SCIENCE WEEK

#scienceweek

7-14 Nov 2021

Supported by Science Foundation Ireland

SMART COMMUNITIES

ABOUT CREATING OUR FUTURE

Creating Our Future is a Government of Ireland campaign to stimulate a national conversation between everyone in Ireland on their ideas on how to make our country better for all. While we might not always think about it, research and innovation affect nearly every part of our lives. The COVID-19 pandemic in particular has shown the importance and value of research and innovation in our lives – medically, socially, politically, and economically. Ideas are the starting point for all research and innovation. Anyone, anywhere, can have an idea that inspires research and innovation. It could be based on an opportunity or challenge that someone has identified in their own life, for their community, for Ireland or for the world. Or it could be based on a topic that someone is curious or passionate about. Creating Our Future wants to hear them all – in particular from our young people. All ideas will be captured and will help inform the future direction of research and innovation in Ireland.

Secondary school students are invited to take part in this national conversation on research. Research carried out in the present will have an impact on your future, and you have the opportunity to have your say on research that will help to make a better future for all in Ireland.

Some of us are excited to go back to exactly the way things were before the pandemic, others have found recent times to be a relief and want to keep the changes we've experienced, others want to hold on to some of the changes but not all of them. Our impact on the environment has improved in so many ways, such as air quality, and yet deteriorated in others, such as the use of single-use plastics. Remote working is the new norm for a significant number, this has directly impacted on quality of life in the positive and the negative for so many, for others it has resulted in a serious hit to livelihoods as footfall in office areas drop. Throughout this journey, the public has been largely united in turning to science for the data to inform decisions for today, and to bring hope for tomorrow.

Use these discussion toolkits in the weeks leading up to Science Week to debate and discuss STEM topics with your class that will affect our future, from changes in the fashion industry to using technology to enhance our cities and communities. During Science Week, submit your own idea to creatingourfuture.ie to help researchers in Ireland to create a better future.

This toolkit provides background and discussion stimulus on smart communities, including smart community initiatives that are currently taking place in Ireland and the challenges in introducing these initiatives in areas with poor internet connectivity. There are video and news sources linked throughout the document to help stimulate the conversation.

INTRODUCTION AND BACKGROUND
Smart Communities and Future Internet Connectivity

Many initiatives have been taken to involve citizens in the development of Smart Cities, and Smart Communities are part of this. Smart Dublin is an example of such a smart city.

Smart communities are regions where citizens, governments, companies, and institutes work together to transform their cities into smart ones with the help of advanced technologies. The aim is to enhance the quality of life for the citizens of these cities by providing better services to them.

For example, The Civiq tool is being used by Dublin Council to communicate and capture the opinion of the public who want to contribute to any city development. Similarly, citizens of Switzerland use mobile applications to report any damages or any other infrastructure-associated issues to city authorities.

These engagement platforms provide opportunities for designing new services with the community and for continuously improving the services based upon their feedback and inputs. The aim is to use this feedback to design new systems and to understand in which kind of cities people want to live in.
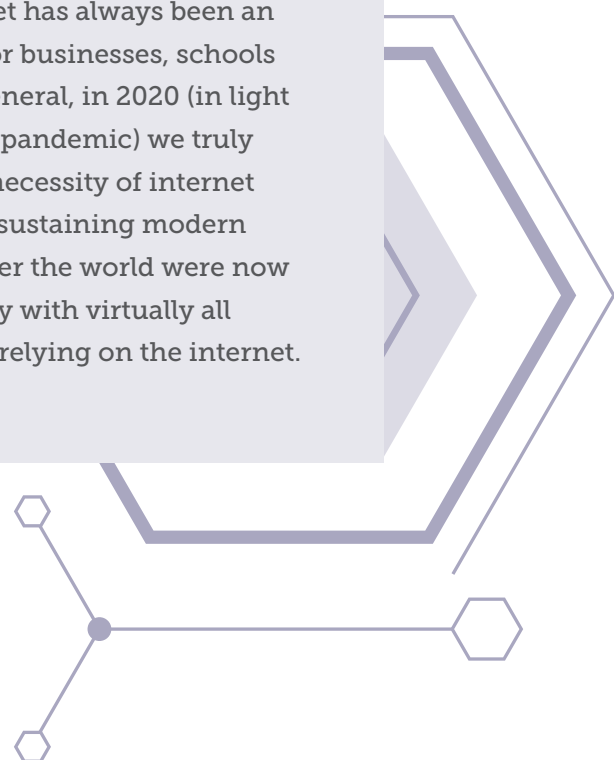
For smart communities initiatives to work we need access to highly reliable, high speed internet, which we all have access to....or do we?

While the internet has always been an important tool for businesses, schools and society in general, in 2020 (in light of the COVID-19 pandemic) we truly understood the necessity of internet connectivity for sustaining modern life. People all over the world were now working remotely with virtually all communication relying on the internet.

