

DISTINCT

Disruptive Technologies Transforming Northern
Periphery and Arctic Communities

FORESIGHT ANALYSIS

FORESIGHT ANALYSIS REPORT



Northern Periphery and
Arctic Programme

2014-2020



EUROPEAN UNION

Investing in your future
European Regional Development Fund

Document history

| Version | Date of issue | Description | Authors |
|------------|---------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0 | 30/06/2021 | Initial version | Jose Manuel San Emeterio (ERNACT) Timo Rui (Karelia UAS) Riikka Räsänen (Karelia UAS) Mikael Söderström (UMU) Ulf Hedestig (UMU) |

Table of Contents

| | |
|-------------------------------------------------------------------------|----|
| Table of Contents..... | 3 |
| 1. Introduction..... | 4 |
| 2. Public Sector Foresight Analysis – findings from the surveys..... | 5 |
| 2.1. General Information..... | 5 |
| 2.2. Disruptive Technologies..... | 8 |
| 2.3. Application of Disruptive Technologies..... | 11 |
| 3. Public Sector Foresight Analysis – findings from the interviews..... | 15 |
| 3.1. Swedish interviews..... | 15 |
| 3.2. Finnish interviews..... | 19 |
| 3.3. Irish local authority interview..... | 22 |
| 4. Appendix 1: Interview question outline..... | 24 |

1. Introduction

The DISTINCT Project explores the practical application of Disruptive Technologies in the public service provision. This includes the use of Virtual Reality (VR), Internet of Things (IoT), Artificial Intelligence (AI) and Blockchain in health and social care, environmental management and training.

Disruptive technology is an innovation that significantly alters the way that consumers, industries, or businesses operate. A disruptive technology sweeps away the systems or habits it replaces because it has attributes that are recognizably superior.

The reason disruptive technologies are important, is because the successful application can save costs, increase viability, improve use of scarce human resources, span distances and improve decision making. However, the small number and concentration of disruptive technology research and innovation centers, allied with low levels of awareness, present serious blocks to realizing this improvement.

The purpose of this foresight analysis report is to figure out the needs, challenges and opportunities the public sector face with disruptive technologies. Also, to increase awareness how disruptive technologies can be applied to public services.

Methodology

The information was gathered using a survey and complemented with in-depth interviews. The surveys, which were collected via Survey Monkey and gathered together and analyzed. The survey was originally created in English, which then was translated to Finnish and Swedish. All answers were then translated to English to analyze the data together. The interview data was collected via phone or video conferencing. The same interview questions were used as a framework for all participants.

2. Public Sector Foresight Analysis – findings from the surveys

The questionnaire's intention is to increase awareness among public authorities by discovering applications and estimating potential demand, of how particular disruptive technologies can be applied to particular public services in remote and sparsely populated areas. The responses received were treated anonymously. The contact details were requested only for the purpose of contacting to share the results and contacting for follow up interviews.

2.1. General Information

A total of 45 total responses were gathered through the online questionnaire from different NPA countries. Responses came from Finland, Ireland, Northern Ireland, Scotland, Iceland, Norway and Sweden. Responses were not required for each question; the answerer could choose to answer as much or as little as they felt they had knowledge about the question. Follow up interviews were done in three countries; *Finland, Sweden and Ireland*. The graphs below represent the data gathered from the questionnaire. Additional information that was gathered from in-depth interviews expand the data with explanations and reasoning why certain questions were answered in a specific way.



Figure 1. Countries of operation. Answer amount: 45 persons.

The size of the participating organizations ranges between 10 - +10 000. There is a well-represented collection of answers. From the figure below, one can find that answers varied, with the majority of answers coming from organizations sized 201-500 persons. There were no answers from extremely small 0-10 persons or extremely large 501-1000 persons organizations.

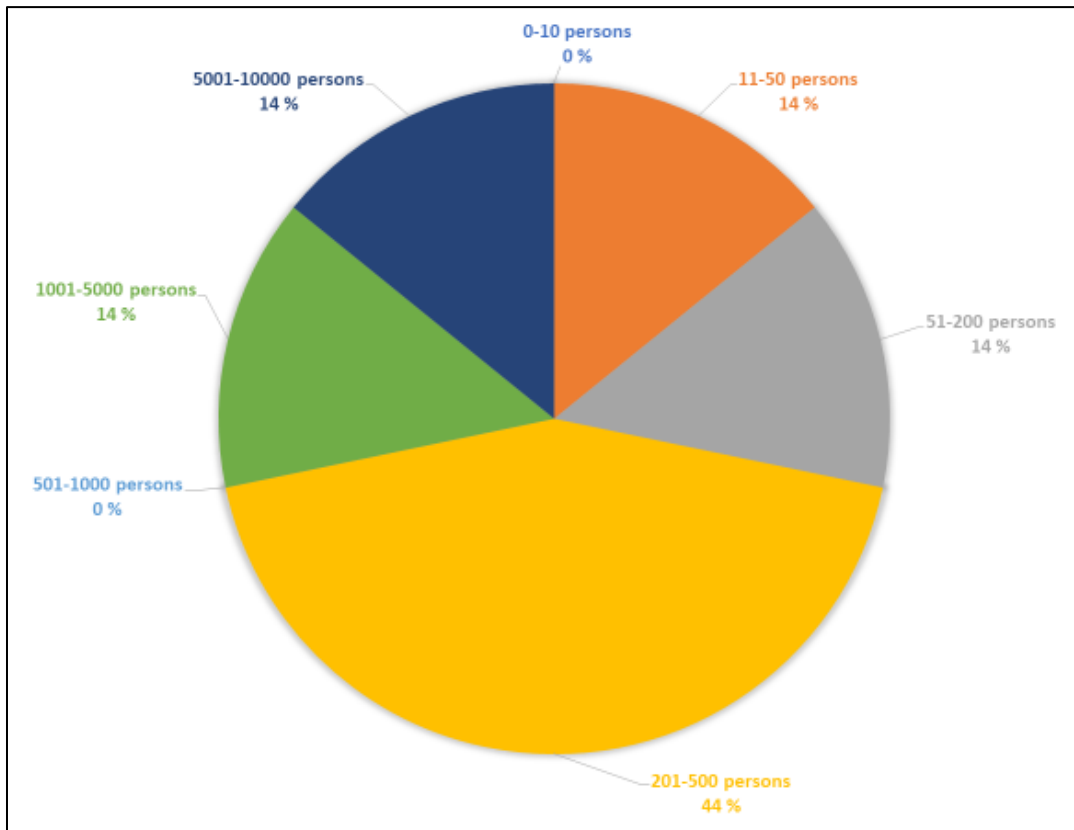


Figure 2. Size of organization. Answer amount: 44 persons.

The following question focused on the specific type of organization the person worked at. There was representation in all types of organizations, with the majority of answered were given by people working in the local authority sector.

