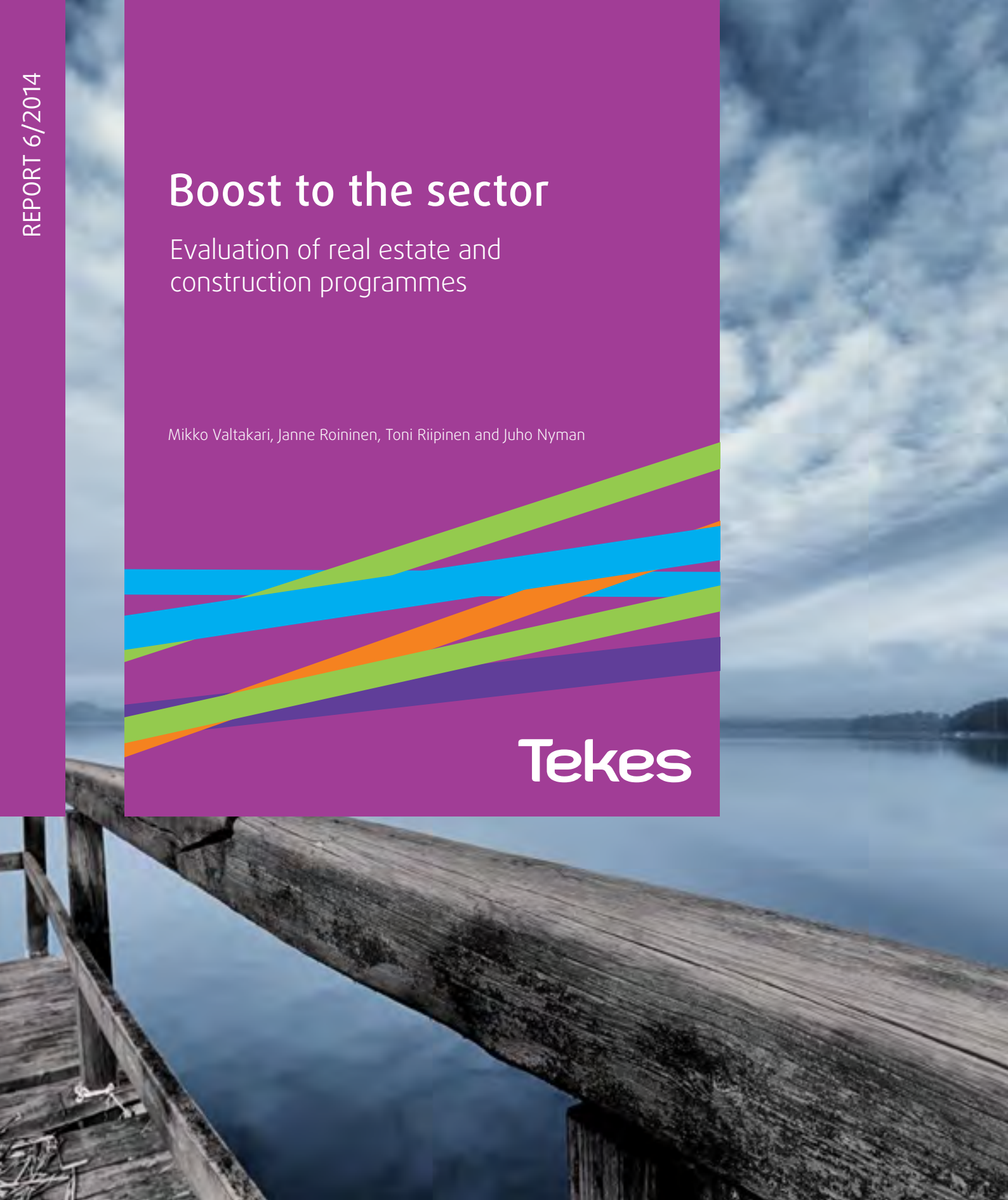
REPORT 6/2014

Boost to the sector

Evaluation of real estate and construction programmes

Mikko Valtakari, Janne Roininen, Toni Riipinen and Juho Nyman



Tekes

Mikko Valtakari, Janne Roininen, Toni Riipinen and Juho Nyman

Boost to the sector

Evaluation of real estate and construction programmes

Evaluation Report

Tekes Report 6/2014
Helsinki 2014

Tekes – the Finnish Funding Agency for Innovation

Tekes is the main public funding organisation for research, development and innovation in Finland. Tekes funds wide-ranging innovation activities in research communities, industry and service sectors and especially promotes cooperative and risk-intensive projects. Tekes' current strategy puts strong emphasis on growth seeking SMEs.

Tekes programmes – Tekes´ choices for the greatest impact of R&D funding

Tekes uses programmes to allocate its financing, networking and expert services to areas that are important for business and society. Tekes programmes have been contributing to changes in the Finnish innovation environment over twenty years.

ISSN 1797-7347
ISBN 978-952-457-588-1

Page layout: DTPage Oy

Foreword

There are some clear drivers such as urbanization, climate change and sustainable development requirements that will affect all the companies related to real estate, construction and built environment a lot in the future. Tekes has continuously funded several programmes and numerous projects in the field since 1980's.

This evaluation work contains an ex-post evaluation of the Rembrand programme, which was implemented in 1999-2003, and a final evaluation of the Sustainable community and Spaces and Places programmes carried out in 2007-2012. In order to understand better the complex operating environment, a comprehensive analysis has been made. The evaluation utilized several survey, interview, case and statistical methods to get a balanced view of the subject.

The report has been written by an evaluation team from Tempo Economics Oy and Aalto University. Tekes wants to thank the experts Mikko Valtakari, Janne Roininen, Toni Riipinen and Juho Nyman for their systematic and analytical approach. Tekes expresses its gratitude all those involved in steering group, interviews, surveys and a discussion forum. There are clear findings and recommendations. The results will serve as an important evidence base for on-going and future programmes.

Tekes,

November 2014

Contents

1 Objectives of evaluation and method of implementation

Over the past few years, Tekes (Finnish Funding Agency for Innovation) has aimed to promote research, development and innovation related to the built environment through programmes such as the Rembrand, Sustainable community (*Kestävä yhdyskunta*) and Spaces and Places (*Tila*) programmes. The Rembrand (1999–2003) programme was Tekes' first technological programme concentrated on the service sector and service innovations. It focused on the development of the real estate sector at the turn of the millennium, when the sector was believed to be in a period of transition in Finland. The programme highlighted the service nature of the real estate business and the related elements such as innovations, the utilisation and application of technology in business operations as well as the information content of products and services. The objective of the Sustainable community (2007–2012) programme was to enhance the development of energy-efficient areas and buildings. The programme was thematically broad, extending to the different sub-areas of the built environment and to several social challenges and business challenges related to various industries. It also sought to bring together sectors and their players related to the themes of the programme. The focus of the Spaces and Places (2008–2012) programme was on the development of premises and the business operations related to them, as well as on developing an understanding of the user needs of premises. The programme aimed to highlight the status and significance of premises in the operations of businesses of other users of the premises.

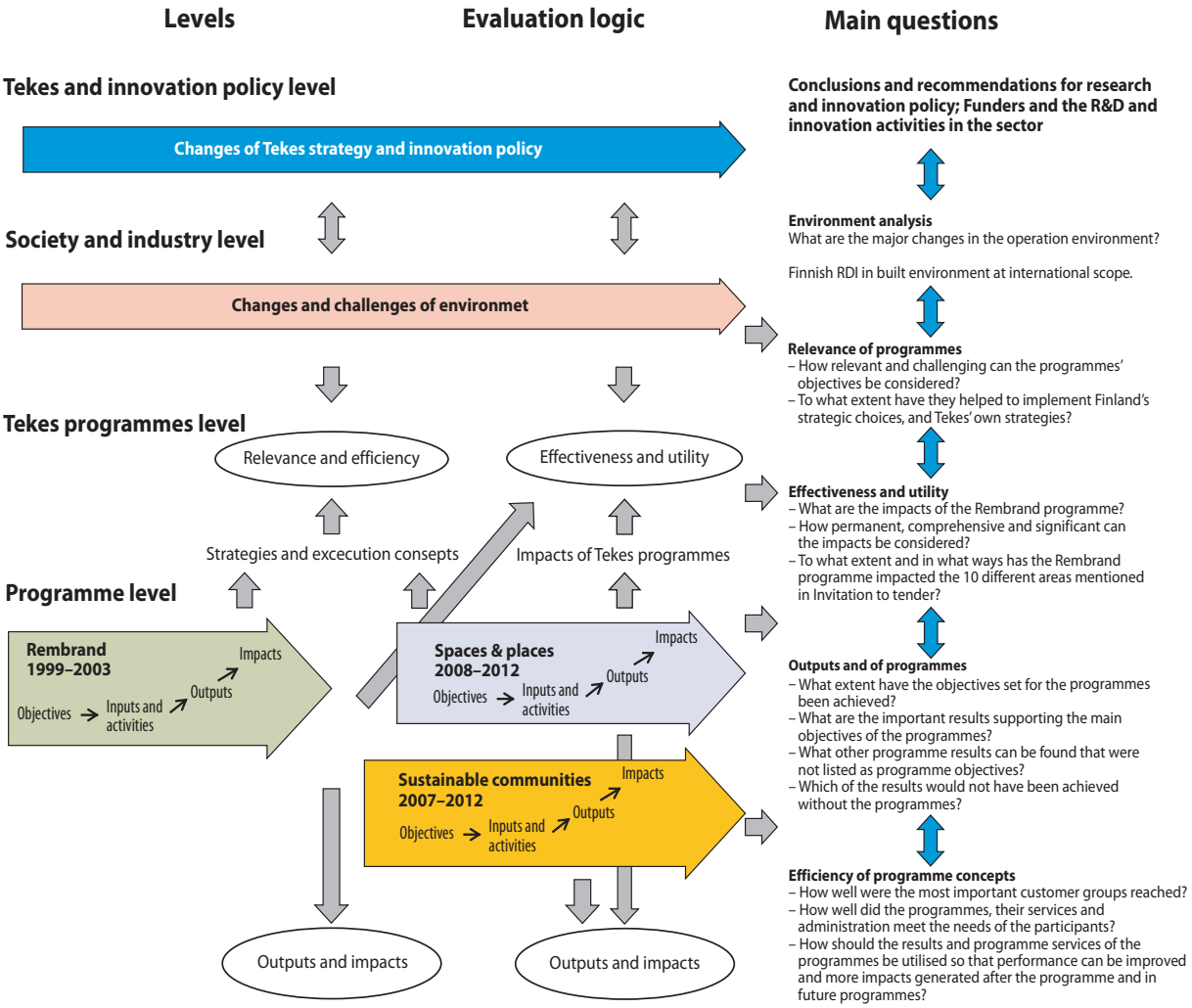
1.1 Objectives of the work

This evaluation work contains an ex-post evaluation of the Rembrand programme, which was implemented in 1999–2003, and a final evaluation of the Sustainable community and Spaces and Places programmes carried out in 2007–2012. The aim of the evaluation is to produce information of the success of the method of implementing the programmes in particular, as well as the results and impacts of the programmes. Other objectives are to produce recommendations for developing an innovation policy and the programme process of Tekes, as well as to develop the research, development and innovation activity of the sector.

The evaluation task consisted of the evaluation of the strategic relevance and pertinence of the programmes, the evaluation of the practices of the programmes, and the evaluation of the results and impacts of the programmes. The common starting point in the evaluation of each programme has been the impact of the programme in relation to its operating environment and the objectives defined for the programme.

The targets of assessment in the final evaluation (Sustainable community and Spaces and Places programmes) have been the strategic relevance and pertinence of the programme, the success of the implementation concept of the programme, and the estimated results of the programme and impacts based on present evaluation data. The focus of evaluation in the post-ex evaluation (Rembrand programme)

Figure 1. A holistic framework for the assessment.



has been on the assessment of the impact of activities on the long term. As a starting point for evaluating the impact of programmes, an approach that was derived from Tekes' impact model and evaluates the impacts of programme activity on four levels, has been applied. These are project level, programme activity level, sector level and the level of Tekes and innovation policy. Figure 1 shows the comprehensive approach used in the evaluation, as well as key questions of evaluation for each level of analysis.

The stages of the evaluation work were: literature analysis of the development of the operating environment of the programmes, international review of good foreign practices, evaluation of the strategic relevance of the programmes, evaluation of the results and impacts of Sustainable community and Spaces and Places programmes, and the evaluation of the long-term impacts of the Rembrand programme. The stages of the evaluation and the logic between the stages are shown in Figure 2.

