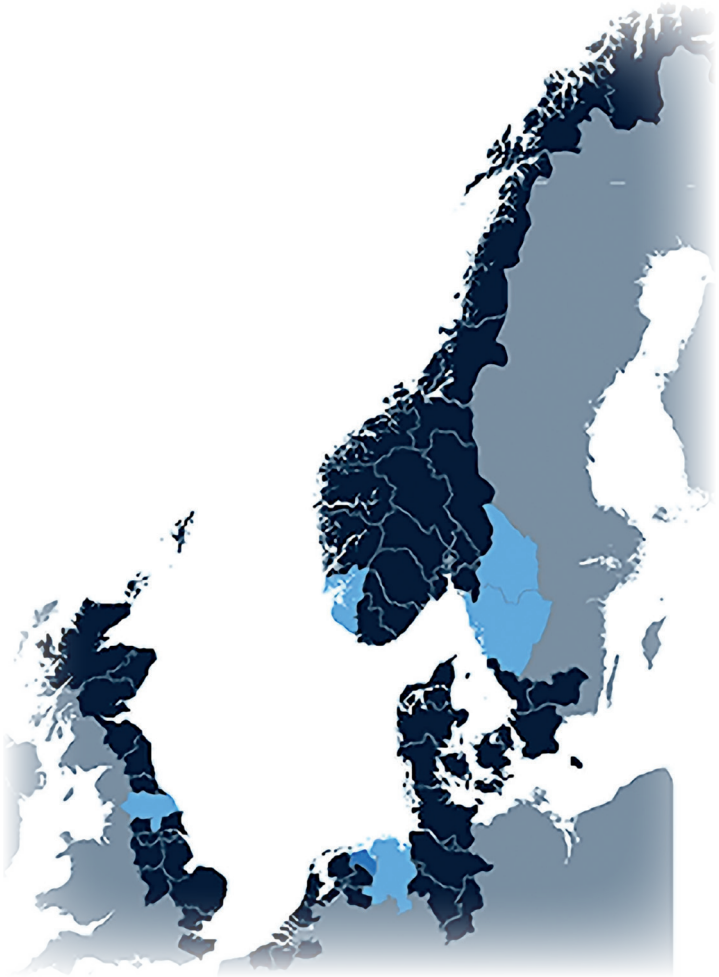
ITRACT
Improving Transport and Accessibility through new Communication Technologies

ITRACT – Policy Briefing

Further Strategies for Smart Specialisation of the North Sea Region



Work Package 10

EUROPEAN UNION
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Investing in the future by working together for a sustainable and competitive region

The Interreg IVB North Sea Region Programme
Investing in the future by working together for a sustainable and competitive region

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MANAGEMENT BRIEFING

This report uses experience gained during the EU Interreg IVB project ITRACT and shares transnational learning on how to deploy IT-based solutions as part of Smart Specialisation Strategies, for example, while creating answers to societal challenges. ITRACT concentrates on rural areas, where the availability of an adequate digital infrastructure is often lacking and where people may lack the digital skills and literacy to adopt the smart solutions (known as Intelligent Transport Services; ITS) offered. The project addresses transport services as an enabler for smart specialisation.

Smart Specialisation is the EU policy to enable regions to participate in the economy and to foster local opportunities and find their niche or speciality within that European context, along with developing their own skills and economic prosperity.[1] New IT services are used to contribute to a regional strategy for addressing societal challenges such as health, demographic change, and wellbeing; secure, clean, and efficient energy; and smart, green, and integrated transport.

ITRACT began defining, developing, and testing innovative, user-centred smart transport services and underlying IT services (websites and mobile apps) in an transnational context: 5 areas in the North Sea Region. There were some prerequisites for the development and use of rural transport services: digital connectivity, data maturity, education in use of new services, getting used to transport and IT, and car dependency. ITRACT experience has shown that the rural dimension is especially characterised by the unavailability of an adequate digital infrastructure in most of these rural areas, resulting in the digital exclusion of a significant portion of the rural population.[2]

ITRACT introduced additional measures with the aim of adopting ITS: multidisciplinary research into embedding ITS, experimental Service innovation workshops (SIW), and Business innovation workshops (BIW)[3] in transport; and the social implications of liveability and connectivity in rural areas. Empowerment of users, target groups, and organisations plays an indispensible role for vulnerable groups (like the elderly). The use of personas and service concepts is generically applicable, along with service concepts that are potentially transferable across different (EU) regions.

[1] A reference to the European Commission's Transport and Mobility action plan.
[2] K. Salemink & D. Strijker, Policy Briefing: Sustaining accessibility and connectivity in remote rural areas: transnational issues from ITRACT, University of Groningen, 2015.
[3] With the use of the Quadruple Helix model citizen, business, governmental, and knowledge institutions are involved. This model was also used in EU Interreg IVB project DANS ON, DANS On Model, 2013.

Pilots of newly developed IT apps have demonstrated that public transport companies can successfully use IT applications to offer more and better information and services, and therefore attract more travellers. In the course of development and deployment, ITRACT brought together regional partners (commercial, public, knowledge, and eventually consumers) willing to experiment with new transport and connectivity ideas in 5 distinct EU regions.

Innovation seems to strongly support social integration and connectivity (e.g. inclusion). Smarter ITS have proven to have a positive impact on liveability and economic prosperity by making rural regions more accessible, especially in those rural areas where they can create a better match between a relatively small number of travellers and a limited offering of transport options. Insights gained from ITRACT are to a great extent independent of the transportation domain and are expandable to other domains (e.g. health, energy, and new societal challenges).