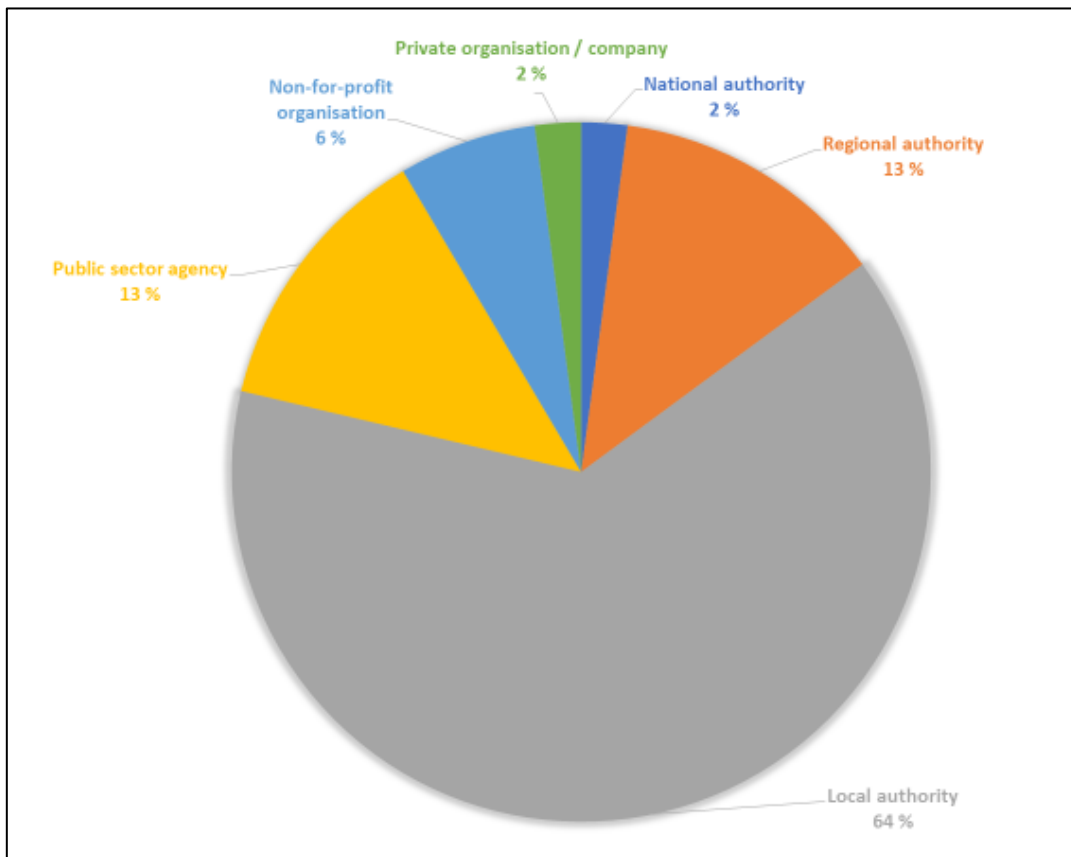


Figure 3. Type of organization. Answer amount: 45 persons.

For the purpose of this question, the differences between the different organization types are as such:

- A regional authority organization is described as an organization that has the power of a government agency or its administrators to administer and implement laws and government policies applicable to a specific geographical area.
- A non-for-profit organization is a legal entity organized and operated for a collective, public or social benefit, in contrast with an entity that operates as a business aiming to generate a profit for its owners.
- The national authority is an authority at the central level of government.
- A public sector agency is a public government or government department or agency or a recognized not-for-profit organization or entity, such as registered charities or registered faith-based organizations.

2.2. Disruptive Technologies

The DISTINCT Project focuses on the following technologies:

- Internet of Things (IoT): describes the network of small physical objects, that are packed with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet.
- Artificial Intelligence (AI): describes software, machines, computers or devices that can mimic functions of the human mind such as learning, perceiving their environment, solving a problem or successfully achieving goals.
- Virtual Reality (VR): use of special headsets/devices to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. The user is able to look and move around and interact with virtual objects.
- Augmented Reality (AR): interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities.
- Blockchain: Blockchain is a growing distributed list of data records, called blocks, linked using cryptography. It is resistant to modification and can record transactions between two parties efficiently and in a verifiable and permanent way.

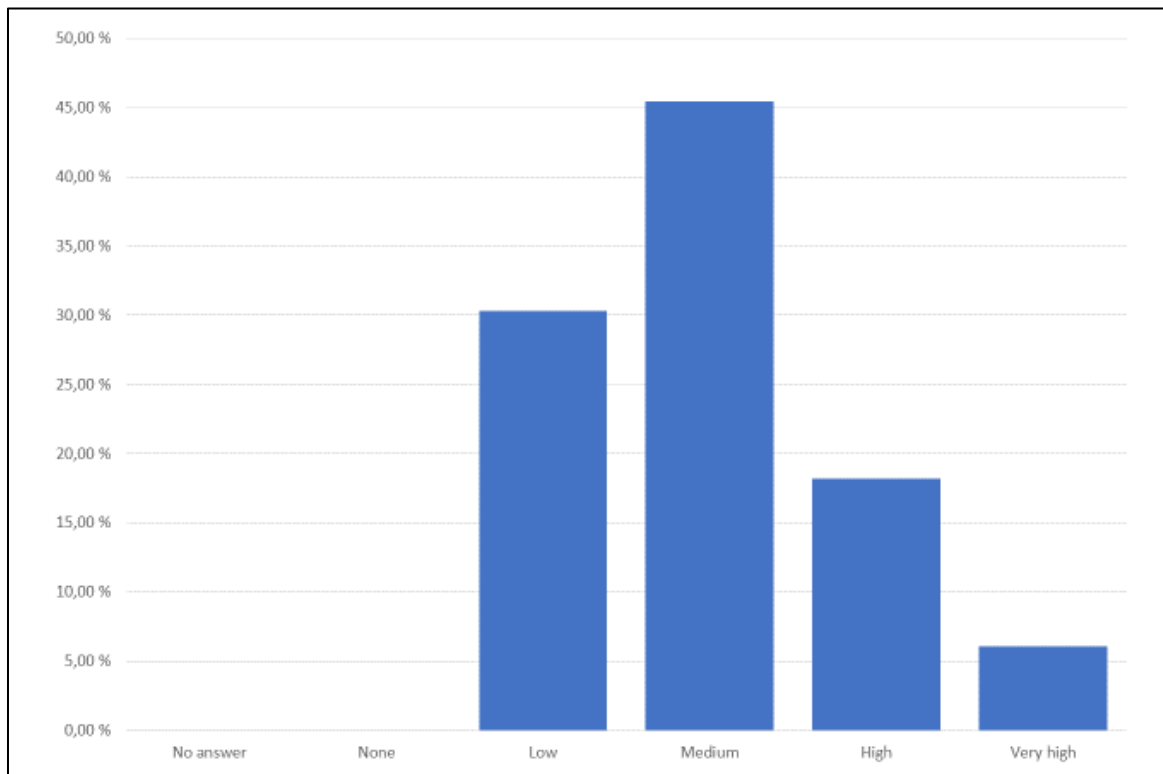


Figure 4. How do you rate the digital maturity in your organization? Answer amount: 33 responses.