Figure 2. The logic of the work stream-process.

Work stream 1. Literature review (the development of the operating environment during the past fifteen years)

Work stream 2. International benchmarking to selected countries

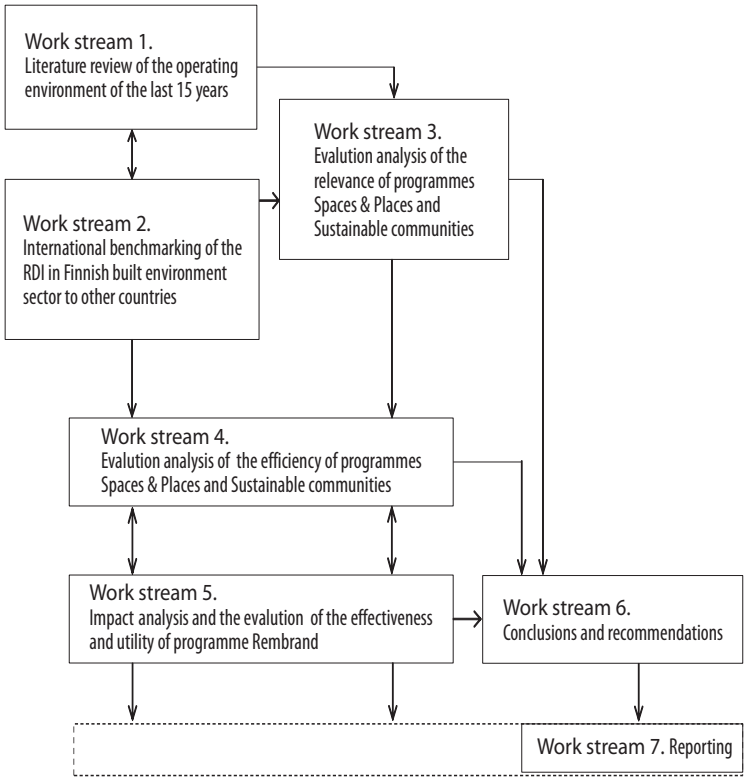
Work stream 3. Analyses of the relevance of programmes Spaces & Places and Sustainable communities

Work stream 4. Analyses of the efficiency of programmes Spaces & Places and Sustainable communities

Work stream 5. Impact analyses and the evaluation of effectiveness and utility of the Rembrand programme

Work stream 6. Conclusions and recommendations

Work stream 7. Reporting



1.2 Material and methods used in the evaluation

Due to the special nature of the evaluation work, there has been an effort to use a variety of materials as comprehensively as possible, and at the same time to utilize qualitative as well as quantitative evaluation methods, with the main emphasis on qualitative methods. The basic framework of the material used in the work has consisted of extensive documentary material describing the development of the real estate and construction industry as well as the built environment more broadly, materials produced by the programmes, and earlier evaluation documents, interview materials, programme questionnaire materials of the Sustainable community and Spaces and Places programmes, case studies, and statistics about Tekes' R&D funding and corporate financial statements.

A picture of the operating environment of the real estate and construction industry, the implementation method and objectives of the programmes, and results and impacts of the programmes was created by analyzing documentary material and material produced by the programmes. The programme-specific materials available in the work were the programme-specific project information and financial information, final reports of the programmes, and other material produced by the programmes; and earlier evaluations conducted of the Rembrand programme. Also utilized in the evaluation were statistics of Statistics Finland in describing the operating environment of the real estate and construction industry, as well as the annual reports of companies, and data of Tekes' R&D funding in the evaluation of the impacts of the programmes.

For the purpose of the evaluation, expert interviews were conducted of the persons responsible for all the programmes

(programme managers, co-ordinators and representatives of management teams), persons responsible for case projects, and other experts of Tekes' programme activity and the real estate and construction industry. Interviews were used to deepen the overall picture obtained through programme documents and other written material regarding, among other things, the implementation environment, strategic success and key results and impacts. All in all, 36 experts were interviewed within the framework of the evaluation and 18 experts were consulted through workshops.

For the final evaluation, a questionnaire was implemented regarding the success of the projects, method of implementation, results and impacts, significance of programme services in the implementation of projects, and the importance and added value of the Sustainable community and Spaces and Places programmes to the projects. For the Sustainable community programme, the questionnaires were sent to 45 persons responsible for a research process and 145 persons responsible for a business project. In the case of research projects, a total of 11 responses were received, with a response rate of 24%. Twenty five responses were received from implementers of business projects, thus with a response rate of 17%. For the Spaces and Places programme, the questionnaire was sent to 58 persons responsible for a research project and 94 persons responsible for a business project. Twenty four responses were received in the Spaces and Places programme related to research projects, with a response rate of 41%. For business projects, 22 responses were received, which made a 23% response rate. The surveys were carried out between 12 March 2014 and 28 March 2014.

An essential part of the evaluation work consisted of case studies of foreign models and procedures aimed at meeting changing challenges of the industry. Similarly, the goal of case studies specific to projects being evaluated was to deepen the understanding of the multi-dimensional effects of the programmes on the activity and development of project organizations, and on the impacts of research and development after the conclusion of the project. About 15 foreign case studies were made of foreign case models that were most relevant to the work, and a total of 25 cases were surveyed. A total of 15 Rembrand, Sustainable community and Spaces and Places programme project studies were made of the programmes being evaluated.

Evaluation findings were iterated and deepened during the evaluation work in two expert workshops organised in Tekes. The first of these (26 February 2014) focused on changes and challenges of the operating environment and on the strategic relevance of the programmes. In the second one (28 May 2014) in turn the focus was on the iteration of evaluation observations and results, and generating development recommendations. In total, 18 persons (12 + 6) participated in the expert workshops.

The evaluation findings presented in this report were based on a comprehensive interpretation of information gathered from several perspectives. Final conclusions on the success and impact of the method of implementing the programmes are based on a comprehensive interpretation made from different material sources of the programmes being evaluated. The evaluation work was carried out in Tempo Economics. Postdoctoral researcher Janne Roininen and Docent Heikki Kukkonen from Aalto University served as the evaluators and experts of the built environment. One main method of implementation used was internal research workshops of the evaluation working group, in which evaluation results were processed on the basis of evaluation material, conclusions arising from the evaluation were deepened, and recommendations for future activity were developed. The evaluation work was conducted in close collaboration with the client. A steering group consisting of representatives of the clients has assisted the evaluators. The steering group has an important role in both guiding the priorities of the evaluation work, and in conveying insightful expertise related to the subject area into the evaluation work.

1.3 Special challenges related to the final and ex-post evaluations

The evaluation work consisted of both an ex-post evaluation of the Rembrand programme as well as final evaluations of the Sustainable community and Spaces and Places programmes. The goal was to use the review to evaluate more broadly the impact and significance of the programmes in the sectors of the built environment. There was a delay of several years between the end of the Rembrand programme and the start of the Sustainable community and Spaces and Places programmes, during which time the development of the real estate and construction industry underwent great changes (such as globalisation, corporate restructuring and changes

in owners etc.). Therefore it was difficult to assess the interactions or synergies and significance of the programmes, and the same was true for the interfaces and impacts of the Rembrand programme on the Sustainable community and Spaces and Places programmes and the research and development work conducted in them.

The processes of research and development are generally long and their results often become apparent only several years after the conclusion of projects. The final evaluation is generally conducted immediately after the conclusion of the project. At this point, the results are often only just emerging and the broader programme-level impact processes are only getting started. A special challenge of a final evaluation is the identification of the impact processes obtained by means of the programme, and the prior evaluation of impacts emerging through them in a complex impact environment, in which final impacts emerge through a chained impact dynamic and in which numerous different factors affect the sophisticated cause-effect relationships between things. It is difficult to use statistical analysis or econometric means to verify impacts generated by the programmes immediately after they have concluded. Therefore the method of the final evaluations of programmes with regard to results and impacts is generally descriptive, often ending up with the same types of generic final conclusions of the impacts of the programmes.

Tekes has in recent years emphasised the evaluation of the success of implementation and programme services, as well as the programmatic significance and added value of the programmes in final evaluations instead of evaluating the separate results of programmes. It is possible to identify and evaluate these themes already while the programme is underway as well as immediately after the conclusion of the programme. Results concerning these themes can also be utilized immediately in the development of programme activity, and in the preparation and implementation of new programmes. Shifting the emphasis in final evaluations to the evaluation of the functionality of the programme concepts has been an appropriate choice. The challenge in it has been in determining whether the procedures and other programmatic means that have proven to be functional and effective while the programme is underway are effective in generating impacts over the long term. In other words, the question is: have the right things have been done in the right way with regard to also generating broader impacts that will become apparent in the long term. Quick good results aren't always indicative of effectiveness in the longer term.

In ex-post evaluation the focus of assessment is on the evaluation of long-term effectiveness of results and impacts of a programme. An ex-post evaluation is generally conducted a few years after the conclusion of a programme, at which time the impacts brought about by the results achieved at the project level have become more widely apparent in the operating environment of the programmes. One challenge that arose in this evaluation was the ex-post evaluation of the Rembrand programme over ten years after the conclusion of the programme. Method-related challenges were related to quantitative evaluations, such as the "tattered nature" of available statistical data, the low number of observation units, and the one-off nature of the funding received from the programme. In this evaluation, the longer term impacts of the Rembrand programme on, among other things, the business activity of participating companies was evaluated on the basis of corporate financial statements. The financial statements of only 14 of the nearly 60 participating responsible organizations of the business projects were found for the year 2012. It was not possible to form a statistically comprehensive time-series from the material, and therefore it was on possible to demonstrate a possible connection between programme funding and the development of the business operations of companies. More generally, statistical-based evaluation of the separate or discrete effects of programmes on the activity and development of companies has proven to be methodologically difficult. The main reasons for this include the fact that the funding received from the programmes is typically small and one-off in nature. Furthermore it is generally only part of the funding received as a whole from Tekes (and other financiers of R&D).

Similarly, challenges for qualitative evaluation (including expert evaluations, case studies and descriptions etc.) were the difficulty in accessing people who had been involved in the project, difficulty in remembering old things, and difficulty in assessing or linking the impacts of old activities with the development that has occurred, for example at the company level. In part, the situation has also been complicated by the fact that the changes in ownership structures of companies that took place after the programme (loss of business identity codes through, among other things, changes in ownership and mergers and acquisitions) have complicated the retro-

spective tracking of the impact chains achieved by the Rembrand programme. For the aforementioned reasons, one of the general challenges of ex-post evaluation and monitoring can be considered to be how long it is possible to monitor and identify investments made several years before. In light of the experiences of this evaluation, making an ex-post evaluation for one programme 10 years after the conclusion of the programme would appear to be very challenging in terms of methods.

In spite of the challenges described above, a joint evaluation of the three "parallel" programmes of Tekes related to the built environment seemed to be the proper way to evaluate Tekes' programme activity in a summary sense. Tekes could do the same thing when organising evaluations of also its other programmes that are similar to each other. By the same token, Tekes could systematically compile the experiences gained from its programmes and its programme-based approach by means of meta-evaluation, and make use of its results to develop its programme-based practice. Even though Tekes does, of course, already compile its results, the aforementioned meta-evaluation methods could make the compilation or collection more systematic.

2

Operating environment and development of the programmes in the 2000s

Rembrand (1999–2003) was a programme aimed at the development of the real estate industry, which was launched during a period of transition in the real estate industry to promote the discovery and concretisation of the service nature and customer orientation of the industry. The shift to the global market economy, which occurred prior to the programme, had contributed to a gradual loosening of the social grip in the real estate and construction cluster. The industry began to form into a genuine, transparent and normal business sector. The programme focused on accelerating and supporting this trend and on the formation of a uniform real estate and construction cluster. The objective of the programme was to develop Finland's real estate cluster into an evolving entity that was internationally competitive, and had a common customer and common goals.

The Sustainable community (Kestävä yhdyskunta) programme (2007–2012) was an entity with a wide range of themes and large group of players, in which the guiding principle was the generation and implementation of new approaches and ways of thinking, solutions and co-operation networks in the planning and implementation of a sustainable community. The focus in the programme was on developing solutions and business concepts aimed at a community that was in accordance with sustainable development through themes of community, buildings, energy and environment, and wellness and health. The background of the programme was a need to develop solutions at the community level to solve the challenges of climate change and the environment, and to unite the fragmented field of actors behind the solutions.