This report indicates those policies that address these challenges by identifying actors/stakeholders and the feasibility of a specific rural policy (also applicable to peri-urban areas). Local governments and communities need to play a leading role in rural areas so as to develop more transport concepts and services (telecommunication networks and services), in accordance with the newly reformed European Cohesion Policies.

Last but not least, this research has resulted in important lessons learned, along with recommendations regarding governmental policies concerning transport, social wellbeing, and economic activities in rural areas in the European Union.

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1 INTRODUCTION

The aim of the ITRACT[4] project was to improve mobility and accessibility in remote rural regions by developing IT-based solutions (Intelligent Transport Services; ITS[5]).

Low population density in rural areas leads to a low public transport service offering, and vice versa, creating a double vicious circle.[6] These vicious circles are depicted in Figure 1.

Firstly, low population density means low (public) transport demand, which in turn leads to a limited public transport service offering. But a limited public transport service offering will drive people to look for alternative, including private, forms of transport, lowering public transport demand even more. As a consequence, over the years, bus lines have gone from hourly, to two-hourly, to four-hourly, to rush-hour schedules only in rural areas. Secondly, when public transport service offerings become very sparse or even non-existent in a given region, in combination with other facilities and services, it affects liveability and economic activity, and influences the number of people and businesses willing to live or operate in that

[4] Improving Transport and Accessibility through new Communication Technologies.
[5] ITRACT-extended Application Form 9th Call for ITRACT, 2013. 'Results: Sustainable business models on ITS, strategies for smart specialization in the NSR'. 'Intelligent Transport Systems (ITS) … further developed and tested during the ITRACT project, create clear benefits in terms of transport efficiency, sustainability, safety and security, whilst contributing to the EU internal market and competitiveness objectives' (4.1/4.2).
[6] E.J. Malecki, Digital development in rural areas: potentials and pitfalls, Journal of Rural Studies, 2003, vol. 19, p.201. Malecki frames this as 'the rural penalty', meaning that people in rural areas 'pay a price' for living remote.

region, thus leading to an even lower public transport demand. In rural areas this is even more the case.[7]

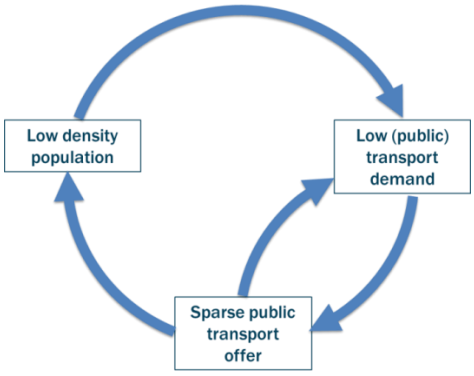


Figure 1. Double vicious circle of public transport in rural areas

The idea behind the ITRACT project is that the use of IT can be used to create ITS that offer adequate but cost-effective service levels in rural areas, despite a low demand for public transport. An important aim was to assess in which way IT-based innovations could contribute to improved mobility and accessibility for rural areas. In this way ITS in rural areas can fill this demand gap for transport, and low population density would then no longer lead to inadequate transport offerings and consequently to a negative effect on the attractiveness of the region for working and living, thus breaking the vicious circles. In other words, active individuals, transport organisations, and entrepreneurs would search for creative new transport offerings and obtain incentives to do so.[8]

The project is implicitly based on the following three assumptions:

1. Smarter use of information leads to smarter transport services in rural areas
2. Smarter transport services offer adequate service levels in rural areas
3. Smarter transport services have a positive impact on the liveability and economy of rural areas.

The project activities were aimed at testing the first two assumptions. The third assumption is supported by the scientific literature,[9] developed within this project, which shows a positive impact for good transport solutions on the economy and

[7] E.J. Malecki, p.201, or K. Salemink & D. Strijker, Policy Briefing, p.5.
[8] Cf. D. Van Amelsfort, A. Hjalmarsson, & M. Karlsson, ITS world conference White Paper: Changing travel behaviour by Viktoria Swedish ICT AB, September 2014.
[9] K. Salemink & D. Strijker, Regional Development and Connectivity a digital perspective, October 2014, p. 9. Refers to: L. Townsend et al., Enhanced broadband access as a solution to the social and economic problems of the rural digital divide, in Local Economy, vol. 28, no. 6, 2013.

liveability of a region, and a negative impact in the case of the absence of good transport solutions. Improvements in digital connectivity can promote this by empowering people and businesses, thereby stimulating economic development and social inclusion.[10] The scope and scale of the project in itself was insufficient to contribute significant added support for this assumption.

1.1 Does smarter use of information lead to smarter transport services in rural areas?

Many new service concepts were developed during extensive Service Innovation Workshops (with users and professionals) and tested within the ITRACT project. More than 40 new transport service ideas were developed.[11] These new service ideas exploited the underlying information and communication technology in a number of ways.

- **Personalised services**
  - Supply and demand: matching transport services with real-time demand.
  - Individualised: adaptive, supportive information services that are tailor-made for specific target groups, such as commuters, the elderly, or tourists.
  - Memory: providing updated travel plans based on stored traveller's plans and real-time progress and delays. Memory of the traveller's plan (e.g. what may be saved on mobile devices for how long[12]).

- **Real-time**
  - Providing travel advice incorporating real-time information on delays, traffic jams, blockages, etc.
  - Support for dynamic information in a route planner system.