The average digital maturity is high or medium, and there is a trend that bigger organizations mark themselves as medium and smaller as low. The regional organization that has answered that their digital maturity is high is connected to the university hospital and has a large R&D office working with disruptive technologies. On the other hand, it has been observed that, for example, in Finland that one's own know-how is easily underestimated.

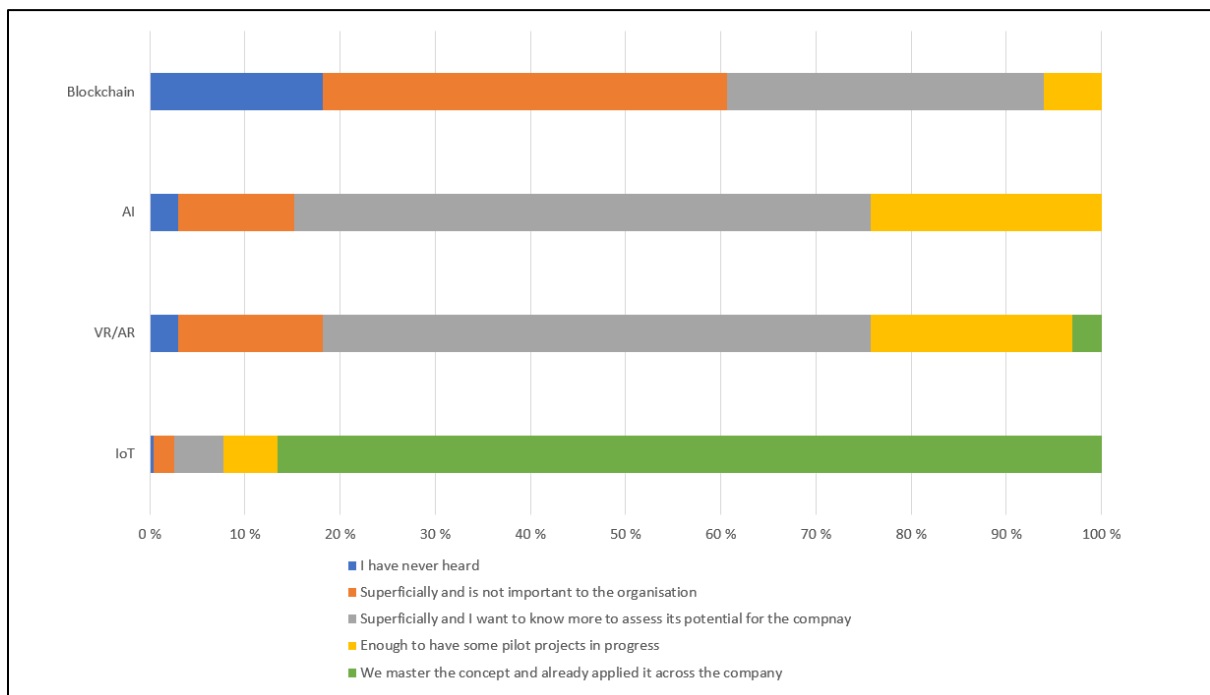


Figure 5. What is the experience of your organization towards disruptive technologies? Answer amount: 33 responses.

2.2.1. Experience: IoT +

There are differences between countries. In Finnish case the data suggests half of the organizations staff thought their organization was mature enough to use IoT. In Finland, sensor technology and the collection of sensor data has grown in recent years, especially in forestry and environmental technology. As well as in training. In Swedish case IoT is the most common technology for the respondents to have had pilots with and is a rather mature technology in Sweden. During the last 5-8 years there has been lots of experiments with sensor technology especially in property management, water and sewerage and energy. The connection to real estate makes it interesting for public sector since they are owners of large holdings of real estates.

In Sweden within the local governments the main disruptive technology that are in operational use is IoT, where the majority use different types of sensors. Also in Ireland

within the local public authority the main use of disruptive technologies has been done so far at experimental level and relate to the Internet of things technology. The main fields of application have been the use of sensors environmental management including air quality measuring, river levels monitoring and traffic management what includes road temperature, traffic control cameras and pedestrian counters.

2.2.2. Experience: AR/VR

It is common in Europe, that universities and polytechnics first had VR, then also AR, in use for a long time. VR has been part of the teaching for several years, but new pilots and Demos are not created in educational institutions either, but more in private companies.

On the social and healthcare side, Virtual reality is now used in therapy to treat various fears, or phobias. It can also be applied to, among other things, the control of the public, cramped and high-place scare (agoraphobia, claustrophobia, acrophobia), fear of flying, fear of spiders and fear of appearance. In this field, the use of VR is increasing, due to its affordability and indisputable results.

In administration level AR/VR is very little used.

2.2.3. Experience: A.I.

We believe that the awareness of this technology is much based on the enormous focus both in media and public policies on AI. Very much resources for projects and pilots are provided by national and European financiers. Most of the cases and pilots in this area are connected to RPA (Robotic Process Automation), such as different types of bots.

In hospitals, AI is widely used. Again, not in administration level.

2.2.4. Experience: Blockchain

Many respondents have limited awareness about Blockchain, but most would like to know more. We believe that the reason is that there have been very few attempts and pilots with this technology.

