

Post Covid Telecoms: A System Dynamics Model of Demand Side Shock

- **Covid 19 has caused a demand side discontinuity for broadband as we seek better connections for work and play.**
- **A System Dynamics model of the market can capture how this shock has effects throughout the broadband ecosystem.**
- **System Dynamics also helps identify how actions by different players can support or deter investment.**

When SPC Network and DAS Ltd developed a System Dynamics model of the determinants of investment in Very High Capacity Networks (VHCNs) in 2019, the world had not heard of Coronavirus and Covid 19. Since then it has changed, and continues to change, our world. Amongst its many effects is a discontinuity in the demand for VHCNs as consumers need better access at home for work and leisure.

System Dynamics is able to capture how this discontinuity can have significant effects on the determinants of investment. In a regulatory context it can help identify the first, second and third order effects a decision by an NRA can have and how it might affect investment levels in the wake of this demand side shock.

Coronavirus has changed the way we work, rest and play. Where once we met colleagues and friends in person, today we meet virtually over one of the many video-conference platforms and calling apps. It's no longer unusual to see business contacts' kitchen, home offices or even bedrooms!

The broadband infrastructure across Europe has held up well so far, but data volumes are likely to increase if the working from home and on-line

socialising trends continue. This may lead to a demand for better quality connections offering more bandwidth to the home. A demand to which network operators must respond.

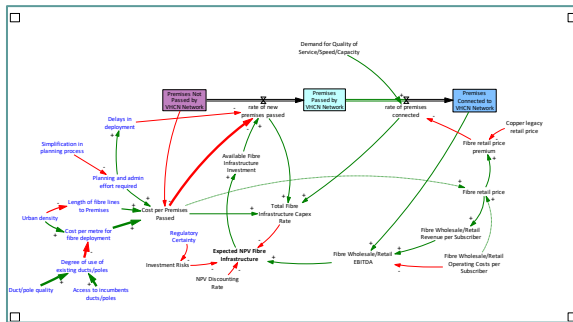
Coronavirus has caused a discontinuity in the demand for broadband services as consumers do more work from home and use more Subscription Video on Demand apps.

When SPC Network and [DAS Ltd](#) developed our System Dynamics (SD) model of the determinants of investment in VHCNs for BEREC in 2019 (see [Hexagon December 2019](#)) we established that in many EU countries such investment was driven by the supply rather than the demand side of the market. In the Post-Covid 19 new normal, that is changing. However, the System Dynamics model is still relevant.

How can SD help? Our model developed for BEREC mapped a journey for a property, from not being connected to a VHCN to one connected, subscribing and generating revenue for the network operator. Around that core, we mapped the various determinants of investment levels and timing.



Using this core model, we could describe the market development taken in different European countries. We showed how in Spain, for example, access to ducts reduced the cost of VHCN deployment despite initially low demand (illustrated below). Running across the top is the customer journey from not connected to being a revenue generating subscriber. The various links show how the low cost of premises passed drove the initial investment to connect houses resulting in a positive cash flow that supported the business case for further investment, creating a virtuous circle, or reinforcing loop in System Dynamics language.



Likewise, the model revealed how competition from cable was important in Ireland and how high

consumer willingness to pay created a demand-side pull in Sweden.

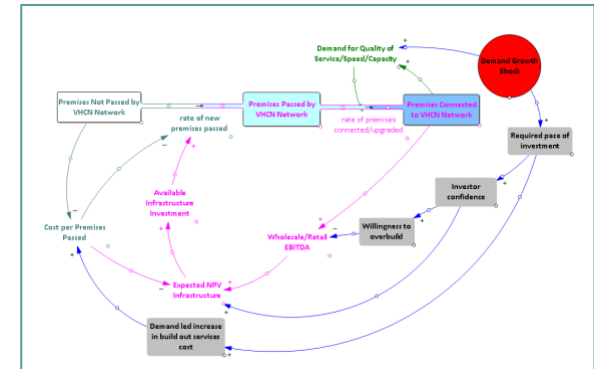
Then along came Covid 19, locking down society, forcing more people to work from home and creating a substantial demand side shock for higher quality broadband access. Consider the following:

- Netflix subscribers increased by 16m in Q1 2020, against a forecast of about half that.
- Travel more or less stopped. Passenger movements at London Heathrow collapsed from around 7 million per month in the final quarter of 2019 to almost none in April and May 2020.
- Zoom ended 2019 with 10 million subscribers. By April 2020 it had 300 million subscribers, plus many more using the free version.

SPC Network and DAS have been considering how the SD model can be amended to map this shock and help companies and regulators develop their strategic and regulatory thinking. Our early thoughts are presented in the simple SD model below.

The red circle represents the demand side discontinuity caused by Covid 19. To the left, it

causes an increase in demand for higher quality broadband connections, which generates an increase in the rate of premises upgraded to a VHCN, or even connected for the first time.



The demand side shock increases the necessary pace of investment, illustrated in the grey box below the red circle. This may generate more investor confidence and perhaps even a willingness to overbuild exiting networks, which operators may not have been willing to do before when demand was less certain. All of this leads to improved Net Present Value (NPV) and so an increased willingness to invest further in network upgrades.

How can this model be used in a regulatory environment? Let us suppose that a regulatory

action is under consideration, or in place, that unintentionally reduces investor confidence (2nd grey box from right). Perhaps the NRA is planning on such tight regulation of VHCN prices that it is not economic for either the SMP operator or alternative providers to invest.

As a result of this proposed action, investors may expect a reduction in EBITDA and so a lower NPV, reducing the funding available for upgrading existing networks or investing in new ones. Fewer households and offices then have the opportunity to upgrade and so operators are unable to meet the demand discontinuity. The virtuous circle that could be built up reverses, leading to lower levels of investment and unfulfilled demand, with attendant effects on the economy.

System Dynamics models can incorporate quantitative assessments of the direction and level of an action on outcomes through the system.

Once a more complete map of the system is developed, NRAs can use the model to consider how actions on one element of the system percolate through the market and what the direction and level

of any outcomes might be on businesses and consumers.

Similarly, companies can use the model for the same purpose and perhaps as a basis for explaining to NRAs how an action designed for one purpose may have unintended consequences elsewhere in the system, preventing the original purpose of the action from being achieved.

System Dynamics modelling can go further than simply plotting the myriad relationships between regulatory actions and outcomes in the market for companies and consumers. Quantitative techniques can be integrated with the system maps to estimate the value of the effect of those actions.

For example, quantitative models of, say, the relationship between level of funds available for investment and number of properties passed and another between investor confidence and funds available, could be integrated into the SD model to quantify the effect an action of the NRA that reduces investor confidence on the number of properties passed.

A Systems Dynamics model shows how complex systems, linking investors, consumers, business and

regulators, responds to external shocks that change the dynamics of the system. It can help pinpoint where actions reinforce each other to help drive investment up to respond to the demand shock or where an action that undermines investor confidence can have the opposite effect: making it harder for broadband providers to respond to market demand.

“An interlocking and complex set of markets lies between regulatory action and the downstream consequences for the public”

The model presented above is a first step towards creating a more complete picture of the systemic links affected by the shocks caused by the way Covid 19 has changed our lives.

For further information and to help develop this model, please contact SPC Network via richard.cadman@spcnetwork.eu



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