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Preprint · April 2020

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Creative Economy and Covid-19: technology, automation and the new economy¹

Guilherme Fráguas Nobre²

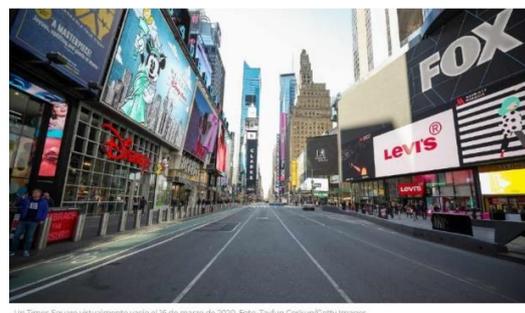
Abstract

The paper aims the impact of the covid-19 crisis over the creative economy, seeking for ideas that may help the creative class to find alternatives as to survive. After a brief definition and dimensioning of the creative economy, section 3 shows how some players of such sectors are dealing with the sanitary crisis. As a matter to survive, the dematerialization of the creative businesses/services is proposed. However, the same technology that may help, may also harm – since artificially intelligent agents have been already employed as an autonomous “creative class”. Therefore, the necessary solution brings also new potential automated competition.

Keywords: creative economy, covid-19, automation, crisis, creative class.

1. Introduction

Empty streets, empty cities. Everybody at home. Everything closed, with few exceptions. The scenario looks...promising for some sectors, such as automation, delivery, online shopping, tele-services as Kindle, Spotify, Netflix, etc. Of course, and for the ones still open to supply the basics for a quarantine – food stores, supermarkets, pharmacies, logistics, and so on. Not to mention the opportunity to the health sector, with fortunes being put on personnel, equipment, material, medicaments, and research for a vaccine development. The pharmaceuticals around the world are investing a lot to be the first able to save lives, and to profit as well.



¹ Second version, adjusted and with amendments: 06/04/2020. First version: 04/04/2020.

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Sure, the counterpart is devastating. Think this way: how many economic sectors and industries do rely entirely (or mostly) in people being outdoors, on the streets? For instance, all related to tourism: transport (air, land, sea), accommodation (hotels, hostels, resorts, AirBnB), restauration (restaurants, cafeterias, fast foods), visits (museums, galleries, natural, historic, and thematic places – as parks, archeologic sites, Disneyland, etc.), renting (cars, bikes, skiing and diving equipment), receptives (commuting, translators, cicerones), show business (operas, theatre, music and dance spectacle), and fairs (commercial, technological, scientific). Bref, a massive quarantine has an apocalyptic social and economic impact over the market as we know it.



But we are also having an opportunity to ask interesting questions, for example: is already time to change the traditional working relations?; an intensive dematerialized and immaterialized economy is finally viable?; from now on are everybody investing (all they can) in automation?; are the creative economy's sectors even more propitious as leaders for the new economy? Of course, this crisis is temporary, and the life as we know it may come back as soon as this virus goes away. Right? Well, I hope not really. Not only because, again, we have tasted different solutions, arrangements, and scenarios; but mostly because many of the economic agents have already changed deeply, with no 'come back' option available. And finally, because another virus may eventually appear.

2. Creative Economy

Before analyzing the impact the crisis is having over the creative economy and how, perhaps, its sectors will be able to reinvent themselves, we need to quickly acknowledge some facts. First, that there is not a unique definition for creative economy. Second, that there are variations over which sectors do compose the creative economy. Third, that exist critiques about the concept, composition, and methodologies used by those who study

and promote the creative economy. For all of you eager to know more about such aspects, please see the references here – and see specially the bibliography referred in the end of those papers. That said, here a first approach:

The Silicon Valley, Hollywood and the Ministry of Culture compose/contain, at least as a first approximation, the main Creative Economy sectors (see the different categories in Nobre, 2015). Or, in other words, they represent the sectors where (the) majority of the creative human capital of the economy work; that is, people whose creativity has justified advancing research in Creative Economy. For example, the Silicon Valley represents the software and hardware industry that enables the Internet, social networks, ecommerce, and derivatives, such as computers, smartphones, autonomous cars, robots, androids, and a myriad of other applications. Hollywood, in turn, is a good metaphor for the harmonious joining of various arts (film, dance, music, performing arts, clothing and fashion) and techniques (marketing, public relations, advertising, press relations, advertising) – whose common denominator is the production and commercialization of ‘industrial’ goods and services. Finally, the Ministry of Culture theoretically covers a wide range of creativity intensive sectors, such as museums, heritage, libraries, literature, music, theater, folklore, fine arts (painting, sculpture etc.). (Nobre, Gil; 2017:310)

The most important information about the creative economy, according to the believe of countries such as Australia and United Kingdom, is that the future of national wealth (GDP and HDI³) will rely on sectors intensive in creativity, innovation, talent, education, and imagination – for instance. That explains why several countries have been increasingly investing to secure and promote such sectors – for they believe the future for economic value creation/conversion depends on it. In short, they believe the economic matrix for wealth generation shall migrate from sectors intensive in matter/energy towards to sectors intensive in technology, services, and creativity. The former would deplete more natural resources and would be superiorly polluting, while the latter would be the opposite and theoretically more sustainable – natural resources savior and less polluting⁴. But in practice, how do perform these sectors?

The creative economy represents 6,1 % of the world’s Gross Domestic Product (2.700 billion of dollars), while the exports of creative goods and services reached 3,4 % of the total worldwide (424 billion of dollars) (Area Metropolitana de Barcelona, 2011, 71). In Europe, both the creative and cultural industries generated 3,3 % of the GDP, and have employed 3 % of the working force (6,7 million of persons) (Azqueta, 2014, 1). Differently, EY (2014, 10) says that “creative and cultural industries (CCI) contributed with 4,2% of Europe’s GDP”. In Spain, the creative and cultural sectors provide with 3,9 % of the country’s GDP – average between 2000-2008 (Barcelona Treball, 2013, 17). The region of Catalonia has been close to such mark, with 3,1 % of GDP, 6,6 % of the working force, and 6.6 % of the companies as well (Generalitat de Catalunya, 2014, 58-59). If one takes the industries based on experiences (that aggregate creative and cultural industries, tourism, and sports), they account for 16% of the GDP and 19 % of the employments (Generalitat de Catalunya, 2013, 17). The capital Barcelona concentrates 46,8 % of all creative jobs in Catalonia, and has a

³ Gross Domestic Product (GDP) and Human Development Index (HDI).

⁴ To a critique on this, see (Berkhout, Hertin; 2004:914) and (Heinonen, Jokinen, Kaivo-Oja; 2001:322).

creative sector that employs 11,3 % of the city’s working force and involves 10,9 % of the companies. (Ajuntament de Barcelona, 2015, 10). (Nobre, 2017:163)

3. Creative Economy and Covid-19

Since some players do include the sectors of tourism, sports, leisure, and entertainment into the creative economy (Nobre, 2015:186)⁵, you can imagine how hard the quarantine is hitting their businesses: countless cancellations on voyages, hosting, meals, vacations, spectacle, tours, seasons, championships, opens, including the 2020 Tokyo Olympics – all of this plus the spillover effect on broadcasting, sponsorship, advertising, branding, merchandising, salaries, bonus, etc. Now add here the other sectors of the creative economy: fashion⁶, design, publication, visual arts, scenic arts, music, dance, multimedia, new electronic medias, services, cultural equipment, showcases, etc. Here below some actual examples on how the creative sectors are facing the challenge.