2.3. Application of Disruptive Technologies.

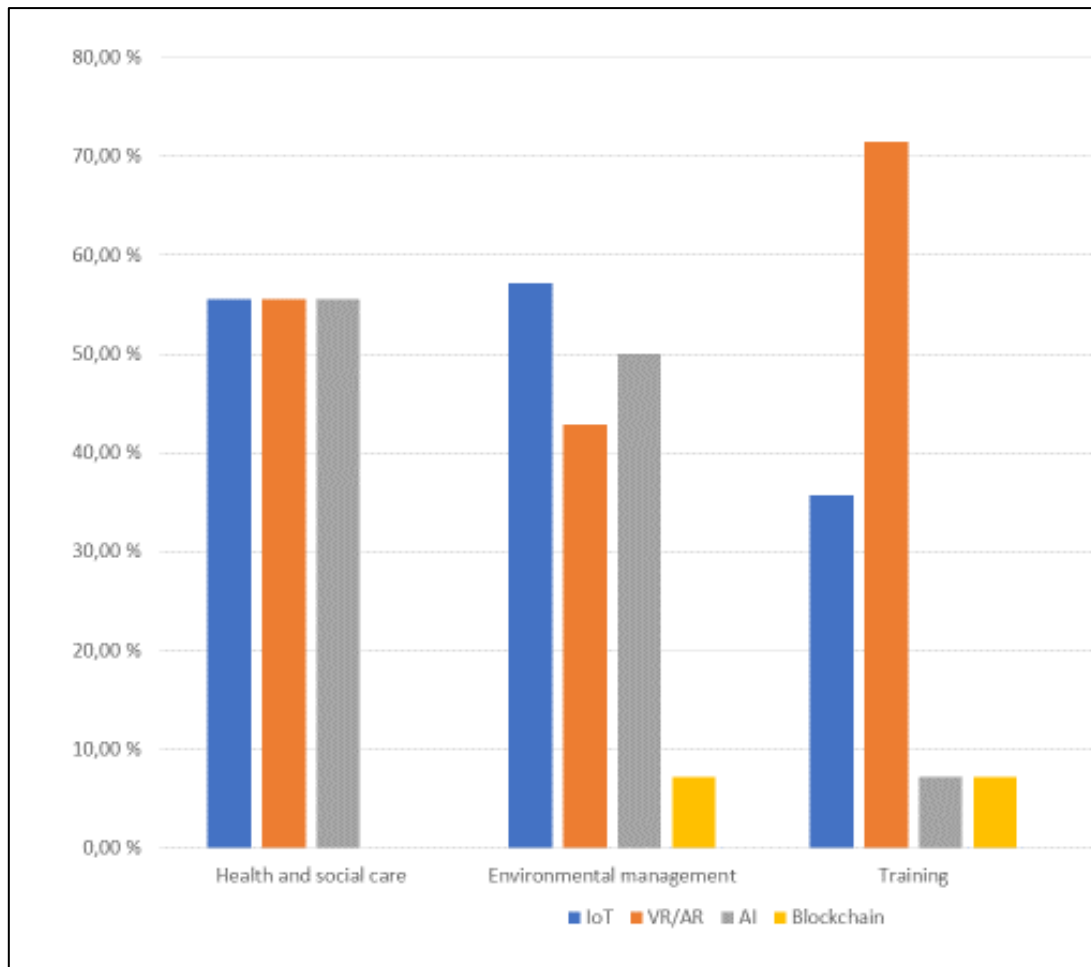


Figure 6. In which service areas are you applying these technologies? Answer amount: 20 responses.

As the graph indicated, the application of disruptive technologies is varied depending on the field. The application of Blockchain is clearly minimal, with the use of VR/AR quite common.

From the interviews, in Finland most of the use of IoT is connected to security alarms, monitoring, motion detectors when used in the Health and social care sector. In the Environmental Planning sector, IoT is often connected to real estate management and energy, which stands for about 80% of the usage. AI use is mainly connected in testing of AI-based city planning software. The use of IoT and VR in Education has increased, with the use of AI connected to bots.

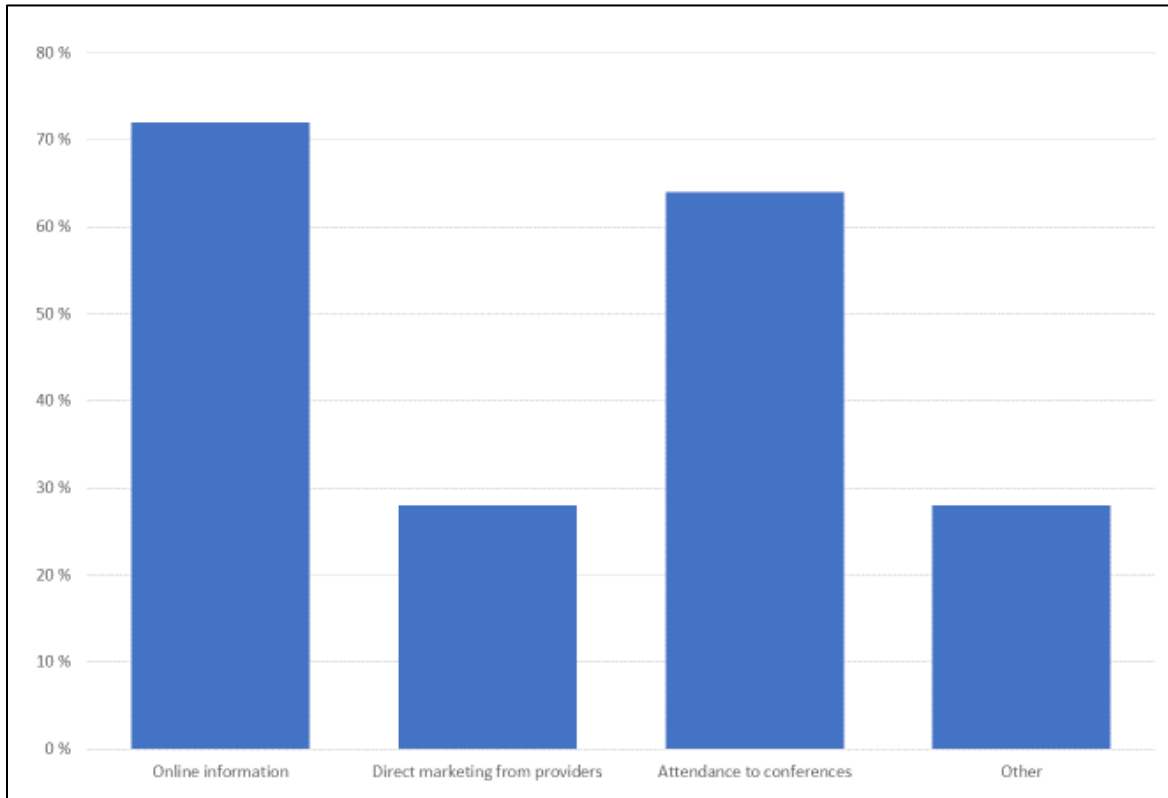


Figure 7. In case you are aware of disruptive technologies, how have you come in touch with these solutions? Answer amount: 25 responses.

