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Letter to the Editor:

Disruptive Innovations from Disruption

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The COVID-19 crisis represents a uniquely sharp disruption in many human activities. Never before has the whole world been so abruptly thrown into a crisis. As a result, a lot of innovation can be expected related to the treatment of infected people and to control and monitor the spread and to compensate for the lockdown (Karabag, 2020). These innovations are both IT-solutions, and real-world innovations. In many cases we are dealing with the widespread adoption of existing technologies that will get a very strong push in development and mature more rapidly than they normally would do. E.g the widespread use of on-line meeting services for meetings and for education. The technology solutions are based on solutions that are decades old but that know is getting such widespread use, and it is shifting from being mainly a supplementary solution, to becoming a mainstream solution for meetings. This means that they will greatly improve, both from the way people are learning to use them, and from resulting requests for better features. This in turn will push the technologies for the next generation of products. There are also real-world innovations, e.g. innovative use of 3D printing to provide spare parts for ventilators, and for the manufacturing of parts for protective gears.

This disruption can best be understood through the technology lifecycles presented in Utterback (1994) and Christensen (1997). A new technology is often developed in a niche application where a special set of requirements are needed and can be paid for. At some point this technology will then mature and beat the existing technologies also in other areas and will thus replace the existing technology. However, the COVID-19 crisis represents a major disruption in society, and it is creating new sets of requirements across a wide range of users, meaning that that technology development gets greatly accelerated. See Figure 1.

We can expect that everything on-line will get a strong push compared to off-line. Robotics is also being emphasized since people are getting used to do more things from the comfort of their home, and for a long time people will be reluctant to have close contact with strangers, e.g. drivers. There has also been deployment of aerial drones in China for transportation of medical samples, for surveillance of peoples, and for using drones to spray disinfectant. In these cases it has also been demonstrated that when there is a strong necessity, regulations will be adjusted to accommodate the introduction of new technology (e.g. insertion of drones in city airspace), processes that otherwise would take many years.

We can expect the penetration of robotics and remote/autonomous operations will be accelerated in all fields where it is applicable. This also includes heavy machinery for material

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handling, transportation and construction. This includes trucks, truck cranes, dump trucks, wheel loaders, excavators and mining equipment, where such development is already under way.

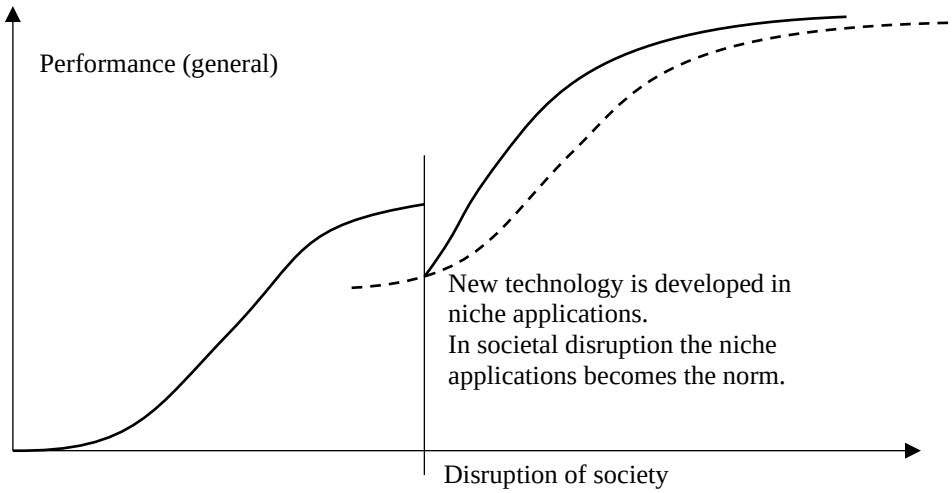

Figure 1. Technology evolution and transition in disruption
(source: Author's own elaboration besed on Utterback, 1994)

Small autonomous home delivery vehicles for the last mile, will get a great push (Deloison, Hannon, Huber, Heid, et al., 2020). They are developed e.g. by companies like Amazon and FedEx, but there are also a range of many smaller companies. It can be seen as a parallel to the development of civil aviation where air-mail preceded passenger transport since the requirement for safety where less. The need for speed in home delivery is very moderate which also makes it an good case for autonomy.

An observation is that electrification also seems somehow to be linked and happening together with autonomy, probably because autonomy implies such a radical change in the product and also business model, that a shift in e.g. propulsive technology does not represent so much of added complexity.

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