- **Cross-domain**
  - Multimodal planning: Public, private (car, ride-sharing, public transport, etc.): optimizing travel plans, including both public and private modes of transport. ITRACT made a start by making newly retrieved information available to public and private transport information systems and trip planners, on internet or mobile phones. The ITRACT platform incorporates existing IT systems and services

[10] K. Salemink & D. Strijker, Policy briefing, p.10.
[11] Cf. Appendix B.
[12] Cf. Best Practice Guide of WP5 & WP3: on policies on privacy.

such as trip planners and public transport open data (GTFS or General Transit Feed Specification), dial-a-bus, taxis, and ridesharing applications. GTFS defines a common format for public transportation schedules and associated geographic information: for instance, see the pilots Shuttle Drive and Ride-sharing in the Dales.

- People and goods (e.g. healthy ageing and pharmacy): optimizing goods distribution infrastructure that combines travelling distances for both people and goods.
- Administrative domains: Trains, busses, P+R, parking, regions and countries, etc.; optimizing travel plans across transport modes governed by different authorities.
- Cross border: within and between regions and countries (shared public transport information in Sweden, Germany, and the Netherlands).

Since the ITRACT project started, other new IT-based transport services have been developed outside ITRACT (e.g. initiatives like Uber[13] and Google Transit[14] in urban areas) that build on the same premise. These new service concepts illustrate the power of information technology to provide smarter transport services. The conclusion is that the first assumption is well supported by a growing body of experience both within and outside the ITRACT project.

1.2 Do smarter transport services offer better service levels in rural areas?

However, the second assumption proved to be less straightforward. The ITRACT project also showed that smarter technology alone was not enough and that additional measures were needed to create an environment in which innovative transport services actually can take root and lead to adequate service levels, especially in rural areas. Thus, the second assumption proved to be much harder to substantiate. Part of the additional requirements for creating a significant impact for smarter services is technological. It entails the availability of a digital infrastructure, which especially in rural areas cannot be relied upon, and the availability of open data sources, which proved to be quite different from region to region. Therefore, without improved physical or digital connectivity this extra information is incapable of adding value.

But other requirements are mostly non-technological and have to do with the ability and willingness of both users and involved organisations to adopt new technological solutions successfully.

[13] *https://www.uber.com/*
[14] http://www.gotransit.com/public/en/schedules/google.aspx

1.3 Smart Specialisation of Regions

The lessons learned within the ITRACT project have wider implications for smart specialisation strategies for regions in Europe.

Smart Specialisation of Regions is defined by the EU as follows:[15]

> *Smart specialisation is a new innovation policy concept designed to promote the efficient and effective use of public investment in research. Its goal is to boost regional innovation in order to achieve economic growth and prosperity, by enabling regions to focus on their strengths. Smart specialisation understands that spreading investment too thinly across several frontier technology fields risks limiting the impact in any one area.*
>
> *A smart specialisation strategy needs to be built on a sound analysis of regional assets and technology. It should also include an analysis of potential partners in other regions and avoid unnecessary duplication. Smart specialisation needs to be based on a strong partnership between businesses, public entities and knowledge institutions – such partnerships are recognised as essential for success.*

The lessons learned within ITRACT are relevant for Smart Specialisation of Regions in at least two distinct ways:

1. IT is an important ingredient of many smart specialisation strategies as an important enabler of information services. ITRACT points towards additional factors that determine success or failure of the application of IT as part of these smart specialisation strategies.
2. Rural regions are disadvantaged compared to urban and peri-urban areas in their capacity to support economic growth and prosperity. The disadvantage is only partially due to a less developed (digital) infrastructure. Other success factors, such as the empowerment of a regional authority, may prove to be extra challenging as well. The example of ITRACT, addressing the transport and accessibility of rural areas, offers insights into how to support economic growth and prosperity in rural areas in the context of these challenges.

[15] http://ec.europa.eu/research/regions/index_en.cfm?pg=smart_specialisation.
Referring to the European Commission's Transport and Mobility action plan, the project ITRACT promote the transnational deployment of ITS, also as continuous cross-border services for travel information and traffic management, which cannot be achieved by one member state alone. Cf. ITRACT application, 4.1.

In Section 2, this report addresses the lessons learned from ITRACT for smart regional specialisation strategies and includes recommendations on how to address the observed obstacles in order to exploit the potential of innovative technological solutions.

Section 3 contains lessons learned about setting up a complex innovation process, as the task of improving transport and accessibility of rural areas turned out to be.

The activities and results of the project as a whole are highlighted in Section 4.

Section 5 ends this report with a vision of future Intelligent Transport Systems (ITS) and conclusions.

2 LESSONS LEARNED FOR SMART SPECIALISATION STRATEGIES IN RURAL AREAS

The ITRACT project showed that smarter use of information could lead to smarter transport services to improve transport and accessibility. But it also showed that IT-based solutions as part of smart specialisation strategies in rural areas need to overcome a number of technical and non-technical obstacles. Firstly, these obstacles will be described. And, secondly, suggestions for overcoming these obstacles will be offered.

2.1 Technical obstacles

Digital infrastructures

During the first year of the project, a crucial internal contradiction in terms of the objectives of the project came to light. On the one hand, rural areas are characterised by sparse physical infrastructures and service offerings. Information and communication technology (IT) was seen as a tool to create new solutions overcoming the traditional problems of distance and sparse services. On the other, rural areas are often lacking an adequate digital infrastructure for those new IT solutions. Thus the solutions envisioned to address transport and accessibility problems appeared to be hindered by the lack of an adequate digital infrastructure in the rural areas where they would be most beneficial.

Data maturity

The IT-based solutions need access to data. In the case of smart transport services, the relevant data sources include information on actual traffic densities and throughput on public transport schedules and delays, routes, and travel plans of individual travellers. The project found that there were differences in availability and formats for such data sources in the five participating regions. The project used the notion of data maturity to indicate the level of availability of relevant data sources for creating smart transport services. Relevant data needs to be made available as open data sources to enable the application of useful IT-based solutions.