The purpose of the *Spaces and Places* (Tila) programme (2008–2012) was to increase and develop business activity related to premises and to generally develop premises, and an understanding of the significance and development potential of premises. Premises were defined in the programme as a combination of physical, virtual and social attributes, which when complementing each other, form a functioning business and service platform for the users and utilizers of the premises. The need for implementing the programme was related to proven business models for developing premises that had been seen abroad, and their importation to Finland, and the need for developing unutilized real estate in Finland. The objectives of the programme included bringing or lifting premises into part of the business activity and management of companies, and giving them a more strategic role in the thinking of companies. The main themes of the Spaces and Places programme were work environments, living, public and commercial premises, the experientiality of premises and virtual premises.

2.1 General development trends in the real estate and construction industry related to innovation activity

The significance of the built environment extends broadly to different segments of society, forming the basis for the operations of society. The built environment constitutes 75% of Finland's national wealth (residential and non-residential buildings, built-up land, land and water structures) and 40% of all energy consumed. About 500,000 people in Finland are employed either directly or indirectly in activity related to it. The built environment is constantly changing, and this change is influenced by social and economic development, and stakeholders of the built environment in the real estate and construction industry and in the planning of regions and communities. The major underlying motives for developing

the built environment in Finland are related to fighting climate change and combating problems related to the state of the environment, the demographic development of the population, population migration and the impacts in the built environment industry that have been brought about by the development of the ICT industry.

The real estate and construction industry is traditionally perceived as a sector of low technology, in which quick and giant leaps in development do not significantly occur. However, the industry is tied to the development of different areas of technology, and changes in these areas can be big and leap-like, and thus also affect the development of the real estate and construction industry. In addition to this, the real estate and construction industry is tied to major social, economic and environmental challenges for which solutions must be found in the industry, too, because of stricter requirements.

The industry is characterized by long value changes involving a wide range of actors. The roles of various actors can be separated in the value chain of the real estate and construction industry, which include owners, users and developers of the built environment, producers of the built environment and its services, and public authorities. Value chains have grown longer in recent years because there are more actors in the network due to internationalization, increase in indirect ownership, outsourcing of services, and the increasingly diverse revenue-generating models.[1]

The challenge to innovation activity of the industry is that, in different parts of the value chain, the end customer has not been identified as the actual customer. Considering the end user in an extensive value chain is considered important in the industry, however, as the industry has emphasized the user-oriented requirements of business operations, and business activity based on services. In a long value chain, however, the interests of operators in the real estate and construction industry are not aligned in many parts of the value chain. Furthermore the field of actors in the value network of the real estate and construction industry can be described as wide-ranging and very fragmented, which makes it challenging to comprehensively change the business logic.

The industry can be furthermore described as conservative in part, as approaches and ways of thinking have remained unchanged in many respects. This is due largely to the fact that the operators in the industry have not had a great need to adopt new approaches and ways of thinking. In this industry, the final product is not typically the product of one operator. In many cases, several operators and the entire value chain must be participating in order to have new innovations. Indeed, major innovations often make sense to the individual company only when the operator has enough power in the value network. However, the attention of the largest operators in the industry is mainly directed at the domestic markets, in which case there is no significant growth in sight in the real estate and construction industry as a whole. There is rarely any opportunity to earn large margins in markets that don't grow, or even get significant benefits with new innovations.[2]

Even though the real-estate and construction industry is, to a large extent, a business operation that is bound to one place, today the international market has a major impact in Finland. Foreign operators, resources and products are entering the Finnish market. Over the past decade, the real estate and construction industry has also internationalized in Finland, but nevertheless the Finnish industry is largely based on the domestic market. For Finnish companies, it is essential to understand the international dimension of the business, and the opportunities it brings, as well as the global rules that affect all operators. This kind of development would also encourage players to engage in development co-operation, which would allow for a wider market from abroad. In fact, today a growing share of the Finnish real estate and construction industry cluster is pursuing international operations.

The real estate and construction industry has an important society role that affects many different levels of society. Industry operators play an important role in a solution to the problems related to environmental, social and economic challenges. The public sector plays a major role from a business point of view as a major investor, owner and customer; as an operator it plays a major role as a promoter of the development of industry approaches and new innovations. Public

---

1 Kiinteistö- ja rakennusalan toimijat ja sidosryhmät -roolit, päätöksenteon ja ansainnan logiikka. Ympäristöjohtamis-menettelyn strategiatyöpaja, FIGBC, 16.11.2010. Hanna Kaleva KTI Kiinteistötieto Oy.

2 KIRA-klusteri: osaamis- ja innovaatiojärjestelmän haaste vai ongelma? Article by Matti Kokkala in the report titled *Tutkimus- koulutus- ja innovaatiotoiminnan hyödyntäminen kiinteistö- ja rakennusalalla* 2/2013. VTV. Keskustelunaloite.

investments can affect the development of the industry, including from the perspective of research and development. In addition to this, the industry is strongly affected by public regulation due to a variety of regulations and laws, as well as the monopoly in land use planning, which make it possible to influence the development of the industry. The public sector does have at its disposal numerous means which are used to create domestic markets and which are also used to encourage innovation.

The most significant opportunities seen in the real estate and construction industry's innovation operations include the trends of the digital revolution, green growth and social responsibility. The large number of functions and, above all, opportunities related to these create many possibilities for the innovation activity of the real estate and construction industry. The development of the ICT industry enables digital services in the area of the built environment, as well as the integration of "intelligence" into devices and physical infrastructure. Green growth creates opportunities for innovations and business activity as requirements for energy efficient and environmentally friendly solutions in the spirit of sustainable development gain strength.

Diverse social responsibility as a theme means the wide-ranging and long-term consideration of society (grey economy, occupational safety, use of foreign labour) and engaging in co-operation extensively with the different stakeholders of society in real estate and construction industry activity. Collaboration with the various stakeholders of society may take new forms, and open new forms with the growth of the civil society activity. In terms of research, development and innovation activity, it can be considered significant that the R&D&I activity of the real estate and construction industry are increasingly tied to user-oriented innovation activity. Exploiting the opportunities requires that all parties engage in determined, focused and long-term operations.

2.2 Development of the sector from the 1990s to the present and foreseeable future development

The operating environment of the Rembrand, Spaces and Places and Sustainable community programmes now being evaluated, and the development of the built environment more generally, has changed. We have collected the changes and development challenges that we consider to be the most significant since around 1990, into Figure 3, while at the same time outlining the foreseeable trends up to 2030. We have divided the changing challenges of the built environment into two levels: 1) those related to actual buildings, real estate and facilities and 2) ones related to regional and community structures. The first ones mentioned are engaged primarily in the Rembrand and Spaces and Places programmes. The latter are more closely associated with the substance of the Sustainable community programme.

Reflections of the recessions of the 1990s, particularly the first of the decade

At the building, premises and facilities level the 1990s was marked by a severe recession in Finland, which contributed to bringing cost-cutting measures in energy and materials, more efficient joint use of premises, and sustainable life-cycle thinking into the centre of discussions and into concrete actions. By the same token, the growth in the volume of renovation construction can be considered a derivative of the recession, but especially as a consequence of the rapid technical ageing of the post-war building stock. Another thing that can be considered a derivative of the recession is the increased popularity of the open office model, because an open plan office was believed to allow for the more economically efficient use of space.

In addition to the aforementioned economic recession, the most visible changes and *challenges of regional and community structures* of the 1990s were related to the adoption of the Act on Environmental Impact Assessment Procedure (YVA act) (act 1994 and decree 2006) and its expansions in the Act on Environmental Impact Assessment Procedures for Official Plans and Programmes (SOVA), as well as the regional and structural policy, which was renewed with Finland's membership in the EU. The YVA act emerged in a very close linkage with the so-called communicative planning paradigm. For example, the assessment of the environmental impacts of town plans was viewed largely as part of the negotiating planning approach and a pursuit of consensus. Other major challenges of the 1990s and particularly this millennium were efforts to prevent and combat climate change and efforts to stop the increasing fragmentation of regional and community structures. At the end of the decade, regional innovations and regional innovation systems began to rise to the centre of development. It was believed that the national innovation

Figure 3. Changing challenges of developing the built environment.

policy definition does not capture regional differences, and is too abstract without regionalization. Overall, innovation thinking came partly from the EU's new winds of regional and structural policy, which Finland also pursued, and partly from the way Finland survived the recession driven by technological innovations (such as Nokia's success story), which proved to be successful.

Changes of the new millennium

The pace of changes and challenges of the 2000s only increased. The most important administrative-institutional change related to the built environment was the reforming of the Land Use and Building Act. The reform was multi-stage and it largely emphasized the values of the communicative planning paradigm. Among other things, it ended the ratification procedure of detailed land use plans and shifted all of the decision-making power regarding land use plans entirely to municipalities. The entities that were users of the land use plans were given substantially more rights to participate interactively in all land use planning, instead of merely listening or consulting, as in the past.

Before the new economic recession that began in 2009, investing in real estate, complicated subcontracting chains in contracting, and the customer-oriented tailoring of facilities were some of the trends related to the built environment. At the same time, recycling of materials become a virtue in construction and simultaneously there were new models of building contracting, including group construction and group repair models of properties, such as common plumbing reno-

vations carried out by several housing companies. At the turn of the decade, the Limited Liability Housing Companies Act was reformed substantially and there were new regulations and obligations related to property maintenance. The Boards of Directors of housing companies were required to have more know-how of the liability or responsibility for property maintenance.

At the regional and community structure level, the 2000s were characterized by the reform of the aforementioned Land Use and Building Act and the emphasis on (regional) innovation systems, in addition to challenges related to climate change. These included improvement in the energy, ecological and resource efficiency of regions and communities, particularly buildings, and the compacting and concentration of regions and communities. The goal of combating climate change in the previous decade was complemented with goals that allowed for simultaneously adapting to the change, the total prevention of which was already acknowledged as impossible.

One of the most significant developments in ways of thinking related to regional and community planning models concerned the MALPE common planning model (Land Use, Living, Transportation, Services and Livelihoods), which was believed to promote the gradually strengthening so-called governance way of thinking, or cross-sectoral administration model instead of sector-specific administration (see e.g. Mäntysalo and Roininen 2009:7).[3] The model first came in its MAL form, and was later complemented with services and livelihoods. However, critics of the model have drawn attention to its efforts to displace the communicative planning approach of the Land Use and Building Act, participatory procedures, and the aforementioned developed assessment of land use plans with the mutual agreements of public authorities in accordance with the model.

Current challenges and opportunities of the 2010s

In the 2010, the real estate business has been characterized by outsourcing of the industry. In other words, there has been a desire to free up capital tied up in real estate to service the core functions of the companies. At the same time, people want buildings and facilities to have more flexible multi-functionality and agile modifiability. The goal of this idea of conversion flexibility is to be able to more quickly react to changing needs and expectations. These changes are largely a reflection of the acceleration of the pace and adapting to them. On the technological side, intelligent solutions based on communication technology of buildings, premises and facilities, as well as zero-energy solutions based on new building materials and methods are gaining ground.

The industrialization of construction continues, with construction of single-family housing at the forefront. Group construction of single-family houses is still rare compared with other Nordic countries, but it may increase in the coming years. So-called mobile homes, which are very popular in the New World, and even in parts of Europe, have not gained any role at all in Finland, at least not yet. Rural construction on large lots (over 5,000 square metres) continues to be a relatively popular pathway for people pursuing subsistence and independent lifestyles. The low growth in community housing in Finland still hasn't reached anywhere near the level of other Nordic countries, particularly Denmark. This is also the case for ecological and lifestyle communities. The conversion of holiday houses into year-round homes seems to be growing increasingly common, especially as an alternative to urban living and among recently retired people, but also as lifestyle living. On the construction material side, wood continues to be a material distinctively for single-family homes, but the relatively positive experiences gained from wooden blocks of flats seem to be providing encouragement for development in the direction of wood construction, which has already become more common in other Nordic countries, in Finland too.

At the level of regions and communities, the 2010s are characterized in particular by the rapid development of geographic information technology (geoinformatics) and its applications, and in particular, computer-aided design. In part, they enable innovations such as the "augmented reality" of communities, virtual communities with different functions, and 3D applications. A model called inverted town planning or even light planning (Jokelainen and Mäntysalo 2007:35) offers new opportunities at least for steering land use in ru-

[3] Mäntysalo, Raine & Roininen, Janne (2009 edited). Kuinka alueellista muutosta hallitaan – parhaat keinot ja käytännöt. Esiselvitys Sektoritutkimuksen neuvottelukunnan Alue- ja yhdyskuntarakenteet ja infrastruktuurit -jaostolle (teema 3). Teknillisen korkeakoulun Yhdyskuntasuunnittelun tutkimus- ja koulutuskeskuksen julkaisuja C 71. Espoo. Also electronically: http://lib.tkk.fi/Reports/2009/isbn9789512299263.pdf

ral villages.[4] Furthermore, opportunities for decentralized energy production (community- and building-specific) are being strengthened as new technology develops, especially photovoltaic technology.