British Council (2020)	“We understand that this is a difficult time for the creative sector and for artists and creative professionals across the globe. (...) Where it is not currently safe or practical to continue as planned, we are putting projects on hold with a view to rescheduling when it becomes possible. We are exploring how we can digitise our programmes and possibilities for connecting people online.”
Soroko (2020)	“While industries like professional sports may have a bigger cushion to weather an empty stadium for several months, small organizations and individuals rarely have such a buffer. By now we know a lot about the losses like vanished ticket sales and staff layoffs. But what holds up the promise of creative thinkers? Day by day, the number of cases rises. Museums are closing, performances are cancelled and festivals are postponed. (...) Other businesses are offering gift cards, classes in advance, support on social media, a gift box of soothing items for troubled times, greeting cards and much more. For many theater companies and performers, Zoom video conferencing software has become the new stage. Some of these options have been in plain sight for years now, but the urgency of coronavirus is propelling creative thinking way beyond the norm.”
Florida; Pedigo. (2020)	“This will be critical for communities that are dependent on such attractions: A Brookings analysis shows that COVID-19’s economic downturn will hit tourism-driven cities such as Orlando and Las Vegas hardest. (...) We are in

⁵ “For example, the Unctad model (for the creative sectors) is quite complete, including: design (fashion, jewelry, graphics), publications (books and press), visual arts (painting, sculpture, photography), performing arts (theater, dance, circus), audiovisual (cinema, television, radio), new media (software, games, digital media), services (advertising, architecture, R&D), cultural spaces (museums, archaeological sites, libraries), cultural expressions (handicrafts, fairs, celebrations) (...). Countries have suppressed or added sectors, such as tourism, sports, education, engineering (in connection with architecture). (...) It was chosen here to include tourism, sports, leisure and entertainment (...); in addition to intangible heritage, education, training, memory, the equipment and supporting material (...). It is worth mentioning the inclusion of indigenous and Afro-Brazilian cultures as cultural components of the creative economy (...).” (Nobre, 2015:184) (*freely translated from the Portuguese*)

⁶ “For their part, the worst affected are fashion, accessories and restaurants (both with a 100% drop) and leisure and culture, with 97%. (...) (T)he leisure and culture sectors have a very low emotional state compared to the rest. Among those concerned (61.5%) and the many pessimists (23.1%), they account for 84.6%. It is followed by the fashion and accessories sector, with 74.4% (55.3% of worried and 19.1% of very pessimistic).” (Fanals, 2020) (*freely translated from the Catalan*)

	<p>the midst of a massive experiment in remote work. Most people will eventually go back to their offices, but some workers and companies may find remote work to be more effective. (...) The creative economy of art galleries, museums, theaters, and music venues -along with the artists, musicians, and actors who fuel them- is also at dire risk. (...) Sectors such as transportation, travel and hospitality, and the creative arts will be hit the hardest, while e-commerce and distribution or advanced manufacturing for health care and food processing may grow.”</p>
OECD. (2020)	<p>“Along with the tourism industry, cultural and creative sectors are among the most affected by the current coronavirus (Covid-19) crisis. The current crisis is particularly critical for cultural and creative sectors due to the sudden and massive loss of revenue opportunities, especially for the more fragile players. Some actors benefit from public support (e.g. public museums, libraries, theatres) but may experience significant budget shortfalls. The sector includes major multinational companies with sustainable revenues (e.g. Netflix), but many small companies and freelance professionals essential for the sector could face bankruptcy. This crisis creates a structural threat to the survival of many firms and workers in cultural and creative production.”</p>
European Creative Business Network. (2020)	<p>“Canceled fairs, festivals and concerts, closed clubs and theatres: The cultural and creative industries (CCIs) are already economically affected by the spread of the corona virus. (...) Not only organisers are affected, but also agencies and numerous freelancers in performing arts, film and music as well as clubs, fair and festivals, basically all who are active in the broadest sense in the event business. As from now, this will effect in the long run the whole of the CCIs and turns into a unrepresented affair with incomprehensible economic and social effects.”</p>
CBCA. (2020)	<p>“Many of CBCA’s upcoming events have been postponed, canceled, or will be moved to virtual platforms. Please check our website for updates. CBCA is dedicated to advancing Colorado’s creative economy. In these challenging times, we will continue to compile and share resources to help artists, creative professionals and nonprofit cultural organizations manage the impact of this crisis.”</p>
Rolling Stone. (2020)	<p>“The North Carolina native recorded the record there during what he calls a “peaceful and joyous” time in his creative life. Now, the album’s success, his live show receipts, and the very livelihood of Caudle and his wife-manager are in jeopardy due to the <i>coronavirus</i> pandemic. His two shows at SXSW disappeared when that festival was canceled last week, and he’s full of uncertainty about the 16-week tour he’s about to begin. He’ll be there, guitar in hand - but will his audience? In his own words, Caudle tells us about how the coronavirus threat could impact independent artists and touring musicians.”</p>
Udall. (2020)	<p>“Like many others in the service and tourism industries over the last two weeks, many arts organizations have closed their doors for the foreseeable future. More than one-third of respondents expect to make reductions in staff - 26% have already reduced their creative workforce. The \$3.2 billion figure includes revenue losses to date from admissions (ticket sales, subscriptions, memberships), non-admissions income (gift shop sales, sponsorships, contributed income), and unexpected expenditures (new cleaning/disinfecting protocols, adoption of new technologies, cancellation fees). Given that those losses have occurred only in the last two weeks, and current indications from the Center for Disease Control (CDC) and President Trump suggest that social distancing and other measures could extend through the summer, Americans for the Arts anticipates an additional \$5-10 billion in potential revenue losses for the nonprofit arts and culture field.”</p>
Rosenberg. (2020)	<p>“At a moment when we badly need common cultural experiences and references to remind us what we share, the covid-19 epidemic is isolating us instead. The cultural pall cast by the outbreak is already widespread. Chinese moviegoers spent a mere \$4.2 million on movie tickets during the 2020 Lunar New Year holiday, a sliver of the \$1.76 billion shelled out a year ago. The Hollywood Reporter has suggested that the international film industry could</p>