2.2 Non-technical obstacles

The non-technical obstacles have to do with the *willingness* and *ability* of both *individuals* and relevant *organisations* to play their role in the innovations, as is illustrated in Figure 2.[16]

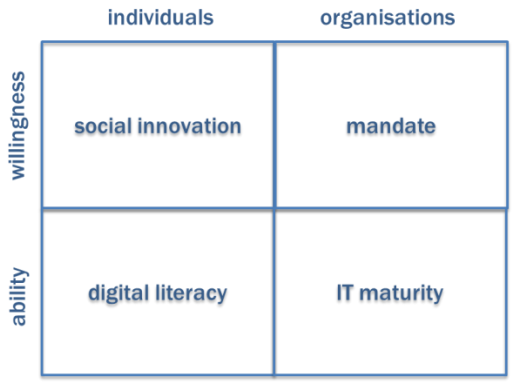


Figure 2. Non-technical requirements of IT-based innovations

Digital literacy

Many new services imply a new way of doing things to a varying degree, and users may need to change their behaviour accordingly. In the example of the Ridesharing app,[17] where someone with a car may give someone else a ride, this change in behaviour could mean making it a habit to see if anyone else needs a ride instead of just getting in the car and going. In general, people are resistant to change, and technological innovations should be accompanied by user empowerment (to overcome lack of skills and digital literacy) in order to stimulate behaviour change and technology adoption. Especially in rural areas, there is a significant portion of the population that may lack the ability to adopt new IT-based services, as was pointed out by Salemink and Strijker in another report from ITRACT.[18] The digital literacy may be insufficient in those who would most benefit from smart transport services, such as the elderly.

Mandate

Regional transport solutions can be offered by both public (bus, train) and private (taxi, minibuses, car owners) operators. Typically, a regional transport authority is tasked with the development of transport in the region, which in practice may often coincide with a goal to maximise the use of public transport. This mandate then conflicts with smart transport services that include private modes of transport.

[16] H. Velthuijsen elaborates this topic further in a forthcoming article in 2015.
[17] Cf. BPG WP4 Information architecture and exchange mechanisms.
[18] Cf. K. Salemink & D. Strijker, Policy Briefing.

Transport authorities and transport operators may not be inclined to collaborate to create smarter forms of shared or multimodal transport.

IT maturity

Within the ITRACT project, there were organisations responsible for the development and/or operation of transport who lacked the vision and ability to commission IT-based innovations. Organisations need a certain minimal level of IT maturity in order to be able to sit in the driver's seat of IT-based innovation.

Suggestions for overcoming the obstacles

Some ideas have been proposed to address the challenges listed in this section. These ideas are represented here to help the regions develop more comprehensive IT-based solutions as part of their smart specialisation strategies.

Digital infrastructures:

- Government sponsoring. In some countries, for example Norway and Sweden, governments have chosen to intervene in normal market dynamics to ensure the roll-out of digital infrastructures in sparsely populated, that is, economically less viable areas.
- Demand bundling. Decision models for the roll-out of digital infrastructures is based on expected earnings, given as the product of the number of users times the average revenue per user (ARPU). Given the fact that rural areas have fewer potential users, the first assumption is that expected earnings will be lower than in more densely populated areas. However, rural areas are also areas where IT-based solutions would be an interesting alternative – if they existed – to regular non-virtual solutions (e.g. video consultation versus regular doctor visits, healthy ageing, or high degree of IT in the agricultural sector). This means that the ARPU – and therefore the expected earnings – could become higher if several such IT-based solutions became available and widely used, thus changing the business case for the roll-out of digital infrastructures.
- New technology. New mobile communication technology has become available supporting more bandwidth and better coverage (e.g. 4G and 5G). This technology lowers to some extent the threshold for an economically viable roll-out, notwithstanding the necessity of fixed broadband.

Open, standardized transport data:

- Open data legislation. Governments should push to make more data accessible and standardized so as to stimulate the development of IT-based

solutions by private and public organizations. This would benefit not only rural areas but also more densely populated areas.

- Data Maturity Model (DaMM). Simplifying the service description of specific services regarding required and available data sources, and utilization to implement digital services across regions. Because ITRACT analysis makes use of the same DaMM and similar specification, service transferability is possible.[19]

Social innovation:

- Living lab. In Gothenburg this enabled further investigation of the behaviour of target groups, incentives, and behavioural responses (in cooperation with European SUNSET project, funded by the European Union Seventh Framework Programme (FP7/2007-2013)).[20]
- Creating incentives. This encourages people/organizations to change their transport behaviour and adopt new service concepts (e.g. incentives during Service Improvement Workshops, User Empowerment Workshops): governments, community, and individuals.
- User Empowerment Workshops. This provides effective training in the use of newly developed ITS have been useful for creating user concern and apply to personal habits and skills.[21]

Digital literacy:

- Design and communication tailored for target groups. Technology adoption is a highly personal process. For the 'late majority' and 'laggards',[22] adopting new technology occurs when they see a personal benefit. 'One size fits all' approaches are less successful for these groups. It helps to create tailor-made solutions for specific target groups and their needs, and to communicate these solutions in their terms and design them on their terms.
- Fit daily practices and routines. The better new solutions fit with existing daily practices and routines, the lower the threshold is for the late majority and laggards to include new solutions in their daily life.

[19] BPG WP3 Development of services and self-optimizing networks, 2015.
[20] D. van Amelsfort, et.al. Changing travel behavior through incentives using a Smartphone application with automatic travel behavior detection, presented on 21st ITS World congress, Detroit, Sept. 8th – 11th 2014, p.6-12.
[21] Cf. BPG WP5, Pilot projects on transport and accessibility. Or: BPG 5.2 User empowerments, p.10, 22.
[22] People late in adopting new technology as termed according to the Technology Adoption Life cycle. Rogers, 2003.