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One of the fears generated by the COVID-19 pandemic was that the mass shift to remote work would "break" the Internet. Indeed things have changed, such as types of traffic and daily patterns but the Internet has withstood. It has a high degree of redundancy and able to sustain faults, failures, demand spikes. This mass migration to remote work has highlighted the imbalance in Internet capacity between urban centres and industrial parks, and sub-urban and rural areas, with rural areas in great need of connectivity upgrade. When we take into account the fact that only approximately 64% of the Irish population live in Cities, towns and urban areas, this leaves a further 36% with potentially major connectivity issues.

High quality and reliable internet is essential if there is to be equality of access to smart community technologies across the country. So, how can research and technology improve the situation? There are solutions being considered but these do not come without their costs....

Here in Ireland the National Broadband Plan is working hard to deploy optical fibre to as much of the island as possible. However, fibre is extremely costly to deploy everywhere and to every home.

Another option are Mobile Networks (4G-5G), where the speeds promised by 5G would more than satisfy home connectivity requirements. Before the benefits of 5G can be felt in all homes, the coverage of mobile networks must be greatly improved.

At a much higher altitude lies the promise of satellite connectivity, with companies such as StarLink deploying massive constellations of satellites (currently ~1700) to provide 100Mbps Internet connectivity to everyone, everywhere. Furthermore, the deployment of thousands of satellites in orbit has resulted in protests from astronomers, as they cause light pollution and can interfere with data collection.

DISCUSSION STIMULUS

Smart Communities

1. **Smart communities**
   Having watched the smart communities video, consider the advantages and disadvantages of smart lampposts. Are smart lampposts being used in your neighbourhood, school or community?

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2. Have you ever been involved in a smart community initiative or started a smart community initiative in your school?

3. Think about concerns and issues that you have faced in the past or you see around your city/community, for example, litter management-related issues or illegal dumping, consider how you would solve these issues and whether smart technology could help.

4. **Smart Bins being used in Dublin**

   Read more

   Dublin Bus video on smart transportation systems
   Having read the article on smart bins and watched the video on smart transportation systems, what do you think are the advantages of these initiatives? Would you like to see these used in your own local area?

Internet Connectivity

Internet Access Inequality - watch

This video highlights the inequality of access to internet connectivity in the USA due to socio-economic factors. Do you think these same issues are at play in Ireland?
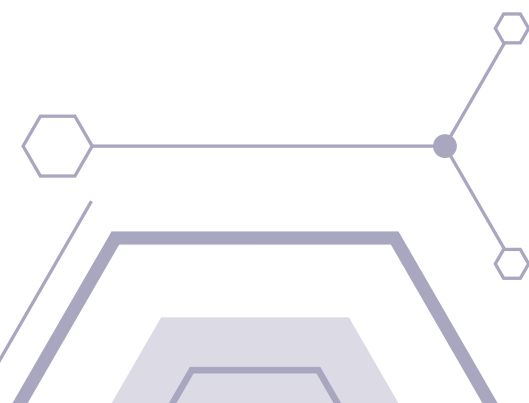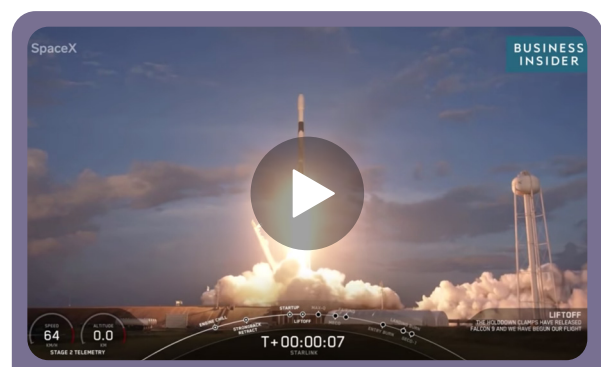

The environmental impacts of the Internet - watch

Most people think about reducing their carbon footprint by doing things like recycling, driving less etc. This video highlights the energy consumption associated with the internet. Having watched this video, would this make you think differently about your use of the internet?

StarLink Explained - watch

A clip explaining the potential impacts of StarLink, a global internet system powered by satellites in low earth orbit. What do you think about StarLink? Do you think the advantages of Starlink outweigh the disadvantages, or vice versa?

Guiding Questions

1. Smart Communities

a. How do you think existing services could be improved in your local area using smart community technologies?

b. Do you think the community's feedback has a role in the implementation of new services?

c. If you had the power to improve or transform existing community services, what would you do?

d. Do you see any challenges/difficulties in involving the community for city development?

e. Do you think technology can help us in solving big issues such as climate change? More specifically do you think smart communities can help with these issues? Why or why not?

2. Internet Connectivity

a. We have seen above that we do not have equality of internet access in the country and the infrastructure is not yet in place to introduce the idea of smart communities everywhere. Rural areas in this respect are at a major disadvantage and have been for quite some time. Is it possible to have truly equal Internet connectivity throughout the entire country? Consider all available technologies in terms of cost and performance.

b. Each of the existing technologies for providing Internet connectivity has challenges and there is no forerunner. The solution will be to combine the technologies based on the characteristics of the rural community that will be served. We have to consider the different types of rural communities in Ireland: small villages, isolated estates, and spread out or isolated houses and farms. In your opinion, what combination of technologies would provide the best performance with the smallest cost for the different types of communities?

c. How could researchers in Ireland work to ensure a balance is struck between equal access opportunities and potentially negative impacts?