	lose \$5 billion due to the epidemic. The latest James Bond movie, “No Time to Die,” on Wednesday saw its release date pushed back six months in hopes the virus will subside. Meanwhile, Venice’s Carnival was canceled and Milan’s La Scala opera house is closed. In Italy and Japan, soccer and baseball games have played to empty stadiums; future matchups face cancellation.”
Music Week. (2020)	“This crisis directly impacts two overlapping groups: people and businesses. In terms of people, there are a huge number of creators and creative specialists who felt they had been left without adequate clarity, support or security. The government has compared the Covid-19 crisis to a war and needs to step in to support the army of British creatives. (...) The government has voiced its support for the economy and it must, therefore, support the people who are the lifeblood of the economy. By supporting businesses to get through this, they are ensuring that there will still be infrastructure on the other side to support people and music to survive and thrive.”
NBC News. (2020)	“ <i>The Olympics is the biggest event yet to be affected by the growing global pandemic.</i> The decision to postpone the games was welcomed by many athletes and national committees after growing calls for the games to be delayed or canceled because of the outbreak.”
Leung; Easton. (2020)	“Despite having an important role to play during and after the pandemic, arts and cultural charities are under significant threat due to the crisis’ economic implications. Our report reveals that the majority of arts, culture, heritage or science charities are small. Restrictions on movement, and consequential loss of earnings, mean that those reliant on donations and with financial operations are likely to be highly vulnerable in the current crisis and its economic aftermath. In addition, many arts and cultural venues have closed during the COVID-19 pandemic. Local community arts and cultural organisations rely on in-person gatherings to carry out their activities. As these can no longer take place, their income will be impacted and they will become even more vulnerable.”



Therefore, not only the virus itself is harvesting innumerable precious lives, the required quarantine is also ruining jobs, companies, businesses, careers, projects, etc. – destroying economic value /wealth in a fast pace. Although this extreme situation, some players have been suggesting interesting solutions⁷: go online, digitize yourselves, do use conference

⁷ “Now, she is taking requests to record cover songs. For a minimum of \$20, she’ll send you a file. (...) Then there’s Zoom: cartoonist Brett Bower is using it to connect with events or individuals, to draw caricatures of them in real time. (...) Regional drag night Queer Space is shooting eight episodes of Queerantime, to be released weekly. (...) Some artists are producing comedy that isn’t stand-up – such as Jenny Wynter’s new podcast Talk to Me that’s monetised via Patreon (...) Kirsten Krauth: launch(ed her) book online, “I’ve started creating ‘how to’ videos for the socials(.) I’ll then be selling these creations, plus my usual costume/fashion collection. (...) Conductor and music educator Ingrid Martin’s YouTube channel Conducting Artistry is catering to the thousands of music students and teachers in isolation. (...)”