Mandate:

- Public-Private cooperation. The responsibility for the development of transportation in a region is usually delegated to a dedicated transport authority. The scope of these authorities should include both public and private transportation in order to optimize transport solutions that change the mandate to 'a smaller scope but larger domain'.[23] Furthermore, in domains other than transportation, a combination of privately and publicly offered solutions might create adequate offerings in areas where governments struggle to offer the same service levels as in urban areas.
- Broaden objectives. In the case of transportation authorities, traditionally the mandate is to optimize the use of public transport and to discourage the use of private cars. When public transport can provide only part of the solution, this mandate should be reformulated. Smart solutions, in general, equire a smart mandate.[24]

IT maturity:

- Invest in regional IT capabilities. The relevant stakeholders should be able to form a vision as to how IT would be able to enable a smart specialisation strategy and be able to act as principal in the development of IT-based solutions.
- Create trans-regional IT capabilities. Rural regional authorities may not be able to sustain their own high-level IT capabilities. A shared service centre approach would be able to support such regions, for example by back-office integration.

[23] K. Salemink & D. Strijker, Policy Briefing, p.15.
[24] Cf. M. Ward, P. Somerville & G. Bosworth, 'The transportation needs of older people in rural Lincolnshire', http://lec.sagepub.com/content/early/2013/07/15/0269094213495232.

3 COMPLEX INNOVATION PROCESSES

The overall ITRACT project structure was set up following a straightforward design-build-test approach. The project Development of services and self-optimising networks organised an intensive interaction with stakeholders per region[25] by means of Service Innovation Workshops to create new, smart (i.e. IT-based) transport service ideas. These ideas were then built into Pilot Projects on transport and accessibility, as new service applications and a substantial part of the developed applications (or apps) were tested by pilots running in the various regions.

While the service ideas were conceived, built, and tested, Project Information architecture and exchange mechanisms developed the IT infrastructure to support the various services and pilots in three distinct iterations. The reason for creating three successive iterations had to do with the need to have a working prototype early on in the project and to develop more comprehensive versions that would support the more technically demanding services conceived and that would be in the work packages added to the ITRACT project at a later stage (Projects Development and implementation of Improved smart algorithms, Dynamic scheduling and incentivizing strategies for sustainable transport, and Pilot projects on transport and accessibility). The early prototype was intended to make clear what was technically feasible, both for the partners creating new service ideas and for the partners developing an innovative IT platform.

During the ITRACT project, there were two major flaws in the way the project was set up that became clear only later when the true complexity of the innovations that the project set about to achieve became apparent. The first flaw was that, during the project, working incentives were lacking to bring together non-technical partners and technical partners so that they actually worked together (instead of remaining independent). The second flaw was that the process of this type of innovation is a *complex problem*, which is typically not suited to a straightforward design-build-test approach.

[25] Conform Quadruple Helix model, The DANS Model, 2013.

3.1 Bridging the gap between non-technical and technical partners

Non-technical partners find it difficult to form new and creative ideas for technical solutions because they do not know what is technically feasible. Technical people find it difficult to develop suitable new solutions in the absence of a clear brief on what is required and often miss the mark. Therein lies – in a nutshell – the cause of the gap between non-technical and technical partners.

Co-creation is often seen as best practice to bridge the gap.[26] Co-creation is an interactive process in which iteratively non-technical partners shape their ideas about technical demand, and technical partners produce solutions that are developed in this sense. By its very nature, such a process is not only interactive and iterative but also explorative: no one knows exactly beforehand the outcome of this process.

Most of the technical work in the project was performed in Information Architecture and Exchange Mechanisms and Interprojects with the other partners' work packages, and restricted to the Transnational Meetings twice a year and at bi-weekly Skype-meetings. This, together with the single iteration of the design-build-test set-up of Development of Services and Self-optimising Networks / Pilot Projects on transport and accessibility, was not enough to ensure an effective co-creation process.

3.2 Complex problems

Snowden and Boone distinguish, in a Harvard Business Review article,[27] between *simple, complicated, complex*, and *chaotic* problems. The distinction between complicated and complex problems lies in the fact that complicated problems can be decomposed into a set of simple problems, whereas complex problems cannot. Complex problems deal with situations where there is interdependency between elements of the solution, nonlinear interactions (i.e. minor changes in the solution may have a large impact on the outcome) and a strong dependence on context (such as history, geography, and networks). Precisely because complex problems cannot be deconstructed into simple problems, they defy a straightforward approach. Snowden and Boone propose that the way to tackle such problems is to *probe, sense, and respond*. Instead of creating and following a clear and finite project plan, the recommendation is just to start doing something (probe), observe closely the

[26] Cf. for example Forbes, Why Co-Creation Is the Future for All of Us, 2-04/2014, ref. http://www.forbes.com/sites/ashoka/2014/02/04/why-co-creation-is-the-future-for-all-of-us/

[27] D.J. Snowden & M.E. Boone, A leader's framework for decision-making, Harvard Business Review, November 2007.

effects (sense), and readjust when the effects are not as desired or expected (respond).

The assumptions within the project about the interplay between technology and users, and organisations and members of those organisations in the transport and accessibility domain, turned out to be oversimplified. Furthermore, the rural context was insufficiently catered for from the outset. By the time a better understanding of this complexity and the rural context emerged,[28] there was no room available for an adequate readjustment within the project's scope and budget.

