



DIGITAL GAME CHANGERS (DGCs): THE POTENTIAL TO GENERATE DISRUPTION

Conceptual briefing

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- What does disruption (in this case, a 'digital game changer') mean for a system?
- Why can technological change create friction in social, economic or legal systems?
- Levels of disruption and impacts on a system
- Key terms: digital game changers, disruption

INTRODUCTION

The DESIRA project will analyse the socio-economic situation in the context of 20 European **Living Labs** focused on agriculture, forestry and rural areas. Due to digitalisation in these Living Labs, we expect to see disruptive 'game changers' that are often unpredictable and multidimensional. In DESIRA, the term **Digital Game Changers** is understood to mean digital or technological entities that create positive or negative disruption in agricultural, forestry and rural systems. Given the complexity of disruption to these systems, its analysis requires a transdisciplinary, participatory process that takes additional aspects into account (e.g. institutional, environmental).

1. WHAT DOES DISRUPTION (CAUSED BY A 'DIGITAL GAME CHANGER') MEAN FOR A SYSTEM?

Disruption interrupts the normal way systems (a mental representation of given domains of reality for analysis and control purposes) work. When a system undergoes disruption, all elements of a system are reorganised: some entities become obsolete, new entities are embodied, the material and immaterial flows change, and relations and interactions between the entities in the system are reshaped. The outcomes generated in the system are also changed in terms of diversity, quantity and quality. Disruption is an *"outcome that can be measured not just by its process but by both its results and its process"*¹.

Technologies are important drivers of disruption². The Gartner Glossary³ defines digital disruption as follows: *"Digital disruption is an effect that changes the fundamental expectations and behaviours in a culture, market, industry or process that is caused by, or expressed through, digital capabilities, channels or assets"*.

In everyday language, the term **'game changer'** is an entity that brings about disruption. It can be a person, a product, a policy, a great idea, or anything that changes 'the game'.

What becomes clear is that something has such an influence on a certain system that thereafter the system is significantly different. If we consider a system, a game changer is an entity, a rule, or an activity, that significantly changes how the system operates. Taking this into consideration, a way to describe digital technologies and digital transformation, besides disruptive, is game-changing.

2. LEVELS OF DISRUPTION AND IMPACTS ON A SOCIO-CYBER-PHYSICAL SYSTEM

The identification of 'the game' in game-changing technologies (e.g. the system itself, or its social, economic, environmental, institutional, etc., domains) helps to understand that disruption may occur at several levels of complexity. A first level of disruption in a Socio-Cyber-Physical system relates to the cyber domain or the broader technical system: when a new digital technology is developed, many technical systems become obsolete. This is the case for analogue cameras and magnetic tapes. Further levels of disruption occur when the disruption impacts interactions within the social domain that affects, for example, legislation that is not (yet) prepared to regulate it.

Often these emerging digital, and potentially disruptive or game changing technologies depend on each other to function (or disrupt) optimally; for example, without connectivity there is no Internet of Things. Moreover, digital game changers enable the combining of knowledge, data and processes of diverse physical machines that were previously disconnected⁴ and now

have increasing autonomy, combining monitoring, controlling and optimisation activities⁵.

Game-changing technologies are expected to impact agriculture, forestry and rural areas. In DESIRA, a **taxonomy of game-changing technologies** will reveal which technologies are manifesting, in what way they can be considered game-changing, how they may differ across systems, and how they are dependent on specific contexts.

3. WHY CAN TECHNOLOGICAL CHANGE CREATE FRICTION IN SOCIAL, ECONOMIC OR LEGAL SYSTEMS?

Digital game changers can be seen as negative but unavoidable, e.g. digital technologies are constantly being developed and improved until there is no choice but to use them: for example, due to changing context and requirements of stakeholders⁶. Disruption is then perceived as something that is external, without the ability to influence it, especially because disruptive technologies are often only identified ex-post⁷.

According to Downes⁸ the 'law of disruption' implies that *"technology changes exponentially, but social, economic, and legal systems change incrementally"*. In other words, while it is acknowledged that disruption contributes to the volatility, uncertainty, complexity and ambiguity of a given situation, which can be a boon to early adopters who excel in the regulatory void⁹, not everyone is able to understand and respond to it at an early stage¹⁰.



Example of Digital Game Changers:

Robotics

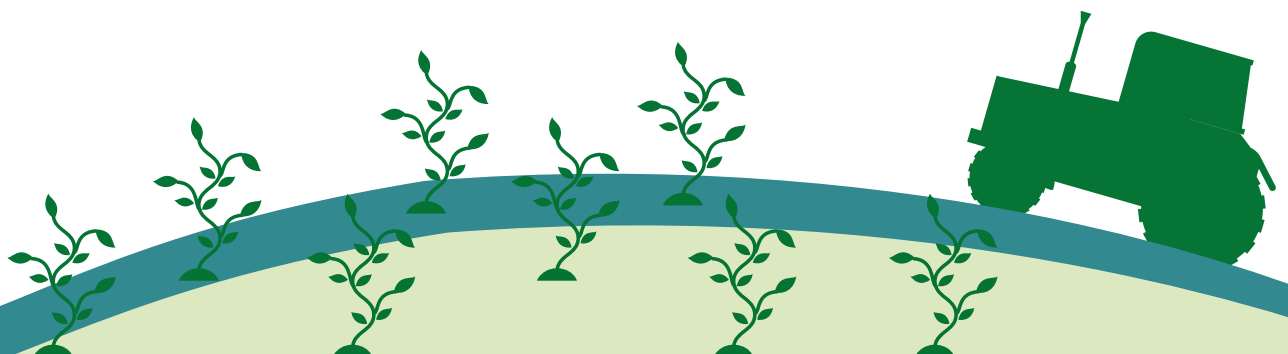
Automation can replace human labour, and this may dramatically increase the productivity of a firm. This is a positive outcome for the adopting firm, which may gain a strong advantage against non-adopters. However, non-adopters become less competitive and may be expelled from the market. This generates unemployment and difficulties in reemploying jobless people. In a context where there is a programme for support and training for jobless people, the transition can be smoothed, and disruption limits itself to the technical and economic sphere. When this does not occur, higher level disruption occurs.

Copyright systems

This exemplifies a gap between speeds of change and domains. With the possibility of digitising texts, images and music, replication and circulation have become costless. The legal system built upon paper and vinyl was not ready to regulate the digital circulation of copyrighted material, so everybody could have easy access to digitalised copies without being caught by enforcing authorities. Even when enforcing authorities have adapted their surveillance systems, the ease of circulation of information imposes a revision of the regulation to let the technology be beneficial to society.

Unnamed Aerial Vehicles (UAVs) or drones

These technologies, which are used in several sectors, are having a large impact, thus provoking disruptions. Considering the use of UAVs in agricultural application to monitor fields from above in real time, or their use in monitoring ancient buildings: monitoring from above provides a different point of view, offers digital imagery that can be analysed for different purposes, can remove the need for scaffolding, all at acceptable costs with respect to similar services in the past. That is why they are being so largely used and firms providing such services are thriving.



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