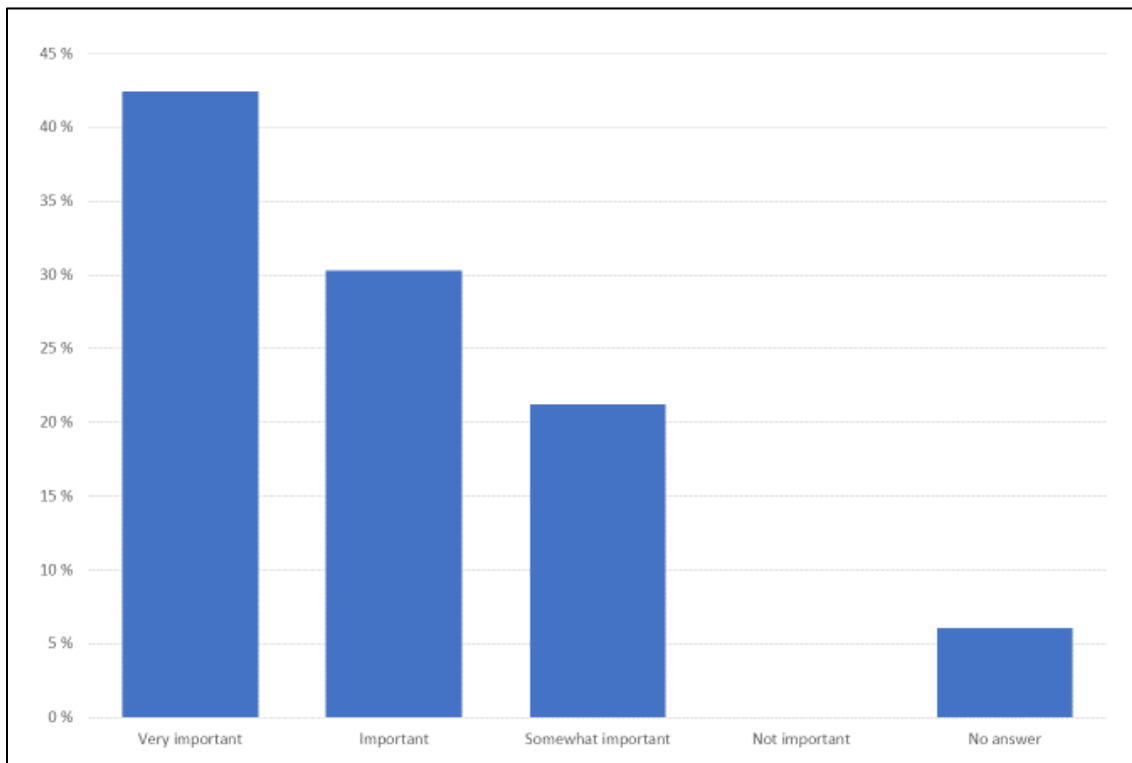


Figure 8. Do you think that disruptive technologies can play an important role in public sector organizations in sparsely populated areas? Answer amount: 33 responses.

The common answers regarding the question of how the respondents has gotten information about disruptive technologies is Internet and conferences. This follows very much similar surveys on how people get knowledge of something (similar answers can for instance be found in questionnaires within the area learning at work).

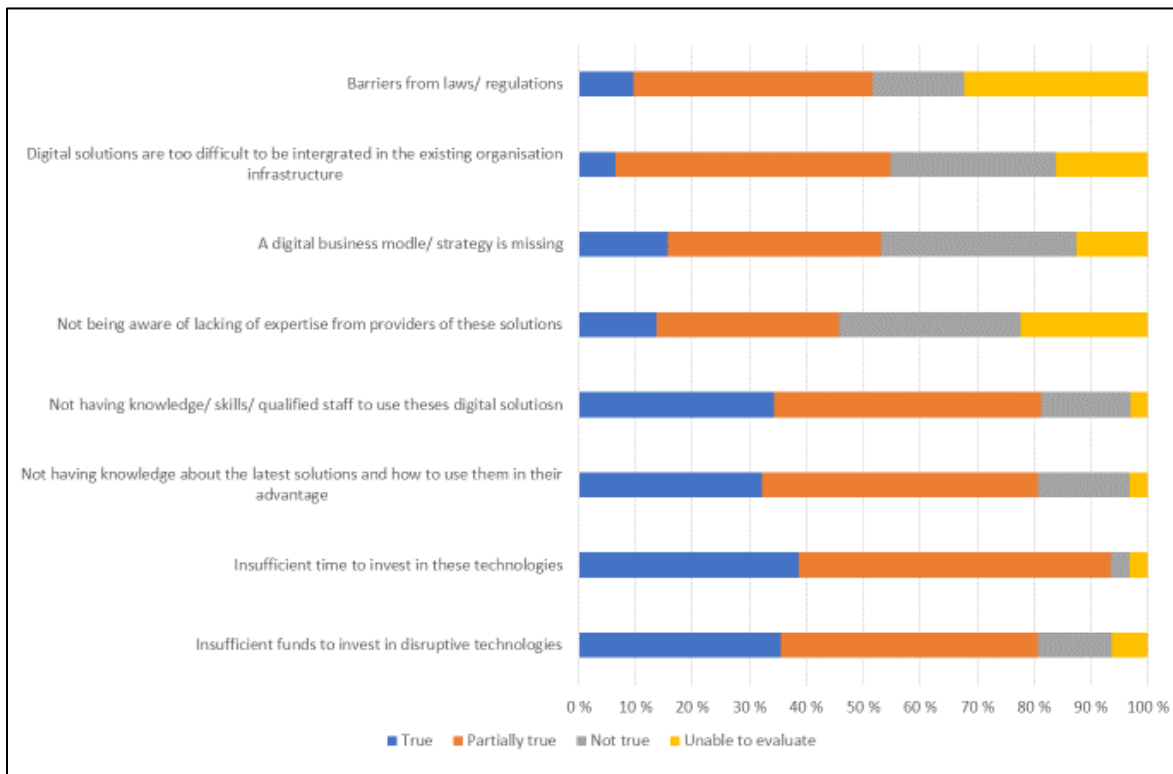


Figure 9. What challenges does your organization find in applying disruptive technologies in the service provision? Answer amount: 32 responses.

Insufficient funding, lack of time, insufficient knowledge and lacking qualified personnel are the main reasons for why the public sector bodies don't implement disruptive technologies.

From the interviews, in Finland, an interesting issue is that very few have acknowledged problems regarding legislation (for example GDPR), or legacy problems with old technological infrastructures, which in many cases can be a real barrier for implementing disruptive technologies. This can be explained by lack of knowledge of disruptive technologies.