software, sell gift cards and vouchers in advance, embrace remote working, create for virtual platforms, and organize to make lobby over the Government for help, protection, and promotion. Trying to align with those sectors less affected by the quarantine, or even with those that are thriving because of it (such as the health supply companies, pharmaceuticals, logistics, supermarkets, news groups, etc.), is another idea. And, of course, with all the internet players that seem to be better than ever, such as Amazon, Netflix, Spotify, Facebook, iFood, and so forth. Finally, with those sectors providing the basics to all to stay at home: power plants, water companies, gas providers, and cable and internet suppliers – including cell phones carriers.

4. Automation and dematerialization

Dematerialization can be seen as the “opportunities to transform a physical product into a service” (Willard, Halder; 2003:11), e.g. a book into an eBook; or even a physical facility into a dematerialized service, when banks branches migrate to the app store – accessible through smartphones. A crucial question to the creative sectors during the quarantine is: how capable are we to dematerialize our businesses in order to reach the public at home?

Some sectors of the creative economy have been trying to dematerialize their production and immaterialize their consumption. For example, several activities that basically were depending on a physical support to exist, like books, DVDs, CDs, letters, reports, thesis, and so on, have now the digital alternative to be produced and consumed. Music production and deliverance is an interesting case amid others. (Nobre, 2016:282)

Despite any eventual difficulties to dematerialize the creative sectors/activities, although the cornucopia of technical solutions already available, the truth is that some technological advances (such as artificial intelligence and machine learning) have bringing more reasons to concern than to relief. Take, for example, the case of “creative machines”, able to produce art and science in an autonomous and independent way. Such dematerialized machines, algorithms living in and working from the clouds, may present a new potential competition to those creative sectors that have only started their migration to internet.

(A)uthor and journalist Catherine Deveny (has) create(d) an online writers’ course – she already hosts in-person writing workshops. She’s releasing one lesson a day with a pay-what-you-can afford model. (...) The annual IronFest Gothic Festival was to be held in Lithgow in April. Now it’s moving online – and there’s even a Facebook marketplace for the vendors.” (The Guardian, 2020)

Some authors have been presenting machines capable of value-generation through creative art production, technical writing, scientific discovery, and patents/copyrights. For instance, machines that paint (Sundararajan, 2014; Moroni, Zuben, Manzolli, 2002), write novels and poems (Dupej, 2012; Voisen, 2010; Bringsjord, Ferrucci, 2000), compose music (Strycker, 2012; Colton, Wiggins, 2012), enact as architects (Boden, 2000, p. 74), that write down journalistic news (Carlson, 2015; Aires, 2016; Weeks, 2014), scientific papers/abstracts (Conner-Simons, 2015; Jordan, Rose, 2010), fill patent application forms (Breitinger, Elmaghraby, Gipp, Hamborg, 2017), that promote scientific discovery (Dzeroski, Langley, Todorovski, 2007; Bridewell, Langley, 2010; Langley, 2013) and develop patentable/copyrightable material (Davies, 2011; Buning, 2015; Hattenbach, Glucoft, 2015). In each of these activities, such machines are creating new economic value, mostly in an autonomous and creative manner. (Nobre, 2018:18)⁸

But the same technology has been also put to the service of society, since the artificial intelligence is one of the instruments been used in the search for a vaccine, to monitor/predict the spread of the virus, and to manage the resources (personnel, material, medicines, and premises) in a situation of extreme demand for health care. According to the Science Daily (2020), the “new AI tool found that changes in three features (...) were most accurately predictive of subsequent, severe disease(, helping) to predict risk of ARDS with up to 80 percent accuracy”; whereas McCall (2020) shows how “Insilico Medicine based in Hong Kong recently announced that its AI algorithms had designed six new molecules that could halt viral replication.”