One of the social trends which may end up being one of the most significant of this decades is the new "Great Move" and "New Urbanism". According to the latest research results, migration flows within the country have intensified to the level of the first half of the 1970s, albeit now it is quite different in nature than in the 1970s.[5] Diversity now means that the migration happens in multiple directions and the so-called rural net migration loss is a relatively minor percentage of total migration. "New Urbanism" in turn means the rise and active posing of special questions related to larger cities on the agenda of the planning and development of region and communities more strongly than before. In a way, both the "Great Move" and "New Urbanism" are also related to the accelerated regional differentiation of the price level of dwellings, and the great challenges of the decade, the restructuring of the municipal and service sector, with the second part including the reorganization of health and social services, called Sote.

At the planning paradigm level, governance thinking seems to be only growing in strength and to have possibly even been joined by aspects of the agonistic planning culture (Bäcklund ja Mäntysalo 2009, Mäntysalo ja Roininen 2009: 60-61).[6] The goal in the agonistic democratic model is mapping out different viewpoints but not merging them into one (management of conflicts with respect for disagreements.

Foreseeable changes in the 2020s

It is somewhat difficult to perceive in advance the changes of the 2020s now while the current fast-paced structural changes are churning, but some indications of the future are already now visible. The rapid development of communication technology is unlikely to stop or even slow down significantly from where it is today, so it will likely be reflected at least in the form of "augmented reality" of buildings, virtual premises and 3D applications. Technological development wills also likely lead to increased automation of property maintenance and even some degree of robotics in property maintenance. In the 2020s, nanotechnology and materials will probably revolutionalise the production and maintenance of buildings, premises and facilities. In the area of energy technology, a shift from zero-energy buildings to plus-energy solutions is probably very likely.

In the 2020s, regional and community structures may by renewed at least by the aforementioned "intelligent" communities and "intelligent transportation" linked to the aforementioned technologies, as well as decentralised and self-sufficient zero or even plus-energy communities based on photovoltage-based energy production. Climate change will likely stay on the agenda, and climate change technologies suitable for combating it and adapting to it will probably be discovered (so-called geoengineering). In addition to the aforementioned possible increase in migratation and "new urbanization", one major social challenge, in any case, will be the increasing demographic misalignment of regions and communities.

Multi-place living and telecommuting are sharply changing the Finnish countryside. Only less than ten percent of people living in the countryside are still primary producers or processers of primary production. Already, the dominant feature of our countryside is so-called residential rural area instead of the former agriculture and forestry countryside. The demand for living near nature and in a single-family house in our country seems to stay high, at least based on the stable, persistently high production numbers of holiday and single-family houses. Multi-place living and telecommuting also affects urban areas. For example, already about one half of households in Helsinki

---

4 Jokelainen, Timo ja Mäntysalo, Raine (2007). Kylien käänteinen kaavoitus: maaseutuoloihin sovitetun maankäytön ohjausmenetelmän hahmottelua. Yhdyskuntasuunnittelu 2007:3.

5 Kytö, Hannu ja Kral-Leszczynska, Monika (2013). Muuttoliikkeen voittajat ja häviäjät – Tutkimus alueiden välisistä muuttovirroista. KAKS - Kunnallisalan kehittämissäätiö. Tutkimusjulkaisu-sarjan julkaisu nro 76. Sastamala.

6 Bäcklund, Pia & Mäntysalo, Raine (2009). Yhdyskuntasuunnittelun teorioiden kehitys ja asukkaiden osallistumisen tarkoitus. Terra 121 (1), 19–31. sekä Mäntysalo, Raine & Roininen, Janne (2009 toim.). Kuinka alueellista muutosta hallitaan – parhaat keinot ja käytännöt. Esiselvitys Sektoritutkimuksen neuvottelukunnan Alue- ja yhdyskuntarakenteet ja infrastruktuurit -jaostolle (teema 3). Teknillisen korkeakoulun Yhdyskuntasuunnittelun tutkimus- ja koulutuskeskuksen julkaisuja C 71. Espoo. Also electronically: http://lib.tkk.fi/Reports/2009/isbn9789512299263.pdf

are statistically "single households", although in reality a significant share of these so-called single people likely maintain two "single households". In addition, possibilities for urban telecommuting, or multi-place work, have already improved today with the proliferation or spread of various mobile technologies.

2.3 Challenges and opportunities related to the operating environment of the programmes

The real estate and construction industry is traditionally perceived as a sector of low technology, in which quick and giant leaps in development do not significantly occur. However, the industry is tied to the development of different areas of technology, and changes in these areas can be big and leap-like, and thus also affect the development of the real estate and construction industry. Areas that will open up opportunities include the trends related to the ongoing digital revolution, green growth, the need for renovation, and social responsibility, which are all linked to each other. Furthermore, new technology (mobility, virtuality, structures and materials etc) are strongly challenging the old operating culture. The following is a presentation of a compilation of challenges that have been highlighted and identified in the work in the previous sections, and also taken into account as part of the evaluation process, which complicate the research and development of the real estate and construction industry and more broadly the entire built environment, and the development of business operations. These have also posed a challenge to the successful and effective implementation of the programmes being evaluated.

In the real estate and construction industry, the end product is typically not the product of one operator. Indeed, innovations generally require more than one player, i.e. the entire value chain or value network. The value changes of the construction and real estate industry/industries are long and they involve a wide range of many different operators. The field of actors is also wide-ranging, encompassing many fields, and partly fragmented. Joint research and development that covers the entire value chain is complicated by, among other things, the non-aligned interests of the operators and well-established value chains and business models.

The starting point of the real estate and construction industry has largely been built on on preselected values, for pre-planned needs, supply orientation, and standardised operational models or outputs. The aim in all of the programmes has been to direct business thinking of the industry away from a production- and product-orientation toward something more customer- and service-oriented. Due to well-established operational models, the key challenge in renewing the research and development activity of the real estate industry and at the same time, the industry, is how to make the shift from a production-driven orientation toward user-orientation, i.e. how to involve users in development work in the development of urban areas, housing services, office premises or shopping centres.

A major special characteristic of the real estate and construction industry that affects R&D compared to many other fields is the fact that the public sector plays an exceptionally significant role as a customer and market-creator of the industry as well as a regulator of the operations of the industry. To this extent it also directs the innovation activity of companies, which poses challenges to the capability of the public sector as an entity that encourages research and development activity and creates innovations and markets. There are otherwise many governing entities in the industry, and the relationships and responsibilities of operators are unclear (such as VTV 2013).

Public R&D investment in the industry has been unsystematic. The real estate and construction industry has partly been left somewhere in the middle of the principles of public R&D funding (Academy of Finland, Tekes), as a result of which there can be considered to be a market disruption in the research and development activity of the industry, in which both society and companies invest too little in R&D relative to the challenges of the industry and the social harms/problems resulting from them (such as VTV 2013). Relative to the significance of the industry on the national economy and society, R&D&I investments have been small. Furthermore, the industry lacks high level, top expertise and research in Finland. It doesn't create enough "critical mass" to allow for the implementation of innovation activity and its utilization more broadly.

In a capital-intensive industry such as the real estate and construction industry, it is common for key players to be integrators who are focused on innovating processes and business models. Most innovations of the real estate and construction cluster are made in building product and building technology companies, whose markets have internationalised substantially within the past 20–30 years. Finnish companies have become subsidiaries of international companies, which has resulted in a reduction of domestic innovation activity (such as VTV 2013).

Furthermore there is a general reversal in the economy, which has led to a reduction in investments and R&D contributions.

2.4 Selected foreign models and practices aimed at responding to changing challenges

Below is a compilation of some the newest possible foreign models and practices, which have been used elsewhere for the changing challenges of the built environment described above. The compilation is not exhaustive relative to the challenges; rather we have only just highlighted the models from abroad which might possibly be applicable to some of the key domestic challenges. We have divided the foreign models and approaches in the same manner as the challenges described above, into two levels: 1) level of buildings, premises and facilities and 2) level of regional and community structure.

Level of buildings, premises and facilities

Energy efficiency and climate change issues

The pursuit of better energy efficiency unites most European countries but there are slight differences in the priorities given to practical means. According to a study by Lindsted and Junnonen (Lindstedt and Junnonen 2009)[7], Sweden bases its energy efficiency efforts on developing legislation and subsidies, in Norway, energy-cutting measures and Enova SF (http://www.enova.no/), which is similar to our Motivaa, play a key role. The Danish model is based on directives and the renewal of building regulations. In Germany the focus has been set on energy efficient renovation construction, as well as regulations and subsidies. Austria and Switzerland base their energy efficiency efforts on programmes (implementation of EU energy directives by means of national operational programmes) and on certificates based on standards. In the Netherlands and Great Britain, the main focus has been set on tax penalties and incentives.

Green Building Council network (http://www.worldgbc.org/) is a worldwide network of operators that especially promotes the efforts of the construction industry of its member countries toward lighter construction that mitigates climate change. There are over 20 member countries, including Finland. The most visible forms of activity include development of lifecycle indicators of buildings and improvements in the energy efficiency of premises.

Nordic Built association (http://www.nordicinnovation.org/nordicbuilt/) promotes and also funds projects of sustainable construction methods in the Nordic countries. Many of the members of the entity are companies in the built environment sector; consequently one of the cornerstones of activity is based on the business perspective and benefits of a sustainable counstruction method.

Resource and material efficiency

A report by the task force on national material efficiency, which was appointed by the Ministry of Employment and the Economy and the Ministry of the Environment (TEM 2013:22) presents a few foreign practices aimed at intensifying the use of material.[8] Included are the models of the Netherlands, Germany and Sweden. Development work in the Netherlands is channeled through the Green Deals programme (http://www.government.nl/issues/energy/green-deal) and its projects. The widest possible range of operators have been encouraged to join the programmes (companies, public sector, societies, residents). In 2012 a resource efficiency programme named ProgRess was launched in Germany in connection which university-level education was also co-ordinated. "ProGress includes goals for the different areas of resource use: sustainable supply of raw materials, resource efficient production and planning, resources efficient consumption and closed circulation. The principles governing the plan are consideration of ecological sustainable in the creation of economic opportunities, consideration of global responsibility in the heart of national resources policy, gradual development economic and production methods toward closed circulation, thus reducing the dependency on primary resources and leading society toward quality growth using long-term sustainable resources" (Kirkinen: http://www.sitra.fi/blogi/saksa-resurssiviisauden-suunnannayttajana). In Sweden themes related to material efficiency are organised as part of the work and sector programmes led by the prime minister's commission on the future.

---

7 Lindstedt, Tuomo ja Junnonen, Juha-Matti (2009). *Energiatehokkaat ja teolliset korjausrakentamisratkaisut Suomessa ja kansainvälisesti.* Suomen itsenäisyyden juhlarahaston Sitran selvityksiä 11/2009. Helsinki.

8 The Ministry of Employment and the Economy (2013). Kestävää kasvua materiaalitehokkuudella. Työryhmän esitys Kansalliseksi materiaalitehokkuusohjelmaksi. Työ- ja elinkeinoministeriön julkaisuja 33/2013. Helsinki.

Level of regional and community structure

Climate change issues and sustainable future in general

The Green City model, which originates from Freiburg, Germany is one award-winning development project operating at the regional and community structure level aimed at addressing climate change (http://www.fwtm.freiburg.de/servlet/PB/show/1199617_l2/GreenCity_E.pdf). The model has subse-quently spread from Freiburg to elsewhere in the world. The model comprehensively combines factors related to the economy, transportation, nature and even civic participation. The model has also inspired several Finnish projects.

Energy Cities (http://www.energy-cities.eu/) is a European local government network whose overarching aim is to promote sustainable development at the municipal/city level and the regional level by increasing the use of renew-able energy, and the opportunities for transitioning to it. From Finland, the network has been joined by Helsinki, Kotka and Tampere so far. The idea of the network, to also address cli-mate change problemetics with measures of the regional and local level, has proven to be effective and necessary as a com-plement to national and international actions. Another local level networking project **EcoMobility** (http://www.ecomobility.org/) addresses climate change is-sues by means of local transportation. The network promotes ecological modes of transport in their various forms. The net-work is world-wide and its strong operator cities include Syd-ney, the city of Portland, and Freiburg. No city in Finland has yet joined the network.