3.3 Lessons learned

The ITRACT project uses IT to address one of the EU societal challenges,29 that is, 'smart, green integrated transport'. Other societal challenges, such as 'health, demographic change, and wellbeing', 'secure, clean, and efficient energy', and 'Europe in a changing world – inclusive, innovative, and reflective societies', will similarly require IT-based solutions.

Based on the ITRACT experiences, there are two major lessons to be learned on how to set up similar IT-based innovation processes aimed at addressing societal challenges.

The first one is to design projects in such a way that they enable co-creation and that they follow an interactive, iterative, and explorative solution development process. The explorative nature of such a project is at odds with the essence of a project that has a clear objective to be achieved with a fixed set of resources and budget in a fixed amount of time. This will only work when the projects are allowed to be part of a larger process or programme for achieving the desired end results.

The second lesson is that special attention needs to be paid to intermediate evaluation and readjustment in order to allow for the complex nature of many of these innovation processes.

[28] Cf. K. Salemink & D. Strijker, Policy briefing..
[29] See http://ec.europa.eu/programmes/horizon2020/en/h2020-section/societal-challenges

4 PROJECT ACTIVITIES AND RESULTS

This chapter summarizes the ITRACT project activities and results in order to illustrate how IT was used to create innovative transport concepts for rural areas as an example of implementing smart specialisation strategies.

4.1 Contributions to innovation in smart mobility by the ITRACT project?

The activities and results of ITRACT produced the following innovative contributions to smart mobility as a means to improve transport and accessibility in rural areas:

Ideas for mobile applications were identified in Service Innovation Workshops in the different regions. The Service Innovation Workshops were used as input for an analysis of regional target users and their needs – described in the form of user personas – and regionally available resources such as existing transport options and data sources. During the workshops, user representatives and professionals from transport organisations and local government were brought together to come up with novel transport solutions that matched the needs of the target users and that would be technically feasible within the regional context. Subsequently, the ideas were developed into service concepts that were evaluated in terms of benefits for the user, their technical feasibility, the estimated costs for users during operation, and the time needed for development. The Service Innovation Workshops used techniques borrowed from Design Thinking.30 One of the challenges was to let target users come up with novel and relevant ideas even though they lacked insight into what was technically feasible. The approach followed in the Service Innovation Workshops tackled this challenge.

An inclusive **IT platform** was developed that integrated information and data from different sources including both public and private transport. The platform is able to combine information from multiple transport authorities and organisations to create seamless multi-modal transport services. Furthermore, the platform supports the use of dynamic information generated by users, sensors, etc., to create smarter transport services and update travel plans based on current information. This information contains, for example, delays, temporary detours, congestion, and current travelling

30 See, e.g. 'This is service design thinking', M. Stickdorn and J. Schneider, John Wiley & Sons, Inc., 2011.

needs. The IT platform is based on novel technology such as virtualisation, cloud computing, event processing, sensors, GPS data, and web and mobile apps.

The ITRACT project developed and piloted several new smart mobility service concepts. These services were developed for different target groups, such as transport users (e.g. the elderly, students, and tourists) and employees of transport organisations (e.g. conductors and traffic managers). Over 40 new applications were developed for the 5 participating regions. These services included the following functionalities (for a full list of new service functionalities see the Appendix):

- Multimodal transport: allowing travel plans to include private (walking, cycling, driving) and public (bus, train, taxi) transport, and to optimise travel plans using multiple modes of transport.
- Realtime bus, train, and stop information: allowing travellers to know the exact arrival and departure times. This information can then be used, for example, to improve connections and to better timing of when to leave home to catch a bus or train.
- Geographical tracking: allowing users to see on a map the actual whereabouts and movement of vehicles and, for example, to see where the closest or quickest transport options are.
- Realtime congestion information: allowing users to be informed and advised of delays to be expected during the trip both before and during their trip and of the best way to circumvent congestion, for example, by choosing another mode of transport.
- Personalisation: allowing users to specify their preferences for planning and updating travel plans, including the level of detail and explanation users like to receive.
- Ridesharing: allowing users to hitch a ride with someone else, including functionality for paying and for rating both the drivers and passengers for added safety, quality, and comfort.
- Digital payment options: allowing users to pay for transport via alternative means.
- Interactive communication: allowing users to interact directly with travel organisations about advice concerning complaints.

Some of the target user groups turned out not to be automatic users of new IT-based transport services. A **transport service usability checklist** was developed to make sure that the services developed were actually adequate and easy-to-use for the

intended users. The checklist offers guidelines to ensure that the handling of the services fits the expectations of the users. The checklist is based on the criteria of ISO 9241 on human-computer interaction in terms of various usability criteria and is adapted for use in public transport applications.

Furthermore, the concept of **User Empowerment Workshops** was developed as a tool to make sure that the target users were informed about the availability and use of new services and – if necessary – trained to use them. Some of the target groups were slow to adopt new services or were not yet familiar with the use of IT-based services or of smart phones or tablets, and needed the User Empowerment Workshops to begin using the newly developed services.

In a later extension to the ITRACT project, the IT platform was used and expanded to support optimising the transportation of goods. The idea was to look for combinations of the transportation of both people and goods to see whether that would lead to profitable business cases that were more attractive through the combination of people and goods than when the transportation of people and goods was considered separately. This led to the development of optimising algorithms for **Dynamic Scheduling and Incentivising Strategies.** These algorithms were applied to and tested in a pilot involving a sustainable and cost-efficient medicine delivery strategy for the healthcare industry. This study explored the possible placement of medicine lockers to deliver medicines to patients in a sustainable and cost-effective way (new business model on medicine delivery). In this approach, goods (medicine) are distributed part of the way to patients by placing them in strategically located lockers, and people (patients) are responsible for the rest, by collecting their goods from the lockers. The IT platform was extended with mathematical optimization software that could determine an optimal location based on patients' zip codes and selected incentive mechanisms, and perform sensitivity analysis to examine the robustness of the solution under different scenarios.[31] The approach was tested by placing a locker in the village of Beilen in the northern Netherlands and by investigating how patients evaluated this innovation.