5. Automation and Covid-19

Even before the sanitary crisis, automation was already seen as a threat to human employment and as for wealth concentration - for instance (Nobre, 2018:21). Now that millions of persons are losing their jobs, and other millions have seen their work conditions being downgraded (shifts with less hours and smaller salaries), the subject of automation comes back stronger.

Field; Murphy. (2020)	The pandemic has sent millions home and out of work. Some of those jobs will be given to robots. (...) The crisis isn't just accelerating the transition to automation: According to experts, it'll also boost investments powering that change. (...) "Economic literature over the last decade shows that these investments are made especially during a crisis."
Blueprism. (2020)	(B)lue Prism is rolling out the Blue Prism COVID-19 Response Program. We are ready to help by providing <i>Digital Workers</i> and process automation resources to organizations impacted by COVID-19 to help them maintain critical business continuity. (<i>italic ours</i>)
Huang. (2020)	Across the globe, Chinese e-commerce giant JD began testing a level-4 autonomous delivery robot in Wuhan and running its automated warehouses 24 hours a day to cope with a surge in demand. Suddenly, autonomous machines need to be better than just proof of concepts.

⁸ The references along the quotation are accessible at the bibliography of Nobre (2018).

Lazenby. (2020)	Depending on how long this COVID-19 pandemic crisis lasts, the mining industry could see big moves into autonomous mining technologies in the not-too-distant future, says SAP Africa mining advisor Shabir Ahmed.
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Artificially intelligent machines (e.g. algorithms) that perform as effective ‘social agents’ may pose a real risk to human employment. Communicative and artistic machines have been studied (Matuck, Nobre, 2016; and Nobre, Matuck; 2016), in a way to conclude that the creative class has strong reasons to rethink its *métier*. Amidst such expected intensification in general automation, technology shall become a highly sensitive subject within the creative economy – since it works both as helper and competitor.

A good image is one machine painting a canvas that a person may want to buy(,) and other machine working as a broker so to sell such canvas online (–) at e-Bay for instance. Or, one machine writing a novel that a person may want to read(,) and other machine creating an e-book and uploading it to the Kindle Store(.) Even more, one machine composing music and producing records(,) and other machine making them available to sell at iTunes(.) (Nobre, 2018:19)

6. Conclusion

The Covid-19 crisis has brought an unprecedented trouble to the economy in general, and to the creative economy in particular: a population in quarantine at home (with very few exceptions, such as police, doctors, nurses, truckers, etc.). To the economy in general, the forecast is terrible: the recession may be worse than the one at 2009 (UN, 2020), with “retail sales down 20% y/y in January-February and industrial output over 13% lower, thanks to widespread factory closures” (Oxford Economics, 2020). To the creative economy, however, the prognostic is less accurate due to the path of each sector: for example, Udall (2020) sees about USD \$8-13 Billion in losses to art and culture only in the United States; global airlines expect USD \$63-113 Billion in lost revenue from virus (Bloomberg, 2020); the loss for the international tourism may be about USD \$300-450 Billion (UNWTO, 2020).



It is highly expected that the sanitary crisis will end soon, and all population start coming out again – not at once and surely not altogether. Even if the movement at the streets come to an almost “normal” again, it seems reasonable to fear that the economy will suffer to recover: for each recession demands time, hard work, and resilience. Remember how many persons have lost jobs, salaries, income, sales... and even lives. But what happens with those who have lost so much with the lockdowns, and whom perhaps have not enough resources to endure the required time to the recovery? Will the governments be there for them? For some time and for some of them, yes; but for everybody and during the entire period, not likely. Based on that, the players on the creative sectors ought start seeking a way to change – immediately. That may imply dematerialize their businesses/services, following the steps of those who have survived the crisis.