Smart Cities and communities (http://eu-smartcities.eu/) is a community initiative programme started and maintained by the EU's energy directorate that focuses on, among other things, energy efficiency and sustainable ways of moving. The operating areas have gradually expanded to also include themes related communication technology (such as intelligent transportation).

The challenge posed by the spread or sprawl of regional and community structure

The Maapaikka project of the Department of Real Estate, Planning and Geoinformatics at Aalto University (Laitinen et al. 2013) surveys foreign models that address the challenges related to the dispersal of regional and community structure. The models referred to below were highlighted in the survey.

Urban growth boundary (UGB) of Portland

Urban growth boundary (UGB) is a sustainable urban planning model that has existed in the metropolitan region of Portland in the USA since the 1970s, and which has subsequently been applied to other areas. The model is based on the purposeful planning of regions, cities and populated areas, economic governance, and an effective dialogue between policy-makers, planners and the public. In the UGB model, a boundary is draw on a map; outside of this boundary there are strict limitations set for construction, and urban growth is directed to within the growth boundary. (Sitra 2010.) (Laitinen et al. 2013:18–19).[9]

Switzerland's zoning models

Switzerland also proscribes zones like the urban growth boundary in the land use law to restrict construction. The effectiveness of these zones, which were originally set in the 1960s, has been studied by examining data from three different regions from 1970 to 2000. As a result, the zones were found to be successful in their task: The number of buildings built outside of the zones was low; there was increased efficiency of construction within the zones; construction had been centred in certain areas within the zones. The zones were also carefully managed: zone boundaries were both extended and reduced at different times. However, it should be noted that one likely reason for the success of the zones is that there was a sufficient amount of land available for construction within the zones during the period under review: in the 1960s the zones were originally made as very large areas in part because of overly optimistic

---

[9] Sitra (2010). Kaupunkiseuduille eheämpi yhdyskuntarakenne – Portlandin UGB-malli apuna. Blog on website of Sitra 8.12.2010. http://www.sitra.fi/blogi/2010/kaupunkiseuduille-eheampi-yhdyskuntarakenne-portlandin-ugb-malli-apuna. Viitattu 18.5.2011.

Laitinen, Karitta, Roininen, Janne, Oksanen, Emmi, Niemi, Petteri ja Mäntysalo, Raine (2013). Maapaikka-hallintamalli. Maaseutumaisten alueiden maankäytön ja palveluiden paikkatietopohjaisen suunnittelumenetelmän kehittäminen. Aalto-yliopisto, Maankäyttötieteiden laitos. Yhdyskuntasuunnittelun tutkimus- ja koulutusryhmä. Aalto-yliopiston julkaisusarja TIEDE+TEKNOLOGIA 2/2013. Electronically: https://aaltodoc.aalto.fi/handle/123456789/9008

population growth expectations. (Gennaio, Hersperger & Bürgi 2009, 227–231.) (Laitinen et al. 2013:20).[10]

China's UCB model

In China, the urban construction boundary (UCB) has been used in urban planning. The model works in the same way as the urban growth boundary, its main goal being to curb the growth of urban fringe areas. Land use in China is primarily controlled by a city's master plan. Land within a master plan area is divided into ten categories, and nine of these categories are designated for construction, which are also included in the urban construction boundary zones. Although the zones have never officially been marked on the cities' master plans, they have functioned as important boundaries for dividing city-type areas from rural-type areas. (Han ym. 2009, 1286.) (Laitinen et al. 2013:20).[11]

What if? Geographical data model

A new tool that has been developed for urban planning is the What if?™ method based on geographical data. It is best suitable for areas with substantial population growth and problems with infrastructure, traffic and urban sprawl (Asgary, Klosterman & Razani 2007, 220.)[11] The method does not consequently involve hardly any planning of rural-type areas, but the same principle as in the urban growth boundary model can be applied in it to protect the countryside from growth of a city. (Laitinen et al. 2013:21).

The What if? Application, which is based on geographic data, offers different alternative future scenarios for land use based on information that is entered into it. For example, it can say that there is not enough land in an area to achieve goals of additional construction, population growth and strict protection of agricultural land, and consequently forces policymakers to choose between alternatives. As its name indicates, What if? does not try to predict the circumstances of the future with precision, rather it explicitly indicates what will happen if a particular policy is practiced (for example growth is concentrated near existing urban areas) and if assumptions about the future prove to be correct. (Klosterman, Siebert, Kim, Hoque & Parveen 2006, 82, 94). (Laitinen et al. 2013:21).[12]

Among other places, the method has been applied in Iran, in the city of Dorood, with the aim of finding a direction for the growth of the city and to minimise the impact of growth on the agricultural land surrounding the city. In the case of Dorood, the result was that the city does not have many alternatives for future urban development. Because the majority of the land suitable for construction is high quality agricultural land, the spreading of the periphery or edge of the city must be curbed if agricultural land is to be preserved. (Asgary, Klosterman & Razani 2007, 219–222, 228–229.) (Laitinen et al. 2013:21).[12]

Although What if? Is most suitable for growing areas it has also been applied in the Cleveland and Akron areas of Ohio, USA, which is suffering from depopulation. Because in this case, however, the population is going down in urban centres but growing in the countryside, the method is being applied in rural areas. In Ohio's case, the analysis showed that even if growth were restricted to be near existing residential areas, the actions would not affect the volume of construction of new residential areas compared to if they did not restrict the placement of new construction. (Klosterman, Siebert, Kim, Hoque & Parveen 2006, 81, 93–94.) (Laitinen et al. 2013:21).[13]

Tax policy model of the Netherlands

The Netherlands, in turn, have considered the country's taxation as one means of curbing the growth of urban areas. There have been many different kinds of forms of taxation debated. For example, a tax could be collected when an open area is used for construction: the idea is to compensate for the loss of the wellness value in an area, when the space may have previously been used for recreation, for instance. The tax could also be associated with changes in town or city plans: if an old plan

---

10 Gennaio, M.-P., Hersperger, A.M., & Bürgi, M. (2009). Containing urban sprawl-Evaluating effectiveness of urban growth boundaries set by the Swiss Land Use Plan. Land Use Policy, 26 (2), pp. 224–232.

11 Han, H.-Y., Lai, S.-K. , Dang, A.-R., Tan, Z.-B. & Wu, C.-F. (2009). Effectiveness of urban construction boundaries in Beijing: An assessment. Journal of Zhejiang University: Science A, 10 (9), pp. 1285–1295.

12 Asgary, A., Klosterman, R. & Razani, A. (2007). Sustainable urban growth management using What-If? International Journal of Environmental Research, 1 (3), pp. 218–230.

13 Klosterman, R.E., Siebert, L., Kim, J.-W., Hoque, M.A., Parveen, A. (2006). What if evaluation of growth management strategies for a declining region. International Journal of Environmental Technology and Management, 6 (1–2), 79–95.

that prohibits construction is replaced with a new one that allows for construction, the value of landowners' land rises and the state could collect a tax on part of this. The tax could also be used to protect un-built land (which has scenic value, is untouched or agricultural) by making it expensive to build on, and thus steering construction to areas that are already built. In spite of the extensive public debate, however, the tax has not been adopted in the Netherlands. The greatest obstacles to adopting the tax have not ultimately been related to its technical feasibility or terms, but mostly the difficulty and ambiguity of determining the value of open spaces (Altes 2009, 236–240.) (Laitinen et al. 2013:22–23).[14]

The following tables (Tables 1 and 2) contain a summary of the main content of the models described above according to their challenge areas. Of the good examples we have collected from abroad, we recommend that Tekes especially utilize the experiences and approaches obtained from the Netherlands, Germany and the USA. The Netherlands development related to the energy and resources efficiency of the built environment is channeled through the Green Deal programme. Similarly the resource efficiency programme ProgRes was launched in Germany in 2012; university level education is also co-ordinated in conjunction with this programme. The Urban Growth Boundary (UGB), which is a response to the dispersal of regional and community structure, is a model of sustainable urban planning that has been used in the metropolitan area of Portland, USA, since the 1970s, and has also been subsequently applied elsewhere.

The Green Deal programme of the Netherlands would provide Tekes with the opportunity to expand its traditional target group thinking in the direction of the 4 P model (companies, public sector, societies and residents in co-operation). Germany's ProgRess, in turn, would create opportunities for collaboration in Sitra's direction. Sitra is using Germany's model in its own resource wisdom activity. The UGB zone models are proven ways to intervene in the dispersel of regional and community structure, which is very topical especially in sparsely populated Finland.

Table 1. Good international models and practices which meet the altering challenges in developing of the build environment on a level of the real estate, properties and spaces.

Altering challenges in developing of the build environment (on a level of the real estate, properties, buildings and spaces)	Good international models and practices	Context of the models and practices
Challenges of the climate change and energy efficiency	Nordic juridical models	– Sweden: laws and regulations – Norway: economic use of energy – Denmark: building regulations and directives
	Central European models	– Deutschland: supports to the renovations – Austria and Switzerland: operational programmes and certifications based on standards
	Netherland's and Great Britain's taxation models	Taxation sanctions and incentives
	Green Building Council -network	Global network of the building industry (among other things the lifecycle indicators)
	Nordic Built -society	Enhancement and funding for the sustainable developmental building projects
Challenges of the resource- and material efficiency	Netherland's Green Deals -programme	Model of the 4P-cooperation (Private, Public, People -Partnership)
	Deutschland's ProgRess -programme	Material- and resource chains, enclosed cycles (also university level education)
	Sweden's future committee and sectorial programmes	Integration of the material efficiency challenge into the work of the committee

[14] Altes, W.K.K. (2009). Taxing land for urban containment: Reflections on a Dutch debate. Land Use Policy, 26 (2), pp. 233–241.

Table 2. Good international models and practices which meet the altering challenges in developing of the build environment on a regional- and community level.

Altering challenges in developing of the build environment (on a regional and community level)	Good international models and practices	Context of the models and practices
Challenges of the climate change and sustainable development	Freiburg's (Deutschland) Green City -model	An holistic integration of the economical, transportal, ecological and citizen participational factors into the developing work
	Energy Cities -network	Networking of the local governments, especially for the enhancement of renewable sources of energy
	EcoMobility -network	Networking on the local level, especially for the enhancement of ecological mobility and transport
	EU's Smart Cities and communities – initiative programme	Enhancement of the energy efficiency, sustainable mobility and communication technology (smart transport)
	Beddington's BedZED (Zero Energy Development), Vauban's project, Malmö's Västra Hamnen, Wien's Aspern and San Francisco's Sonoma Mountain Village (SOMO)	An holistic residential area renovating targeting the sustainable development
	Vancouver -model	City aim to be the world most green city in year 2020
Fragmenting of the regional- and communal structures	Portland's Urban Growth Boundary (UGB) -model	Boundaries as the methods for the steering the city growth
	Switzerland's boundary models	Suchlike the Portland's boundary model
	Chinese's Urban Construction Boundary (UCB) -model	Boundary model in addition of the land use categories
	What if? -method (USA, Iran)	GIS (geographic information system) –model based on scenarios
	Netherland's taxation model (not in use yet)	Setting the different tax rates for the separate land use areas
Others	Manchester's city renovation (years 1995–2020)	An holistic development programme (based on the development of existing structures, not new building)
	Japan Sustainable Living 2020 -project	Produced an analytical knowledge of the future trends and sustainable development on build environment

3
Final evaluation of the Sustainable community programme

3.1 General information about the Sustainable community programme

The Sustainable community programme was carried in 2007–2012. The aim of the programme was to promote the development of sustainable and energy efficient regions and companies. The programme was very broad thematically, extending to the different subsectors of the built environment and into numerous social challenges and business challenges related to various sectors. The main target groups of the programme included the construction and real estate industry, the energy and environmental industry and operators in the service sector. The programme combined different sectors and their operators in relation to themes of the programme. The vision of the programme became: "Finnish companies in the real estate and construction industry and in the energy and environmental sector have integrated into their business operations the opportunities provided by sustainable development, and together with the local research bodies form a strong cross-technological cluster that is more effective than its competitors in making substantial international business as part of international networks."

The objectives of the programme were:

- Promote the construction and maintenance of communities that are efficient in their energy and environmental impacts, functional and comfortable
- Enhance the ability to make technological know-how into a business
- Renew co-operation models, practices and procurement practices
- Create new business models, service concepts, system solutions and technological solutions
- Networking of operators from different subsectors and
- Strengthen the interaction between the public and private sector.

The key themes in which the programme wanted to influencial were community structure (construction, land use, logistics and transportation), energy and the environment (energy sources, energy production, energy efficiency and waste processing and recycling) and well-being and healthiness (work and leisure time, indoor air quality, productivity and functionality).