Additional Resources

Links to other Smart Cities/Communities Limerick Cork National Broadband plan interactive map:
https://www.gov.ie/en/publication/5634d-national-broadband-plan-map/

NBI Broadband Connection Points:
https://nbi.ie/broadband-connection-points/

Live Satellite tracker:
https://maps.esri.com/rc/sat2/index.html

No, coronavirus isn't going to break the internet:
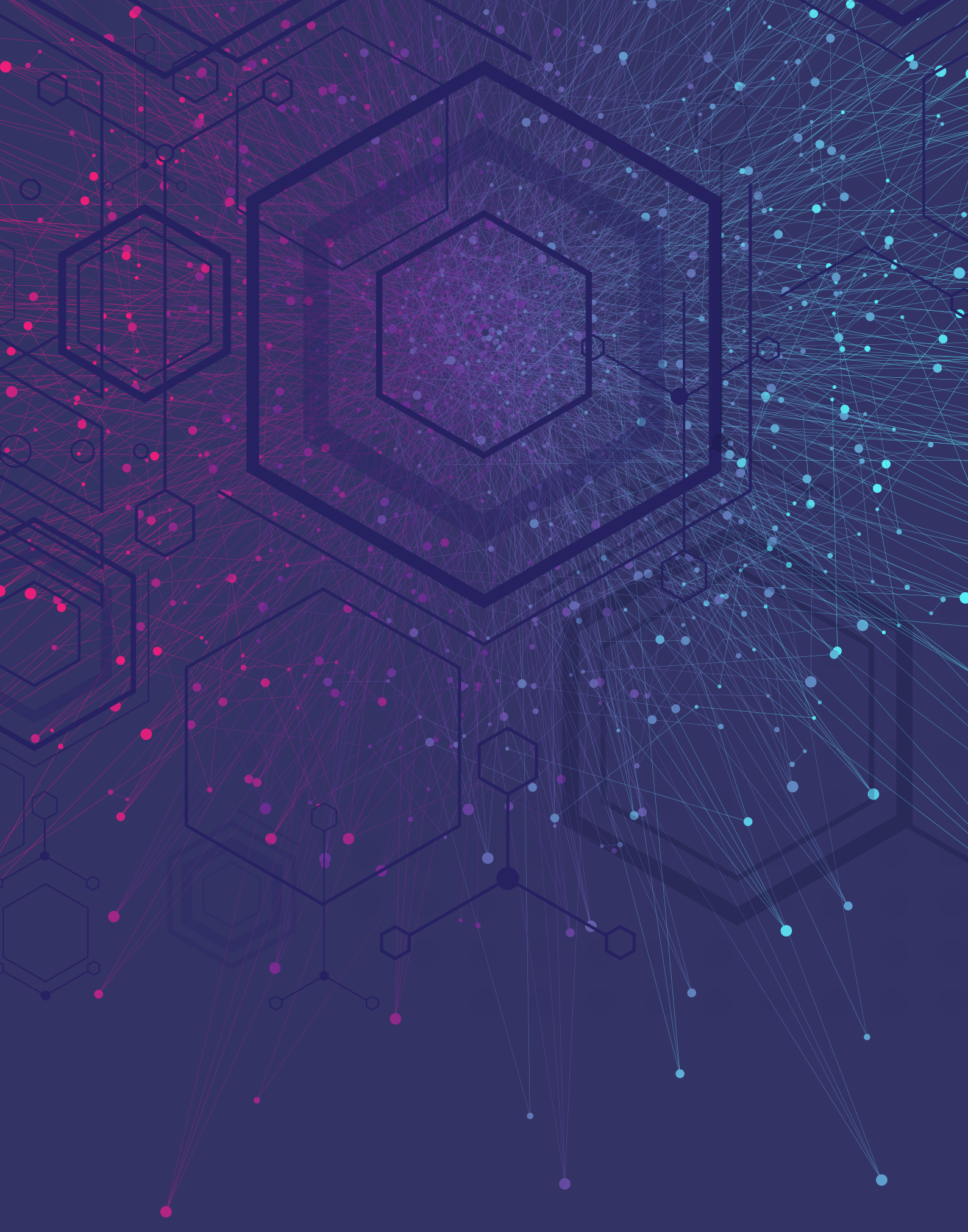https://www.wired.co.uk/article/coronavirus-internet-speed-shut-down

Ireland's Biggest Brainstorm - have your ideas heard!

Now that you have discussed smart communities and internet connectivity, take five minutes to think of an opportunity or challenge you see for yourself, your community, Ireland or the world on this topic.

These can be captured in the classroom using this template and emailed to creatingourfuture@sfi.ie or if you have access to a computer lab log on to creatingourfuture.ie and submit your idea directly on the website.