3. Public Sector Foresight Analysis – findings from the interviews

3.1. Swedish interviews

The Swedish interviews were conducted with one state agency, one regional agency and four local governments from 4 NUTS-3 areas that ranges in size between 75 to 8 000 employees. The first issues discussed were related to types of disruptive technologies and their usage. Within the local governments the main disruptive technology that are in operational use is IoT, where the majority use different types of sensors. The primary users are the Technical Offices at the local Governments and examples of services where sensors are used are in, areas such as water, sewage, heating etc. One aspect that became clear during interviews is that the size of the local government determines the number of sensors in use – Large governments have a greater number of sensors and more resources to create or hire infrastructures for IoT. The largest municipality we interviewed have built a LoRA-network that covers geographically the whole municipality, which creates good conditions for different stakeholders to test and use sensors based on the LoRA-technology. Furthermore, in other departments at the local governments than the Technical Offices, for instance health care, education, and urban planning IoT is in some cases used in more experimental ways in different projects. Here, the experiments are in wide areas and includes sensors for measuring water temperatures at beaches, flooding, snow depth, monitoring of elderly persons in special care, measuring fall accidents, etc. Other kinds of disruptive technologies are very little operationalized in local governments. None of our respondents could account for examples of services that was based on AI, VR or blockchain. Most of those technologies were only on an experimental level, where chat bots or solutions based on robotic process automation were the most common examples. VR or AR was also something that was mentioned together with 3D-printers that was used at schools, but here the objective was to teach the pupils hands-on knowledge of the technology and not to make the municipal's administration more effective.

The state agency, which is a decentralized organization and deployed to NUTS 3 areas, consists of 21 units, that also are the 21 counties in Sweden, covering Sweden with a central cohesive unit responsible for, among other things information and communication technology. The organization has very little usage of disruptive technologies and the few attempts they conduct regard IoT, where they run experiments using sensors especially within nature conservation and wild animal care. They have also participated in research projects where they tested sensors on reindeers with the aim to create a warning system directed to car drivers on roads. Different types of RPA-solutions could also be of interest, but most of the barriers at local levels, lays within organizational constraints in the sense that every technology experiment or implementation of a digital service must be approved and conducted by the central ICT-unit.

The regional agency is working mainly within the healthcare sector which also includes the university hospital. The organization conducts both experiments and operational

use of solutions based on most of the disruptive technologies. In AI solely they have currently around 95 projects connected to areas such as medical life sciences, medical chemistry and biophysics, surgery, clinical science, nursing, biobank research, radiation science, public health, medical centers in sparsely populated areas, etc. Many of the projects with AI concerns the ability to analyze large amounts of data, analyze x-ray images, categorize different cancer forms such as prostate cancer, etc. They test and use extensive number of sensors using different networks from LoRa-networks to 5G. In VR/AR they have for a long time used the technology in surgery and in treatment of stroke patients.

3.1.1. Needs

The benefits of using disruptive technologies are more multifaceted among our respondents and all organizations interviewed put forward benefits such as increased value to citizens, quality increase and streamlining of administrative processes. The regional agency also stressed that they had increasingly been instructed that all projects should include analysis of return of investments.

The ownership and responsible for experimenting and implementing disruptive technologies are mainly directed towards local business managers and unit managers. Two of the local governments had digitization coordinators, but they had limited power to affect the rest of their organizations. Instead, they acted more as influencers and tried to inspire, illustrate best practices, and disseminate knowledge, especially towards management. Formalized digitization councils or teams existed only at two of the local governments. Both the regional agency and the state agency have digitization councils. At the local governments the role of this councils was as an interlocutor and a forum for discussion for those who are interested in digitalization. At the regional and state agency the role was expanded to also prioritize projects and allocate funds. The state agency has a central ICT-group responsible for all the 21 units and if one of the units wanted to test and use disruptive technologies, they had to convince the majority of the 21 units that it is an appropriate idea. The challenge is that even if they are organized in a similar way, every unit is very different when it comes to scope, volume, and types of services. For instance, issues connected to reindeer husbandry and Sami minority are only a concern for four of the state agency units and any services and experiments in these areas most probably will not be accepted by the majority within the agency. The regional agency has both a digitalization manager and a digitalization council that meets every month. The top-level management is also included in the group and makes decisions of investments, projects etc. based on the strategies of the organization.

Currently, the regional agency is developing a new digitalization strategy with updated indicators (KPI:s) that will cover the time period from now until 2025. The state agency has a digitalization strategy that has a central perspective, and the individual units do not have their own strategy. The local governments have surprisingly few updated digitalization strategies. Digitalization strategies have been common among local governments since the middle of the 1990s, but our interviews and other sources shows that local governments seem to either have very old strategies that are not

updated or none. This situation seems to exist” regardless of the size of the local government.

Different kinds of digital maturity models and the understanding of the objectives of such tools were known among all our respondents. Two of the local governments had tested a maturity model that have been constructed by The Swedish Association of Local Authorities and Regions. They mentioned that it had been only for experimental purposes and the model have not become implemented in their organizations. One of the local governments was also a partner in a large eGovernment project at Gothenburg University that aimed at developing and re-designing a digital maturity model for public authorities. This digital maturity model for public organizations is included in the draft version of the digitalization strategy at the regional agency, and the ambition is that it will be used in the organization. Our respondent at the state agency could not recognize that the unit had performed any measurement according to a digital maturity model and referred the issue to the central ICT-department.

3.1.2. Challenges

Our respondents put forward several challenges and causes to the current level of digital maturity and use of disruptive technologies. The most common cause is attributed to the organization and its silos, which creates several types of obstacles. Firstly, it creates decentralized decision making which means that lots of different initiatives can happen. But the consequence is that everyone “reinvents the wheel” and the obstacles create small local projects that have a low level of impact and/or seldom are disseminated throughout the organization. No one take the holistic perspective and owns the big picture of the digitalization process in the organization. Secondly, since the organizations perform their activities within silos the digitalization coordinator or digitalization unit works either as a support unit or on the same level as the other units. A consequence is that they do not have any power or funding for making digitalization happen within the whole organization. Thirdly, the silo-effect creates also different cultures that affect the knowledge level and the interest of digitalization. Units such as the Technical Office, the Urban Planning Office or Social/health care Office seem to be much more active than other units, which result in difficulties to create common visions, missions and objectives for the organization as a whole. Fourthly, the division of the organization in silos also splits the responsibility of digitalization. Example of this is that the CIO and the ICT-department usually focus only on infrastructure, i.e., hardware and software, and leave the rest of the digitalization process to heads of units and other managers.

This leads to the next issue which concern the top-level management and their interest of digital transformation. The only organization that has top-level management included in the digitalization process is the regional agency. The state agency only refers to the central ICT-unit, but it functions more as a traditional IT-unit with focus on infrastructure. The top-level management at the 21 units are not interested and not involved in any activities connected to digitalization. The local governments we have interviewed exhibits similarities with the state agency. The top-level management at local governments consist both of managers but also of politicians who set the vision

and the goals for digitalization. At the local governments it is only those who have reached a level of urgency, that have managers involved in discussions on digitalization with the aim to solve financial concerns or lack of staff.

The time aspects have also been a frequently mentioned through our interviews. The line work within the silos always goes first – Public servants must fulfil their obligation towards the citizens. The rationalization process during the last decade have resulted that fewer people have to do more and more work which means that there is no free time for projects, or involvement in digitalization. The savings requirement continues and activities such as digitalization or continuous improvement are becoming increasingly difficult to implement at the 'workshop floor' level.