4.2 Potential pitfalls

During the project, several pitfalls became apparent, which needed to be addressed in a project like this, that is, a project aimed at developing IT-based solutions for societal challenges as part of a smart specialisation strategy. These were the following:

[31] Cf. BPG WP9 Pilot projects on transport and accessibility, 2014.

- Stakeholder alignment: a project like this consists of many different partners, or stakeholders (local and regional governments, transport authorities and companies, user groups, knowledge institutions, etc.). Each of these may have different objectives and expectations vis-à-vis the results and outcomes of the project. As the project progresses and things change over time, different stakeholders may start to deviate from each other in how they would like to see the project adjust to these changes. It is very important that the stakeholders maintain a dialogue about the way the project is adapted.

- Integrating technical and non-technical partners: this project consisted of technical and non-technical partners. Typically, non-technical people have a hard time understanding what is going on in technical work, and technical people have a hard time listening to the needs of non-technical people. Good collaboration between the two depends on close cooperation and intensive interaction. But in an international project, with a project meeting only once every six months, meetings may be too infrequent for the required intensive face-to-face interaction. Therefore, special attention should be given to organising in-between interactions, for example via Skype, or with a regional cross-section of the project.

- Specific target user groups require specific solutions, not necessarily IT-based solutions. Too often one-size-fits-all solutions are created for specific target groups, thus missing the point. It cannot be stated too often that the specificities of a target group should remain in focus when developing solutions, including asking oneself the question whether an IT-based solution offers the right tool for that situation.

- Students are attractive (inexpensive, well trained) resources for building prototypes and for testing a new concept. However, they are not suitable for building commercial-grade IT-based services that need to be operational 24x7. The project must understand when a transition is necessary from prototyping (with students) to piloting and beyond (with commercial IT builders).

- Digital connectivity is still not abundantly available everywhere. This may limit, or inhibit altogether, the type of IT-based solutions that may be used.

5 CONCLUDING REMARKS

ITRACT's policy goal is to stimulate social wellbeing and economic activity within rural areas. If public transport service offerings become very sparse or even non-existent in a given region, liveability and economic activity will be affected and thereby influence people/businesses willing to live or operate in that region. So by improving the accessibility of the rural areas, smart specialisation is easier to introduce. Because this not only applies to rural residents but everyone who travels through and to the rural areas (with new stakeholders like commuters, business people, maintenance engineers), this leads to greater interest in improving digital infrastructure and services.

Conclusions/recommendations:

- Development and implementation of smarter ITS have a positive impact on the liveability and economy of rural areas. They are desirable, specifically in rural areas, in order to create a better match between a relatively small number of travellers and a limited range of transport options. The use of personas and concepts of services is generically applicable, and concepts of services are potentially transferable across different (EU) regions.

- Pilots of newly developed IT apps demonstrated that public transport companies can successfully use IT applications to offer more and better information and services, and therefore attract more travellers. User empowerment plays an indispensible role for vulnerable groups (like the elderly).

- Digital innovation to promote mobility and accessibility in rural areas is limited by poor data infrastructure (supply) and poor digital engagement (demand) in rural areas. Offering devices and applications is not enough to assist people in becoming digitally included. For digital non-users to make the step towards digital engagement, the IT device or application has to connect to everyday life and routines.
  As well as digital literacy, there is also a remarkable reluctance to use public transport (or services like ride-sharing): people have to be stimulated to cross the threshold to make use of new possibilities. Elderly people, for example, often have problems with travelling with public transport: car dependency, lack of familiarity with public transport, and difficulty reading timetables or

understanding announcements at railway stations. User empowerment plays an indispensable role in this (cf. the Step-by-Step app).

- Local governments and communities need to take a leading role in rural areas to develop more transport concepts and services (telecommunication networks and services). The ITRACT policy report shows that rural-based approaches with integrated projects and alliances with a smaller scope, that is, not just remote rural areas but also encompassing a larger domain, in other words, mandates from different sectors, could offer better solutions.[32] This outcome dovetails with the crucial role of Community-led Local Development in the newly reformed European Cohesion Policies.

- Innovation seems to strongly support social integration and connectivity (e.g. inclusion). A specific target group approach is very rewarding.

- Rural transport research is also applicable to suburban areas, but in rural areas the need is most acute (from a sociopolitical point of view).

[32] K. Salemink & D. Strijker, Policy Briefing.

6 APPENDIXES

6.1 Appendix A Project setting

Work packages of ITRACT and Work package leaders

- WP1 Project Management, Hanze University of Applied Sciences, Groningen
- WP2 Publicity and Communications, University of Stavanger and Värmland County Administrative Board, Karlstad
- WP3 Development of services and self-optimising networks, Viktoria Swedish ICT AB, Goteborg
- WP4 Information architecture and exchange mechanisms, Hanze University of Applied Sciences, Groningen
- WP5 Pilot projects on transport and accessibility, Jade University of Applied Sciences, Wilhelmshaven
- WP6 Evaluation and strategy development, University of Groningen
- WP7 Development and implementation of improved smart algorithms, University of Karlstad
- WP8 Dynamic scheduling and incentivizing strategies for sustainable transport, University of Groningen
- WP9 Pilot projects on transport and accessibility, Alliance Healthcare, Meppel
- WP10 Strategies for smart specialisation, Hanze University of Applied Sciences, Groningen.