As a complication, it is worth to note that being into the internet is not enough. An internet business that needed people in the streets (e.g. AirBnB, Uber, etc.) has also had problems with the quarantine. Some sectors have had less trouble, such as the educational: given that many of the schools did have “distance learning” platforms. Anyway, the same technology that offers a solution to the creative class may be, also, a source of additional competition – with “artificially intelligent machines (that) have been programmed to become creative: once capable of generating (art,) innovation(,) and discovery by themselves, AI machines can be seen as assets that create new marketable value in a very autonomous way” (Nobre, 2018:13). Therefore, the new economy is a necessity for the creative class, but it comes with new warnings and challenges as well.

7. References:

- Berkhout, F.; Hertin, J. (2004) **De-materialising and re-materialising**: digital technologies and the environment. *Futures*, 36, pp. 903–920.
- Bloomberg. (2020) **Airlines brace for \$113 Billion in lost revenue from virus**. Available: <https://tinyurl.com/w4kaj72> Access: 04/04/2020.
- Blueprism. (2020) **Taking action**: Blue Prism COVID-19 response program. Available: <https://tinyurl.com/qlcpuhr> Access: 05/04/2020.
- British Council. (2020) **Our response to Covid- 19**. What you can expect from British Council Arts. Available at: <https://tinyurl.com/yx3suuv3> Access: 31/03/2020.
- CBCA. (2020) **Resources to support the Arts during coronavirus**. Available at: <https://tinyurl.com/u5ehmnf> Access: 31/03/2020

- European Creative Business Network. (2020) **Urgent Survey: effects of COVID-19 (“Coronavirus”) on the European Cultural and Creative Industries.** Available at: <https://tinyurl.com/yxyvph7c> Access: 31/03/2020.
- Fanals, L. (2020) **El petit comerç gironí ha perdut un 88% de vendes per la crisi del coronavirus** [The Girona small retail has lost 88% of sales due to the coronavirus’ crisis] Diari de Girona, 01/04/2020. Available: <https://tinyurl.com/r7qyu3x> Access: 05/04/2020.
- Field, H; Murphy, M. (2020) **Covid-19 will herald an automation boom.** Protocol, 03/04/2020. Available: <https://tinyurl.com/tx5avh2> Access: 05/04/2020.
- Florida, R; Pedigo, S. (2020) **How our cities can reopen after the COVID-19 pandemic.** Brookings, March 24. Available at: <https://tinyurl.com/s7ktf3o> Access: 30/03/2020.
- Heinonen, S.; Jokinen, P.; Kaivo-Oja, J. (2001) **The ecological transparency of the information Society.** Futures 33, pp. 319–337.
- Huang, B. (2020) **Will COVID-19 accelerate an automated future?** The Robot Report. 29/03/2020. Available: <https://tinyurl.com/rl8sxfr> Access: 05/04/2020.
- Lazenby, H. (2020) **Industry could fast-track automation amid COVID-19 fallout.** Mining Journal, 31/03/2020. Available: <https://tinyurl.com/qn5tayx> Access: 05/04/2020.
- Leung, R.; Easton, E. (2020) **The impact of COVID-19 on arts and cultural charities.** NESTA, March 31. Available at: <https://tinyurl.com/wudy8uc> <https://tinyurl.com/wudy8uc> Access: 31/03/2020.
- Matuck, A. & Nobre, G.F. (2016) **Communicative and artistic machines: a survey of models and experiments on artificial agents.** International Journal of Computer, Electrical, Automation, Control and Information Engineering, vol. 10, n. 10, pp. 1816-1820. Available: <https://tinyurl.com/raahs7r> Access: 05/04/2020.
- McCall, B. (2020) **COVID-19 and artificial intelligence: protecting health-care workers and curbing the spread.** The Lancet, v. 2, i. 4, pp. 166-167, April 01.
- Music Week. (2020) **Coronavirus advice: AIM's Gee Davy on the challenges faced by the SME music sector.** Available at: <https://tinyurl.com/v6rn2en> Access: 31/03/2020
- NBC News. (2020) **New dates announced for Tokyo 2020 Olympics postponed over coronavirus concerns.** Available at: <https://tinyurl.com/vhtfef5> Access: 31/03/2020.
- Nobre, G. F. (2015) **A economia criativa e o valor potencial da Escola de Comunicações e Artes** [The creative economy and the potential value of the Communications and Arts School]. Organicom, a. 12, n. 23, pp. 180-190. Available: <https://tinyurl.com/wmxojzb> Access: 31/03/2020.
- Nobre, G. F. (2016) **Creative industries and dematerialization of the economy: ideas on communications and public relations.** Em: Farias, L. A.; Lopes, V. S. C. (Org.). Proceedings 10º ABRAPCORP. Porto Alegre, ediPUCRS, pp. 269-287. Available: <https://tinyurl.com/tk6l3xf> Access: 31/03/2020.