Resources i.e., money restrictions are also obvious. Most the local governments have no specific budget for digitalization, it is referred instead to the managers within the silos to make sufficient dispositions for digitalization, but as we mentioned above, continuously budget cuts do not promote digitalization projects. The regional agency, however, has resources for digitalization projects and has introduced impact targets in their prioritization process where the project owner must provide data on return of Investment. The regional agency is the only respondent that have a systemic perspective and structured processes of dealing with IT-projects. Among the models they use are an Innovation Model describing a TLT-level of projects (conceptualization, proof of concept, validation phase, product implementation), scope of the project (technology development, clinical development, business plan, SDG 2030, IPR, financing, etc.). The state agency could not provide any answers about financial resources but thought that the central IT-unit had enough resources to conduct projects. This statement was based on earlier examples of IT-implementations that always been adequately funded. The main barrier for IT-projects was instead regulations and legislation, and that the central IT-unit first check the potential projects based on GDPR, cyber security and data security.

The last challenge concerns the competence level in relation to digitalization and especially disruptive technologies. The regional agency was the only respondent that have enough knowledge and skill within disruptive technologies to both experiment and perform work with advanced technologies on daily basis. The state agency made it clear that knowledge and skill was connected to personal interest. Since the unit did not have their own IT-projects there were no roles or departments responsible for having this kind of knowledge. The respondent could only recognize one person in the organization that had the knowledge and skills to be able to conduct IT-related projects. At the local governments the silo structure makes it possible for departments to develop skills and know-how locally, but this is not distributed to the whole organization. There are very little systematic or structured processes for educating the employees or the managers. Only one of the local governments referred to a common course about awareness of digital transformation towards unit managers.

3.1.3. Potential

All six Swedish respondents provide many examples of collaboration with external partners, but most of the collaboration among the local governments are concentrated to test/experiment or support. The collaboration processes are not

focused on a systematic knowledge building. The exception is the regional agency who has intimate cooperation with ICT companies and research institutions with the aim of increasing their knowledge level. However, this takes place in each domain, which become in each a silo and there is no platform to disseminate the knowledge to the rest of the organization.

The interviews show that the ability to collaborate is based geographically to where the government is situated. Local governments in sparsely populated areas collaborate less and have fewer options of collaborating with local SMEs or public authorities with skills in disruptive technologies. In our interviews those governments usually collaborate with traditional hardware/software businesses and central support organizations such as The Swedish Association of Local Authorities and Regions and their services. Larger local governments have more extensive collaboration with research organizations, both universities and research institutes. Surprisingly, there is very little collaboration among local governments. The only example that was mentioned during our interviews was a procurement project on a common case management system within social welfare.

3.2. Finnish interviews

3.2.1. Background

We manage to get interview from health care organization, one university of applied sciences and two (partly) regional councils. The problem with getting interviews has been municipal election held on Finland in mid-June. The main theme of the election was health and social care and regional reform.

At present, the responsibility for organising health and social services in Finland rests with 310 municipalities. The resources that municipalities have for organising these services vary considerably. The objective of providing people with equal access to services is not currently realised. Both differences between population groups and regional differences have increased, which is reflected as inequalities in health and wellbeing. So, In Finland the biggest issue at this moment is the health and social services and regional government reform. The health and social services reform will transfer the responsibility for organising services to 22 health and social services counties.

The organizational model of Siun sote is an experiment and an example of what the model of the entire Finnish regions would become. Therefore, Siun sote is also a good example in terms of disrupted technologies. The same applies regional councils, they will receive power from municipalities. For this reason, we interviewed Siun sote and regional council, not for example municipalities. Siun sote has a total of approximately 7,800 employees, it is organization for about 166,400 residents.

From our point of view the comparing the Siun sote/regional council to the Karelia was interesting. Karelia, as other universities of applied sciences, plays also a key role in the regional development and research, development and innovation (RDI) activities.

3.2.2. Needs

One of the key objectives of regional and social and health care reform is not only to improve care, but also to cut ever-increasing costs in every level. The population is aging, which knows the additional cost especially to the social and health care sector. All regional and national strategies mentioned that the promotion of digitalization is the one of the key ways to reach the goal. No specific disruptive technology is mentioned, but digitalization only in general.

Maturity of Siun sote is variable. Because Siun sote is a large organization, the ways of operating within it vary. The Finnish health care system has five bigger university hospitals, with whom others work closely. In Siun sote case the closest partner is Kuopio University Hospital (KYS). KYS takes care of all the most demanding operations, and operates as part of the University of Eastern Finland. We didn't manage to get interview how the relations between KYS and Siun sote in strategic level and in practice works. This is a clearly politically sensitive issue at the moment.

In regional council, level of digital maturity is quite slow. The same is not happening in North Karelia as in Lapland, where Regional Council of Lapland is implementing an artificial intelligence solution designed for municipalities. In North Karelia there is very little use of advanced technologies in decision-making and governance. Digital solutions are largely outsourced, so there are no actual individuals who own such technological solutions. Digitization is mainly the construction of broadband networks etc.

On the other hand, they are regularly involved in national or international projects (for example NPA), where new technologies are involved. However, participation is not systematic. But it is positive that they are, of course, somehow aware of new technologies, because they are also one of the funders of the Structural Funds.

In Karelia, as an organization which main function is to teach, not so much to research, it is quite clear that teachers play a key role when using or adapting disrupted technologies. Besides teachers, also RDI personnel. Karelia's RDI activity aims at the development and creation of new and already existing services, products, methods, facilities, processes and solving practical problems. Teachers acquire knowledge and skills about disruptive technologies in many ways, according to their own interests and needs. They have also some resources to do that.

Karelia has a strategy, which mentions digitization and the exploitation of its new components. No specific technologies are mentioned, but within the strategy is indeed the exploitation of new technologies. In Karelia, strategies are created through co-development with whole personnel. So teachers and RDI people have the opportunity to influence it. They are also actively using this opportunity.

3.2.3. Challenges

Regional council: Regional council is an organization that outsources its own IT services. Each participation in projects is defined separately. Participation in webinars is determined by each employee's own interests. They can use the working hours, if it is justified.

Siun sote: It is clear that if new technology is introduced, training will be provided and employees will be required to take part in it. Can employees decide which training to attend, that's the other think. it depends very much on resources and areas. If there is a shortage of nursing staff in any field, it is clear that nursing work will play a major role.

Siun sote organizes its own trainings, but at the moment there is nothing related to digital. In contrast, almost all regional universities (including Karelia) offer separate training related to digitalization for nursing staff. Siun soten personnel may participate in them under certain conditions.

Karelia: In teaching, teachers can participate in seminars and trainings. The main way to get new knowledge are RDI activities, participation in which is mentioned in the Karelia strategy. In addition, the Karelian leadership recommends, or demands this from teachers. Personnel of administration can also participate in seminars and webinars, it is largely based on one's own interests, but they have fewer resources than teaching or RDI staff.