Delivered Best Practice Guides and Good Practice Guide

- WP1/2 Good Practice Guide, Hanze University of Applied Sciences, Groningen / Värmland County Administrative Board, Karlstad
- WP3 Transnational business models for ICT based transport services, Viktoria Swedish ICT AB Institute Goteborg
- WP4/7 Information architecture and exchange mechanisms for efficient transport concepts, Hanze University of Applied Sciences, Groningen / Karlstad University
- WP5 User empowerment workshops for ICT applications, Hochschule Jade, Wilhelmshaven
- WP6 Policy briefing and Regional Development and Connectivity: a Digital Perspective, University of Groningen
- WP8 Dynamic scheduling and incentivizing strategies for sustainable transport, University of Groningen

- WP10 Further Strategies for Smart Specialisation of the North Sea Region, Hanze University of Applied Sciences, Groningen

ITRACT partners/sub-partners:

- Hanze University of Applied Sciences, Groningen, the Netherlands (Lead Beneficiary)
- Alliance Healthcare, Meppel, the Netherlands
- Gemeente Oldambt, Winschoten, the Netherlands
- Jade University of Applied Sciences, Wilhelmshaven, Germany
- Metro, West Yorkshire Passenger Transport Executive, Leeds, England
- OV Bureau Groningen, Drenthe, Assen, the Netherlands
- Rogaland County Council, Stavanger, Norway
- Shuttle Drive, Zuidbroek, the Netherlands
- University of Groningen, Faculty of Economics and Business, the Netherlands
- University of Groningen, Faculty of Spatial Sciences, the Netherlands
- University of Karlstad, Sweden
- University of Stavanger, Norway
- Värmland County Administrative Board, Karlstad, Sweden
- Värmlandstrafik AB, Munkfors, Sweden
- VEJ – Verkehrsregion Nahverkehr Ems Jade, Jever, Germany
- Viktoria Swedish ICT AB, Goteborg, Sweden

6.2 Appendix B Overview of developed Apps

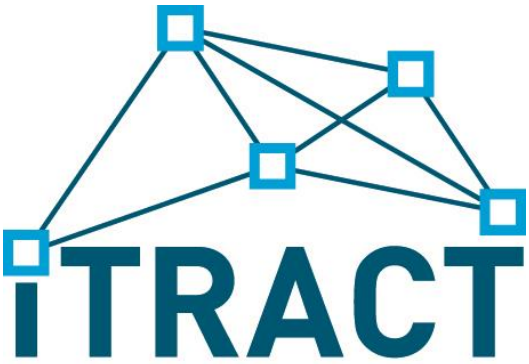
For more detailed information about the content of each application and pilot, please see appendix 5.2 in the Best Practice Guide: ‘User empowerment workshops for ICT applications’.

Summary / More detailed service information (developed under the supervision of ITRACT):

- Bus shelter-initiated augmented reality supported trip: An app that facilitates desires (in real-time) that fulfils the needs of the traveller. The app is not yet ready; the programming of the app is now in the hands of a commercial third party
- Active Bus Stops
- Active Bus Stop info

- Bus schedules
- Bus stop info
- Business travel app / Company Invoice (integrated in VTAB's MobiTime travel planner and website): a service for searching, paying, and obtaining a ticket for business trips with public transport; companies can offer employees the possibility to pay for and receive a ticket for their work-related trips in Värmland. At the end of the month an invoice is sent to their employer together with an overview of their employee's trips
- Check monthly season tickets for pupils
- Dynamic passenger information for low-cost smartphones; display versions 1 and 2
- Get Connected: an app that better informs (potential) passengers about travel opportunities to and from the basic junctions in the region, was developed by students and completed by a commercial party
- Hardware GPS low cost
- On-Demand traffic management
- Online bus route stops and lines
- Online route network: presenting real-time information on bus lines and departures times for the user's current position on a digital map (Open street map)
- Order-on-demand travel
- Order-on-demand bus / Order-on-demand responsive trip / Order-on-demand traffic (integrated in VTAB's existing MobiTime travel planner and their own website): a service that enables customers to order timetables based on on-demand traffic by mobile app or on the web. They also receive confirmation from VTAB that confirms that the trip is booked (sms and/or mail)
- OV Lift: this service helps travellers find a public transportation hub.
- Payment app
- Park & Ride! An app that stimulates the use of P+R places by providing accurate and clear information. The app is not ready yet and is still being programmed by students at the UAG
- Price-Flex
- Quality rating system
- Real-time data, low cost GPS
- Real-time feedback
- Real-time information: consists of real-time screens at bus stops for customers, which show all buses in real time.
- Real-time info in busses
- Real-time travel app

- Ridesharing building block on ITRACT server
- Shuttle-drive app suite that advises and combines information on ride-sharing (car trips) and public transport (busses) information
- Scan and Go: provides information on tourist destinations in the East Groningen region and how they can be reached by bus
- Scheduling app: a service which tells users how to reach a bus stop on foot, when the next bus is expected (according to the timetable), when you can transfer from bus to train to Oslo, when you can transfer to a local Oslo bus, where to stop, and how to reach your destination on foot
- Smart Live Travel map: visualizes public transport vehicles (of various types and from different providers) in real-time on the same map
- Step-by-Step: mobile app with a step-by-step explanation of how public transport works (under construction)
- Tariff calculator
- Tell us! App that makes the traveller's 'voice' heard by sharing information about his trip and his experiences while using public transport in East Groningen
- Trip Planner: a service that shows bus stops with arrival and departure times, and allows trips to be planned. As a special cross-border service, a manual GTFS feed of information from Public Express in Groningen in the ITRACT back-end server was created. This enables the user to plan a transnational trip using both the back-end server and the Trip Planner app



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