The budget of the programme was nearly 95 million euros, which Tekes' share was 49.5 million euros. There was a total of 257 funded projects. 159 of these were business projects (some of which were implemented by a public body) and 98 were public research projects. Some of these were implemented as joint projects. The funding granted by Tekes for the research projects was 17.5 million euros and 32 million euros for business projects. The funded projects were implemented by a total of 159 operators. The highest number of projects was carried out by the Aalto University Foundation and VTT Technical Research Centre of Finland.

Table 3. Numerical information about the Sustainable community programme.

Programme financing	
Total budget of all financed projects	94 700 000 EUR
Tekes financial contribution to projects	49 500 000 EUR
Tekes financial contribution to research-projects	17 500 000 EUR
Tekes financial contribution to enterprise-projects	32 000 000 EUR
Projects financed in the program	
Number of projects/of which the number of joint projects	257 projects all together/ 64 joint projects
Number of research-projects	98 projects
Number of enterprise-projects	159 projects
Organizations that implemented projects	
Total number of organizations that implemented projects	154 organizations
Number of enterprises that implemented projects	113 enterprises

3.2 Strategic success of programme

Preparation of programme

The Sustainable community programme was preceded by comprehensive strategy and vision work on which the programme strategy was formed. The need for a comprehensive programme that covered the built environment broadly on a societal level was noticed in Tekes in the mid-2000s. The "drivers" that were influencing the programme in the background included the increased awareness related to the environment and climate change, and changes in the values held by people and companies, the growing scarcity of natural resources and energy, urbanisation, influencing people's health and well-being by developing habitats, and stricter legislation and control related to construction and the planning and development of communities.

The programme was needed for the co-ordination and networking of operators and expertise of different subsectors. This was seen as enabling the emergence of new business models, service concepts, service solutions and technologies, as well as the formation of a cross-technological and internationally competitive cluster of operators. The development of processes, changes in practices and models of co-operation was considered necessary in order to enable co-operation of operators in different subsectors related to the themes of the programme. In the initial stage, the mission of the programme became "development of internationally competitive business models and the development of the kinds of services and products that enable sustainable regional- and community-level solutions".

Preparation of the programme was started with an international survey and initial interviews through which tentative guidelines were outlined for the programme strategy. The international studies mapped out operational models in the USA related to commercialisation, solutions related to passive construction from Germany and Austria, and Russia as a potential area of expansion for Finnish companies. Based the interviews and the thoughts of the task force charged with preparing the programme, initial claims were developed that were tested in task forces. Authorities and companies in particular were invited to these task forces to comment on the direction that was forming in the strategy work of the programme. The task force asked whether there was a demand and novelty value for the thoughts that had developed. The strategy of the programme was further specified and directed into its final form on the basis of the workshops. Through the actual project applications and project selections, the priorities were revised and focused on certain themes as the programme progressed.

The key novelty and added value of the programme in a strategic sense can be considered to be the desire in the programme to act on the community level on a larger scale in which a wide range of different business sectors, and subsectors of the built environment, are involved in activity aimed at the same direction.

Strategic relevance and pertinence of the Sustainable community programme

The goals of the Sustainable community programme have been relevant with respect to the development challenges of the sectors of the built environment and also to the development of the operating environment. The programme appropriately took into account the prevailing trends of urban development and the future outlook. The preparation of the programme took into account stricter energy regulations and stricter building regulations, and anticipated an increase in general ecological thinking in construction and in the development of sustainable communities. In particular, thinking about energy efficiency has gained wide acceptance, and the change has happened largely during the programme.

The focus of the Sustainable community programme has been very wide-ranging, covering nearly everything possible on the topic. Due to the wide-ranging focus and fragmented nature of the industry, the projects haven't not, in all respects, formed sufficiently systematic development entities in the programme (such as networked operator structures, combining of expertise and the generation of new know-how). Indeed with respect to the goals of the programme, it is essential that resources are not fragmented thematically into an overly broad area into different kinds of development actions. In this respect, the focus of the programme could have been more clearly defined, and resources allocated to the most essential themes of the programme. Instead of four theme areas, the programme could have focused more strongly on two focal areas: community structure and buildings, where well-being and healthiness and energy and the environment could have acted as themes that cut across these themes. Compared to the other two themes mentioned above, the theme of well-being and healthiness, in particular, is a clearly more distant theme from a sustainable community point of view.

From the perspective of future development work and its continuity, it is also essential that a sufficiently specific definition is found for the target of development. For example, in the Sustainable community programme, well-being and health is largely a consequence of the success of the development measures achieved in other themes. Energy efficiency, meanwhile, as its own theme is a very significant theme even on a general level that could have even been implemented as an independent entity. Through a more precise definition of a sustainable community, a more focused and clearly defined or delineated programme would give a clearer picture of the aim of the programme for resource allocation and setting of objectives.

3.3 Success of the implementation method and implementation concept of the programme

Programme services and programmatic measures of the Sustainable community programme

The Sustainable community programme had at its disposal a variety of different kinds of programme services. The so-called traditional services of the programme provided funding for projects of the programme topic, seminars and other joint events, publications and reports, industry and market reviews (including survey reports and country-specific background reports), video presentations of the programme and projects, press releases, newsletters and other internal communication of the programme. Services related to internationalization were also provided through the programme, such as building of research co-operation and networks, monitoring and communication of EU programmes, and international visits were organised. In the programme there was also collaboration with, among others, the ERA 17 action programme, Sitra's programmes, Nordic Innovation; furthermore ERA-NET co-operation was also implemented. At the end of the programme, a joint result seminar was organised with the Spaces and Places programme. A significant new type of programmatic service format adopted by Tekes and included in the programme was social media. The programme's own web pages were created for social media, in which participants in the programme were able to engage in discussions and write down and read opinions and thoughts. Visitors were guided to discussion forums through comprehensive mailing lists.

Among other things, Tekesin Tori[15] was available within the framework of the programme; it served as the key information forum, as an enable of discussion and commenting related to the topics of the programme. In addition to this, Tekes' Hankegalleria[16] was used to increase access to information about other projects of Tekes' programmes. Project operators themselves wrote down information about their own project and its key results into Hankegalleria. The great mass of projects can be managed or handled in the Hankegalleria by themes and information about individual projects, for instance, can be searched. As a new form of activity, Tekes' Sustainable community programme organised two-stage communication training for the staff of the research projects that it funds. The concrete objective of the researchers' communication training was to increase visibility of research projects by making press releases of the research projects.

Activation of field and project selections

The successful activation of the field is the cornerstone of a successful and effective programme. Getting key players involved in the programme and a successful selection of projects create the framework for a programme that is successful in terms of its impacts. A lot of efforts were invested in marketing the programme to the field at the initial stage of the activation activity of the Sustainable community programme. This was done as so-called legwork by meeting a wide range of operators. A key idea in the programme was to map out project ideas from the perspective of the customer needs of the purchasing organizations. Indeed the structure of the programme was partly formed on the basis of project recommendations, and they partly guided the direction of the programme. Another thing that can also be considered to have contributed to activation activity is the programme's strong investment in social media, by which the field was activated extensively to join the discussion on the target areas of the programme and thereby get involved in the development work of the sector.

Even though there were great efforts directed at activation work during the start-up phase of the project, and it stirred great interest in the field, according to the programme team, the challenge in getting different operators in the sector involved in the programme was the scope and multilevel nature of the programme's focus area, as well as the scope and diversity of actors in the networks of value chains in the real estate and construction industry. The scope of the focal area of the programme required wide-ranging efforts in order to reach different target groups and contributed to making it more difficult to get the message of the programme across to different operators. The length of the value chains in the real estate and construction industry also posed challenges to getting all of the operators of a value chain involved in the programme. However, the programme was successful in getting customer-oriented projects that covered the entire value chain into the programme. This can be considered a great achievement, especially since the business operations of the real estate and construction industry have traditionally been built on pre-selected values, pre-selected needs, a supply-orientation and standard operational models and outputs, according to the National Audit Office of Finland (Utilisation of research, training and innovation activity in the real estate and construction industry. Reports of the National Audit Office of Finland 2/2013).

Considering the wide-ranging goals of the programme, the project portfolio of the programme was very comprehensive and there were no gaps specific to a theme area remaining in the programme, for instance. The real estate and construction industry, and a wide range of private and municipal operators, participated in the programme. Of all

---

15 Tori is Tekes' community service for the real estate and construction topic since 2009. Tori serves as a news channel for the construction and real estate industry and information about topical issues of the industry are collected into it. Tori also acts as an events calendar and discussion forum for the built environment. Additionally, a variety of material such as videos, bulletins and reports are distributed through it. Tori has supported the communication and networking of customers in the Kestävä Yhdyskunt, Rakennettu Ympäristö and Spaces and Places programmes.

16 The purpose of Hankegalleria is to bring into a single view the projects funded by Tekes and other public funding bodies. Hankegalleria helps people find the latest results of research and development projects, and thus promote the dissemination of research results. Another objective of Hankegalleria is to act as a networking forum for researchers and developers. Hankegalleria opened in March 2012 and the Tekes' Kestävät yhdyskunta programme was responsible for most of its development work.

the responsible organizations of the business projects, 63% were new customers of Tekes. The reasons for this can be considered to be the project application procedure, which took into account the needs of demand, and strong efforts placed on project activation. On the other hand, investors and large property owners in the industry (such as pension companies and other institutional investors etc.) were clearly missing from the programme. Part of the reason for this might have been the fact that the objectives of the programme regarding energy efficient construction, for instance, did not directly match the interests of investors. Also, the share of operators from the logistics sector remained low relative to its significance (including transportation management, material and waste flows).

Success of the implementation method of the programme

In terms of implementation method, the Sustainable community programme can be considered to be a very traditional Tekes programme, with the exception of the use of social media. One thing that could be considered to be a distinguishing factor compared to other Tekes programmes was the scope of programme, which posed challenges in using the programme services and for a balance between the different subsections of the programme. Based on the view of project operators, the programme services provided by the Sustainable community programme have been important throughout for the organizations that implemented the projects. The programme services they considered particularly important were ones that promoted networking (such as seminars, workshops and stakeholder co-operation) and the dissemination of results (results material and media events), and co-ordination services of the programme. The programme was especially successful in media visibility. On the other hand, the communication training for researchers, which was a new form of activity in the programme, was not well known even among researchers, and its benefits as a whole were considered to be relatively low (Figure 4).

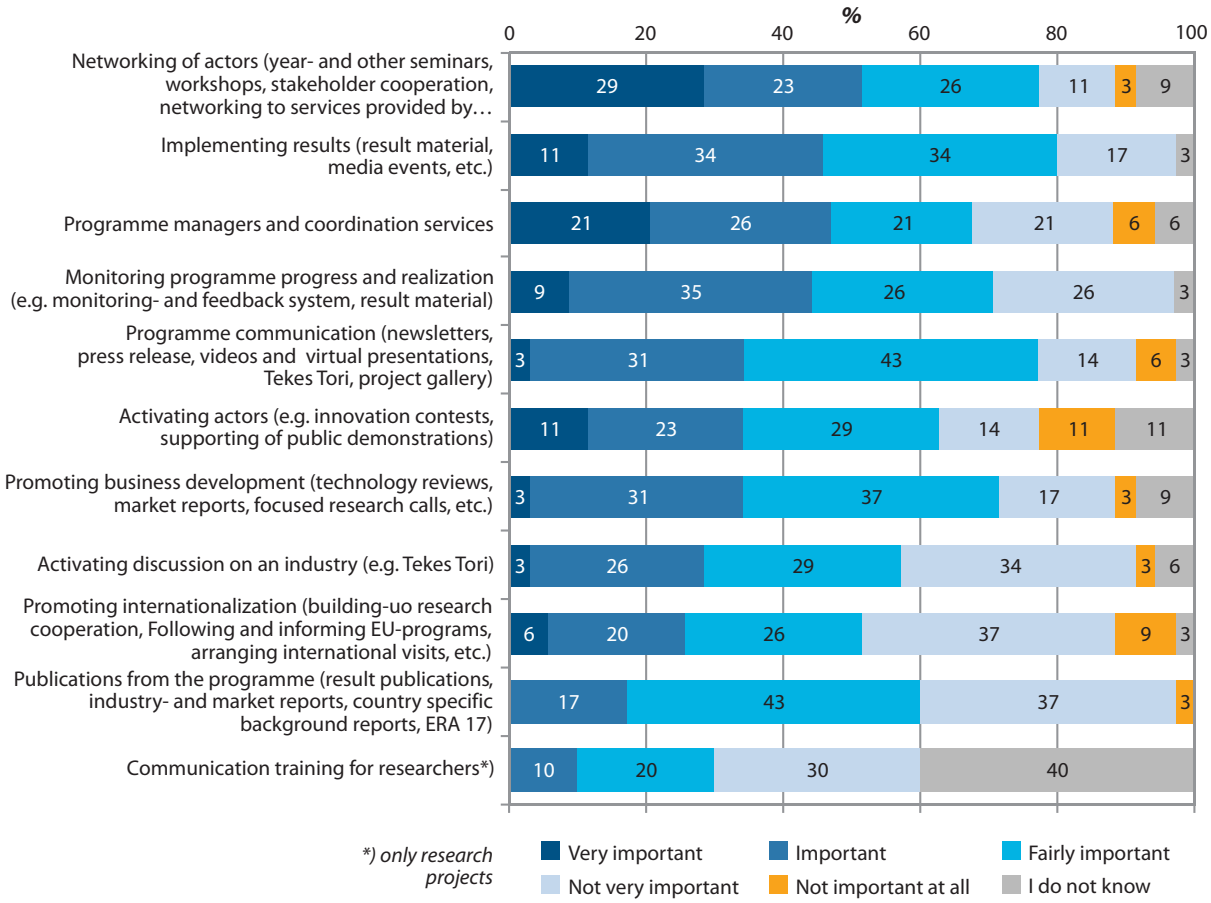
The implementation method of the Sustainable community programme can be considered to have been successful from the viewpoint of achieving the objectives of the programme, and the programmatic measures as effective in terms of adding value. The following can be considered as good programmatic operating practices in the Sustainable community programme:

- The demand-oriented procedure to promote the relevance of the research queries, in which customer needs (demand) are mapped and tied to research projects by placing representatives of both the provider and purchaser side to the same table to discuss needs and supply
- Concrete sparring support of the programme team in the implementation of projects
- Tekes-tori as a tool for activation and networking
- Strong efforts in the use of various media and the general visibility received by the programme through it.

Internally the programme was successful as a promoter of projects and project entities, but as a programme that had a wide range of goals, it could have done more extensive co-operation with other development programmes. For example, collaboration with the Spaces and Places programme and RYM Oy could have been more systematic. At the project, level, even more support was desired from the programme for promoting networking, disseminating research results, for proactive securing of the continuation of research and development work conducted in the projects even after the end of the programme. In this regard the programme could have put more effort into functions of the final stage of the programme, for example on themes (such as providing directions to other programmes, further financing, international initiatives etc.) that would enable the securing of the continuation of long-term research and development work after the end of the programme.

The implementation method of the Sustainable community programme can be considered very successful from the point of view of achieving the wide-ranging goals of the programme. As a whole the method of implementing the programme enabled an implementation environment for the projects of the programme in which very few bottlenecks preventing the success of projects and generation of results and impacts were experienced. Based on a project survey, the projects achieved their own goals very well, and in practice mostly only factors that were independent of the programme, such as the negative cycle of the economy, and the internal matters of a project – such as changes in staff – were perceived as

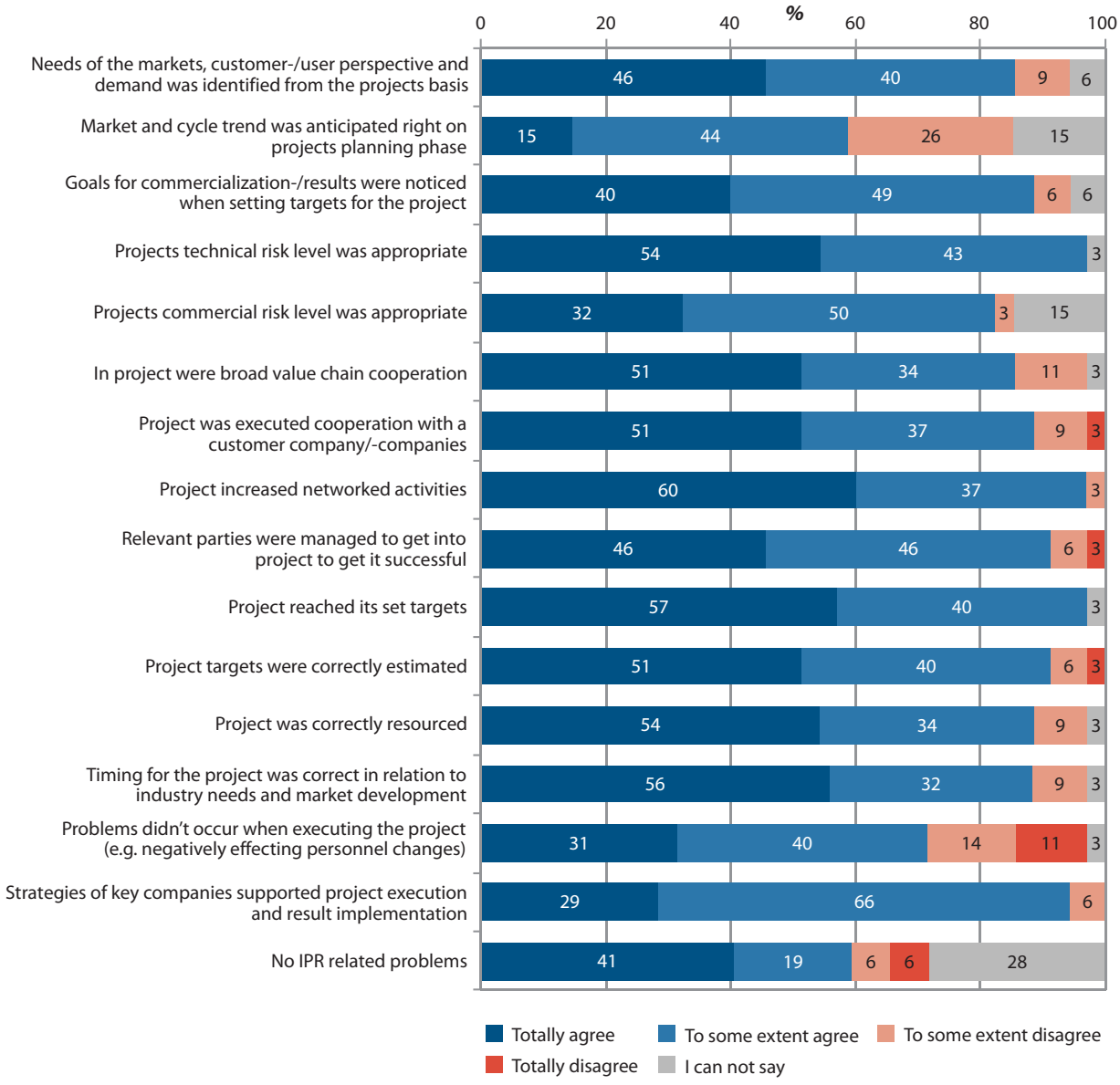
Figure 4. Estimated importance of programme services provided by Sustainable community programme with regard to success of the programme. (Source: Questionnaire for projects of programme 2014. n=36)



reducing the possibilities to achieve good results and impacts. Based on claims describing the success of the programme, the Sustainable community programme was very successful compared to the results of previous programme evaluations[17] in generating good customer-oriented projects that were aimed at utilizing results and which include extensive value chain co-operation. Similarly dimensioning of the projects was very successful. At the same time, the risk level of the projects was determined appropriately and entities that were essential to the success of a project were successfully involved in projects in the programme. (Figure 5).

[17] Including evaluation (Tekes 2013) by Pharma-, Lääke 2000- and Diagnostics, evaluation of Tekes' SISU 2010 – Uusi tuotantoajattelu programme, and Tuotantokonseptit programme (Tekes 2010), and evaluation of NewPro programme and other Tekes programmes aimed at developing metal processing (Tekes 2009)

Figure 5. Claims describing the success of a project. (Source: Questionnaire for projects of programme 2014. n=36)



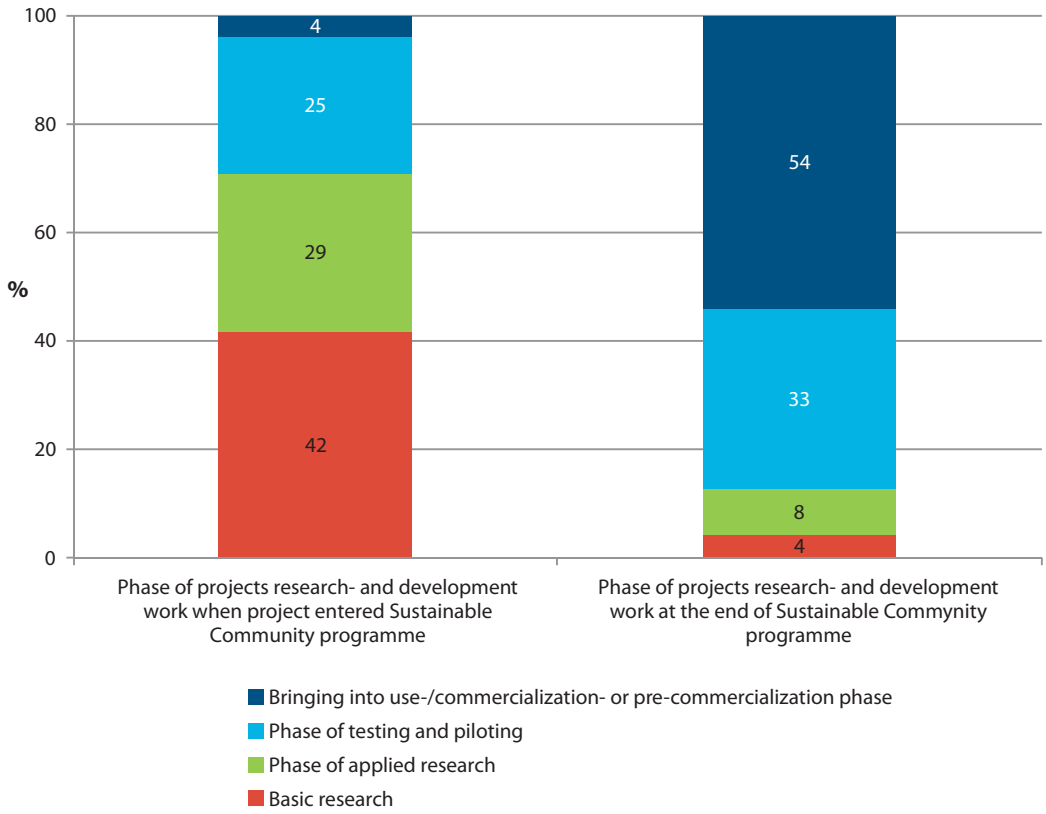
3.4 Results and impacts of programme

The purpose of the Sustainable community programme was to promote the development of sustainable and energy efficient regions and buildings. The key themes which the programme wanted to influence were community structure, energy and environment, buildings and well-being and healthiness. Consequently the programme was thematically very broad and there were a total of 257 projects implemented in it, of which 159 were business projects and 98 were public research projects. The funding granted by Tekes for research projects was 17.5 million euros and 32 million euros for business projects. The funded project was implemented by a total of 159 operators.

3.4.1 Project-level impacts

Because research and product development processes generally take a long time, only a certain share of the process can be advanced with a 2–3 year project funding. At the project level, perhaps one of the most significant impacts of the Sustainable community project is that on average, there was a clear leap in the research and developmen process involved in it during the programme from the research phase to the commercialization and adoption phase of results. Based on responses of the project survey, most of the business projects involved were only at the stage of basic or applied research when they entered the programme (about 70% of projects). After the end of the programme, only a little more than 10% of projects were at the level of basic or applied research in the development work of projects, and more than half of the projects were at the level of commercialisation and creating a business (Figure 6).

Figure 6. Estimated development stage of a project when the project began participating in the Sustainable community programme and at the end of the programme. (Source: Questionnaire of projects of programme 2014. n=25)



CASE

Passive House Project of TA-Asumisoikeus Oy

The passive house project of TA-Asumisoikeus Oy was implemented in 2009-2011. The objective of the project was to build a passive block of flats as a pilot project, which is being developed as a concept that would be suitable for mass production. The construction and structures of the passive block of flats are monitored during the process with monitoring measurements.

Essential steps before the actual construction of the property was to determine the most suitable structural solutions to achieve a balance of air-tightness and insulating solutions in a context of a block of flats, and to take into account that too much insulation exposes a building to moisture problems. Moisture problems can be prevented with ventilation. With regard to ventilation, both decentralised and centralised ventilation solutions were tested. In terms of energy efficiency, price and building functionality, a centralised ventilation solution was found to be better because in the model where ventilation was dispersed in individual flats, the choices made by residents had a significant impact on the energy efficiency of the property.