In Karelia curricula are updated from time to time, bringing teachers and RDI perspectives to the future. Similarly, the ongoing intensification of co-operation between teaching and RDI actors will facilitate the integration of new technologies. When preparing new projects, their suitability for the strategy is checked. In new projects digitalisation must always be taken into account.

3.2.4. Potential

Regional councils: As already mentioned above, projects play a big role in providing resources to participate in various events. In addition, regional councils collaborate with various provincial organizations, such as educational institutions. Companies are also important partners. As the member of North Karelia regional council said, "with regional reform, we know that new technologies will play a greater role". The example Regional council of Lapland of this is good".

Siun sote has recently hired several people whose task is to test and bring new technologies to the organization. They expect big from this. At the same time, they intend to intensify cooperation with projects, universities and companies.

Karelia: If teachers are asked, they will never have enough time or resources to attend seminars or events. The same applies to RDI activities. But, still most teachers see RDI activities as a key way to acquire new knowledge. RDI activities also create contacts with external partners and companies, which is important in acquiring new knowledge about disrupted technologies.

3.2.5. Conclusion:

The common feature was that digitalization was taken into account at the strategic level, but disrupted technologies were not specifically mentioned anywhere.

Another common feature was that the acquisition of new skills and knowledge emphasizes individuals' own interest and desire to learn new things.

3.3. Irish local authority interview

In Ireland a local public authority with over 1000 employees was interviewed.

3.3.1. Use

The main use of disruptive technologies has been done so far at experimental level and relate to the Internet of things technology. The main fields of application have been the use of sensors environmental management including air quality measuring, river levels monitoring and traffic management what includes road temperature, traffic control cameras and pedestrian counters.

An important aspect highlighted is that this IoT devices are an adequate solution for rural areas since they are a more affordable solution in terms of costs for installation and maintenance. This is one of the main points that shows real advantage for this technology when supporting services in these areas.

They also bring real advantage from the health and safety point of view by reducing the need of human resources to go for inspections under difficult conditions.

Some virtual reality solutions are being used in tourism and heritage sites and could become part of the tourist offer. They have the potential of making attractions more accessible to tourist as well as to enrich the experience.

3.3.2. Needs

There isn't a specific strategy nor dedicated resources to seek for the introduction of disruptive technologies in the public services solution.

Sometimes the only way of introducing them is by responding to funding calls financing this type of initiatives. Internal buy-in happens when the solution presented brings along the funding to be implemented.

3.3.3. Challenges

An important challenge is how to pick the right disruptive technology to solve a real need or problem.

Also, the change management required to adopt these technologies and integrate them in the processes of the organization is seen as an obstacle.

Time is also a challenge. There is a dependency on having local champions willing to dedicate their time to be up to date about this very dynamic environment and push for these technologies and this requires time.

Money is not seen as big challenge in the implementation phase but it might be in the long-term to sustain the service. The initiative must demonstrate the added value to be acknowledged and supported in the time.

An effective way to overcome these challenges could be to implement quick win initiatives by testing solutions that solve real problems. Not testing just for the sake of testing. They can be applied at small scale but can become a powerful demonstrator of the possibilities offered and engage with the required target groups.

3.3.4. Potential

Local authorities have to open more themselves to external parties to get better insights about how the services work and are provided. This would help them to get valuable inputs to see how services could be improved by the technology.

4. Appendix 1: Interview question outline

Use

- To which extent do your organization use disruptive technologies (DP), if any? Is your use of DP more of an experimental kind, or do you use them on a regular basis in your daily operations?
- Which kind of disruptive technologies do you use? For each DP used, in which areas (contexts) do you use them? For the areas in which DP is used, in which of these are your use experimental and in which are your use of a more regular kind?
- If you use DP, is your focus on hands-on knowledge of the technology or is it more on using applications developed by other organizations?

Needs

- What are the estimated benefits for using disruptive technologies (save money, efficiency or productivity, creating value for citizens, receive quality, increase attraction and recruitment etc.)? Do you see other solutions (e.g. technological or organizational) that can provide better impact for the organization?
- Who determines the need and tasks of DP, does this belong to a person's specific job responsibilities? Have work resources been defined for some people to learn about and adopt new (disruptive) technologies?
- How will the opinions / wishes / new skills of individual employees be heard at the level of the entire organization?
- What is the organization's process for defining its needs and actions for new (disruptive) technologies?
- If no process/strategy, is there other capacities in your organization that discover needs and take actions related to legacy systems (general IT strategy) or business development (or continuous improvement/LEAN) that result in discovered needs for new technology?
- Management strategy
 - Does the organization have a strategy for new (disruptive) technologies (either specific or as part of a bigger digital transformation strategy)?
 - If no, why have not the organization recognized the importance of a digitalization strategy? Do you have other types of strategies (Business strategy, regional development strategy, etc.)? Have new technologies been considered, at least in some way, as part of the organization's strategy(ies)?
 - How do the organization relate to different kinds of digital maturity models and other similar measurements - Is there any strategies or action plans to improve the maturity level?

- If no, why don't you implement such strategies - Doesn't care about these things or lack of resources (time, money, people) to conduct such measurements?

Challenges

- How is awareness, insights, foresights, demonstration events, etc. about new technologies disseminated within the organization?
 - Time and money: Are time and money a challenge for your organization to implement or adopt Disruptive Technologies? If so, could it be a reason the lack of awareness about the potential they might have for a more effective way to manage/provide services saving time and costs.
 - Skills: Are skills and issue that is preventing your organization to make a more intensive use of Disruptive Technologies?
- Is training provided about new (disruptive) technologies and their potential?
 - If so, what kind? Who can take part in them, and in which forms are training provided (presentations, workshops, courses, etc.)?
- Does the organization's management participate in training about new (disruptive) technologies / does the management understand the possibilities of new (disruptive) technologies?
- Organization's context: Is the current context of your organization in terms of existing structures, procedures, legislation or integration with existing infrastructure an issue to implement solutions based on Disruptive Technologies?
- What do you think it would be the most effective way for you and your organization to overcome the current challenges that you are facing when considering the use of disruptive technologies in the provision of services (more information about their possibilities, possibility to test them or access to running initiatives, more dedicated resources time/money, etc.)?

Potential

- Do external partners have any impact on the organization's ability to adopt new technologies? If so:
 - Who is the collaboration with?
 - Does it provide new information and skills?
 - How systematic is the work with external partners on new technologies?
- If no, why don't you collaborate with external partners? Are there any other ways for the organization to enhance your ability to adopt new technologies?
- Would your organization be willing to explore more the potential of DP by working with other partners that would support you in the implementation of these solutions?