value?'. The problems that make AI stand out from its human counterparts is that it only has the knowledge that has been given to it by humans, which does not have any original thoughts. As this shows that AI lacks its own thoughts and emotions, this makes it difficult to replace humans, because it cannot understand the originality that humans possess. Secondly, AI lacks the moral, ethical and safety awareness when making its decisions. According to Pazanesse

(2020) AI gives three main areas of ethical concern for society. These are: privacy and surveillance, bias and discrimination, and the role of human judgement, which is the most difficult and philosophical question of the age. This unique role creates very important question whether artificial intelligence can be a functioning part of our society. In terms of morality the struggle of teaching morality is also described by Oh (2019):

“Teaching morality to machines is difficult because humans can’t objectively convey morality in measurable metrics that makes it easy for a computer to process. Without its own moral and social consciousness, AI can only blindly accept data sets without filtering any biases.”

Therefore, it will be challenging to replace AI with its human counterparts, because it cannot have their own moral and social awareness, AI can only have one-sided beliefs which are only given, making it will make difficult to make its own decisions. Finally, there are differences between artificial Intelligence and the natural systems, which is one of the factors to consider replacing. According to Lawrence (2018) the difference between artificial systems and natural systems are that AI is created by humans while natural systems are part of natural evolution. The details are varying but the common theme between these two is for them to complete tasks with the least number of resources, so that artificial Intelligence is created for a specific

purpose only. Thus, this differs from a natural system which adapts to changing environments.

Having researched these keywords, these have led me into an interest towards the impact that artificial intelligence brings into the design industry. This is an area that I have realised that I would like to research for my dissertation as it is relevant to a current issue within the design field and its future. This investigation gives me an understanding of how AI will make the work process more efficient and the advantages and disadvantages of its use. I have learned that we designers can work with AI instead of being afraid that it is going to take our jobs and must treat it as a colleague or something like that. As well as discovering the benefit of collaborating with AI, discovering how the AI has possible drawbacks which it will bring to humans. The research for my dissertation next year would be about 'whether AI can have its own creative thinking?'. As AI could be present as new form of art and creativity, which is expressed by Michael Fried (1967) which I am proposed to read for my dissertation research "it is not an isolated episode but the expression of a general and pervasive condition." Although he was not talking exactly about AI, but this quote does seem to be relevant when discussing the introduction of AI into the design process. This research will be covered by following subtopics: 'Creating efficiency

comes with cost', 'Pros and cons of its use', 'Does it take away something rather giving something', 'Does its design create emotional power, creative individuality, and artistic value?', 'What kind of designer we must be in the future?' and finally 'how the Natural systems are connected'.

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