- Nobre, G. F. (2017) **Creative economy at Girona, Spain: a potential, a hope, and investments to be.** *Economía Creativa*. v. 8, pp. 159-186. Available from: <https://tinyurl.com/vdnqucn> Access: 31/03/2020].
- Nobre, G. F. (2018) **Automata Economicus: machines that create value and the artificial Creative Economy.** *Economía Creativa*. v. 9, p. 10-26. Available: <https://tinyurl.com/wffzowm> Access: 04/04/2020.
- Nobre, G. F.; Gil, P. G. (2017) **Creative economy and communicational capital.** In: APDR. (Org.). *Proceedings 24th APDR Congress, Angra do Heroísmo*, pp. 310-317. Available from: <https://tinyurl.com/qs8xx7p> Access: 04/04/2020.
- Nobre, G.F. & Matuck, A. (2016) **Communicative and artistic machines: some remarks on authorship, copyright, and liability.** *International Journal of Humanities and Applied Sciences*, Vol. 5, No. 2, pp. 145-149. Available: <https://tinyurl.com/s7ec4xt> Access: 05/04/2020.
- OECD. (2020) **Coronavirus (COVID-19) and cultural and creative sectors: impact, innovations and planning for post-crisis.** Available at: <https://tinyurl.com/tn6alqb> Access: 31/03/2020
- Oxford Economics. (2020) **The economic cost of coronavirus lockdowns.** Available: <https://tinyurl.com/sonxhgz> Access: 04/04/2020.
- Rolling Stone. (2020) **Coronavirus could decimate Touring Musicians' livelihoods.** Available at: <https://tinyurl.com/s595x96> Access: 31/03/2020
- Rosenberg, A. (2020) **The Louvre and James Bond show us what coronavirus could cost us.** *The Washington Post*, March 4. Available at: <https://tinyurl.com/vavymm9> Access: 31/03/2020
- Science Daily. (2020) **Experimental AI tool predicts which COVID-19 patients develop respiratory disease.** Available at: <https://tinyurl.com/spzjah9> Access: 31/03/2020.
- Soroko, S. (2020) **In a pandemic, the creative sector has a lot to lose.** It also has a lot to gain. *Arlington Economic Development*. Available at: <https://tinyurl.com/wk7dn6p> Access: 31/03/2020
- The Guardian. **Coronavirus arts crisis: expert tips on keeping your audience – and getting your work out there.** 19/03/2020. Available: <https://tinyurl.com/t6hya8n> Access: 05/04/2020.
- Udall, T. (2020) **Udall, Heinrich, Senate Democrats Call for \$4 Billion Stimulus to Protect America's Creative Economy.** Relief package would help sustain arts economy to stem the devastating economic toll of the COVID-19 pandemic. *USA Senate*. Available at: <https://tinyurl.com/r567qxn> Access: 31/03/2020.
- UN. (2020) **The recovery from the COVID-19 crisis must lead to a different economy.** Available: <https://tinyurl.com/shcobgz> Access: 04/04/2020.
- UNWTO. (2020) **Impact assessment of the covid-19 outbreak on international tourism.** Available: <https://tinyurl.com/vbhq36x> Access: 04/04/2020.
- Willard, T.; Halder, M. (2003) **The Information Society and Sustainable Development - exploring the linkages.** *The International Institute for Sustainable Development*, Winnipeg, Canada, 37pp.