The project achieved the goals set for it. After the exploratory design phase, the passive block of flats was building and its functionality was monitored using different kinds of measurements, which allowed for the observation of the functionality of selections and decisions. The built property is also suitable for mass production. During the project, the property was fixed with solar collectors and with the positive experiences gained from the operation of the solar collectors, they have also been used in passive block of flats projects that were launched later, in which other information generated through the project was also utilized.

The construction of a passive block of flats was not dependent on funding from the Sustainable community programme. Tekes funding only constituted a minor share of the total costs of the building project, and only concerned a part of the whole process. However, Tekes' participation added value to the project, particularly with involvement by VTT. ◀

According to the views held by project managers, the results of the Sustainable community programme will be utilized extensively by companies and public organizations. The majority of the research project managers believed that the results of the projects will be utilized in the processes of companies in the industry or public organizations, or that a company in the industry or a public organization will develop a product or service from the results of the study. Similarly the majority of project managers of business projects believe that the results of the project will be utilized in the processes of their own organization, or that a product or service will be developed from the results of the project in their own organization. In addition to this, the project managers believe that the results of the project will also be utilized more broadly in other sectors of the built environment in addition to the aforementioned (Figures 7 and 8). The success in the adoption and commercialization of the research and development can at least partly be explained by the strong demand-orientation of the programme and by programme methods that reconciled the supply and demand of research and development work, such as surveying customer needs and linking them to research programmes, and with strong communication of results.

Figure 7. Assessment by research project managers of how the project's results have been utilized or will be utilized in the construction sector or in the development of communities.

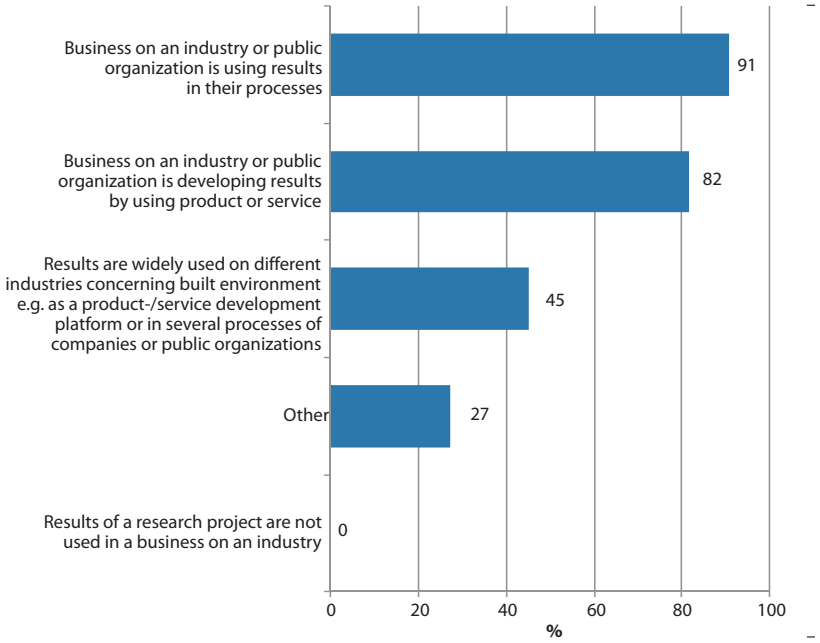
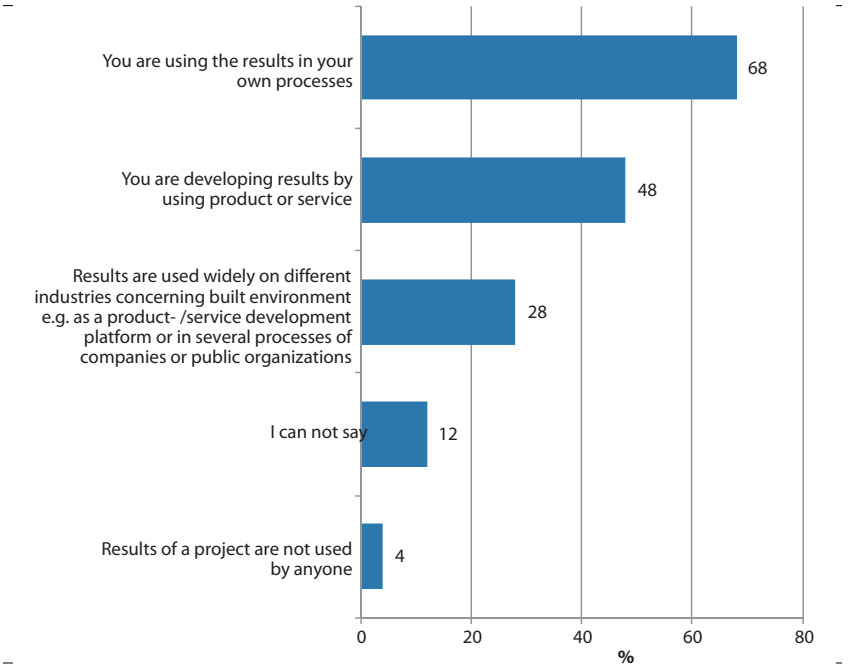


Figure 8. Assessments by persons responsible for business projects of how the project's results have been utilized or will be utilized in the construction sector or in the development of communities.



CASE

Regional-level eco calculators for cities and municipalities

Regional-level eco calculators for cities and municipalities is a research entity formed by several projects under one project name. The whole entity consists of Keko A project, which has already ended, and Keko B project, which is still ongoing. The first Keko A project of the research entity was launched in 2010. The project was implemented by the Finnish Environment Institute, Aalto University Foundation, and VTT Technical Research Centre of Finland.

The KEKO A project was a study and evaluation of alternative ways to assess energy efficiency in regional development projects (town planning). The evaluation concerned available foreign and domestic methods and tools. Another goal was to investigate the basic research needs of energy efficiency for the purpose of further development. Different eco calculators were explored in the project, and a study was made of what kinds of calculators already exist for communities.

The project produced a shared vision of the contents of the eco calculator needed that follows the principles of lifecycle assessment. The project consequently achieved its research goals. The project was more successful than anticipated due to a good division of labour (VTT, Aalto and SYKE) and successful collaboration, as well as the active participation of the management team and stakeholders. An obvious result was the increase in the use of eco calculators by municipalities and the product development by companies regarding eco calculators and business operations based on them.

After the end of the Keko A project, Keko B project was launched. The KEKO-B project concerned the development of a new internet-based tool for assessing the ecological sustainability of town and regional planning, for use by municipalities and constructions, among others. The core content in the Keko B project is to build and start using the eco calculator that was designed in the Keko A project. ◀

CASE

MeraSun project

(Energy consumption and technical functionality of an entire block of flats implemented with low energy technology, Product concept for heating the hot water of large buildings with solar collecters)

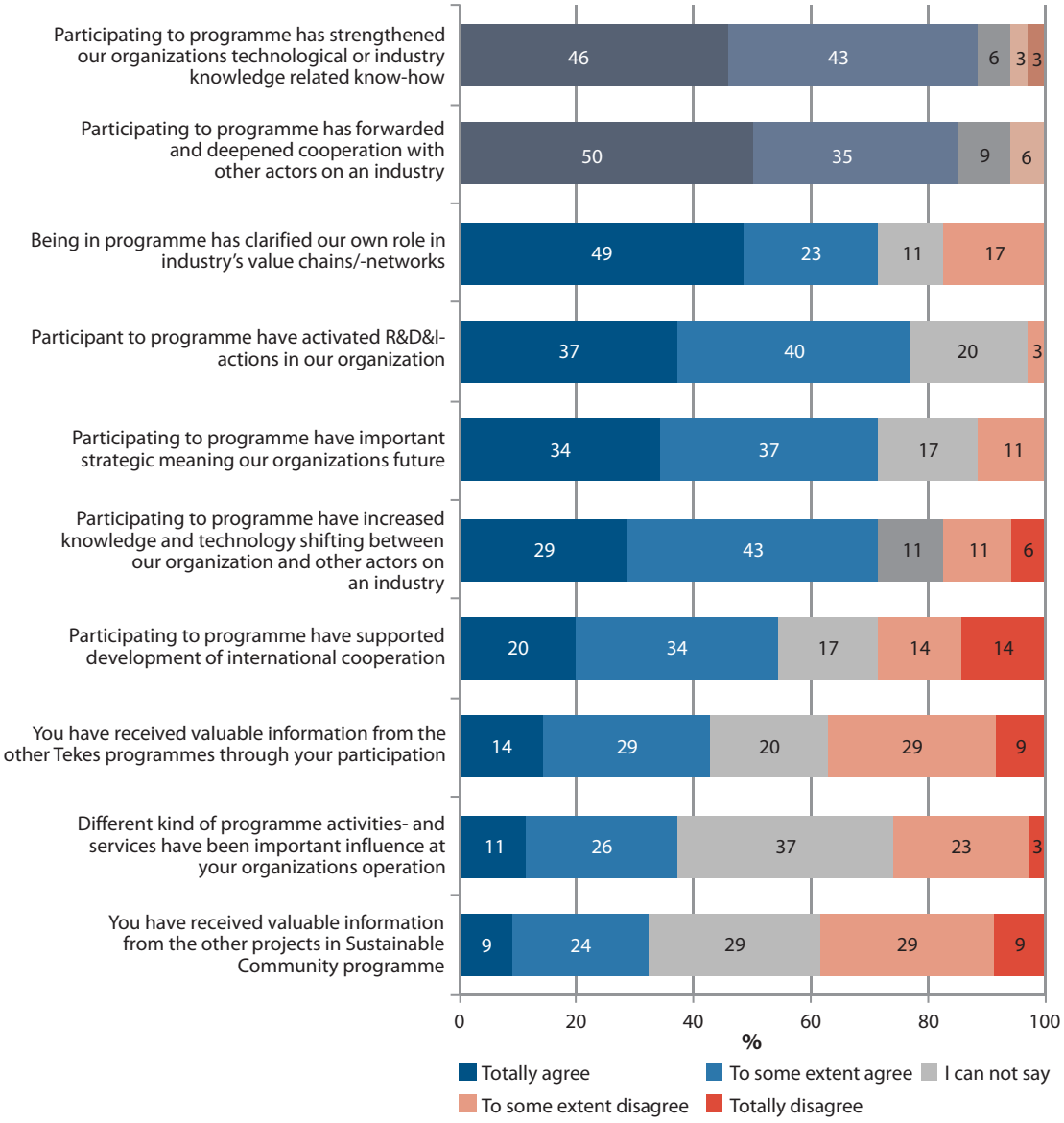
The MeraSun project was implemented in co-operation by three entities, the business operators in the project were Kaukora Oy and Rakennusliike Reponen Oy, the research institute partner was VTT. The goal of the project was to determine the suitability of sun collectors in heating the hot water in a block of flats or other large building. In particular, the objective was to find studied and measured information of how solar collectors function in real life in the conditions of Finland.

The goal of project was reached in terms of its most significant goals, and a substantial amount of measured data of was generated as background information, the use and exploitation of which has continued even after the project. Entities outside of the project implementers, especially government authorities and the energy industry, have been interested in the measurement results because there is hardly any measurement data on solar collectors on a similar scale. Using the calculation models created in the project, a solar collection system can be designed and dimensioned for old and new, as well as different sizes of blocks of flats, which expands the potential group of applications significantly. Furthermore they hoped that the combining of a solar collector system into passive house construction would have innovation value, which would increase the popularity of passive house construction. With the positive experiences obtained from the project, the use of solar collectors as part of the heating of the hot water of a block of flats has been continued in a block of flats at Kivistö's housing fair area, among others.

Tekes' role as a partial financier of the project was considered to be significant because without Teke's investment in the project, it would not have been likely possible to involve VTT, which conducted the measurements, for cost reasons, and consequently the data material generated by the project would not have necessarily reached the level that it did. ◀

At the level of project organizations, belonging to the Sustainable community programme has boosted the technological knowledge base and knowledge related to the sector, especially for organizations that were part of the programme, promoted and enabled closer co-operation between sector operators, clarified the role of different operators in the value chain or network of the industry, and activated the R&D&I activity of organizations in the sector. For many participating organizations, involvement has also been very important for the organization's future. (Figure 9)

Figure 9. Claims related to the benefits of participating in the programme. (Source: Questionnaire for projects of programme 2014. n=36)



CASE

Eco efficient urban village of Honkasuo

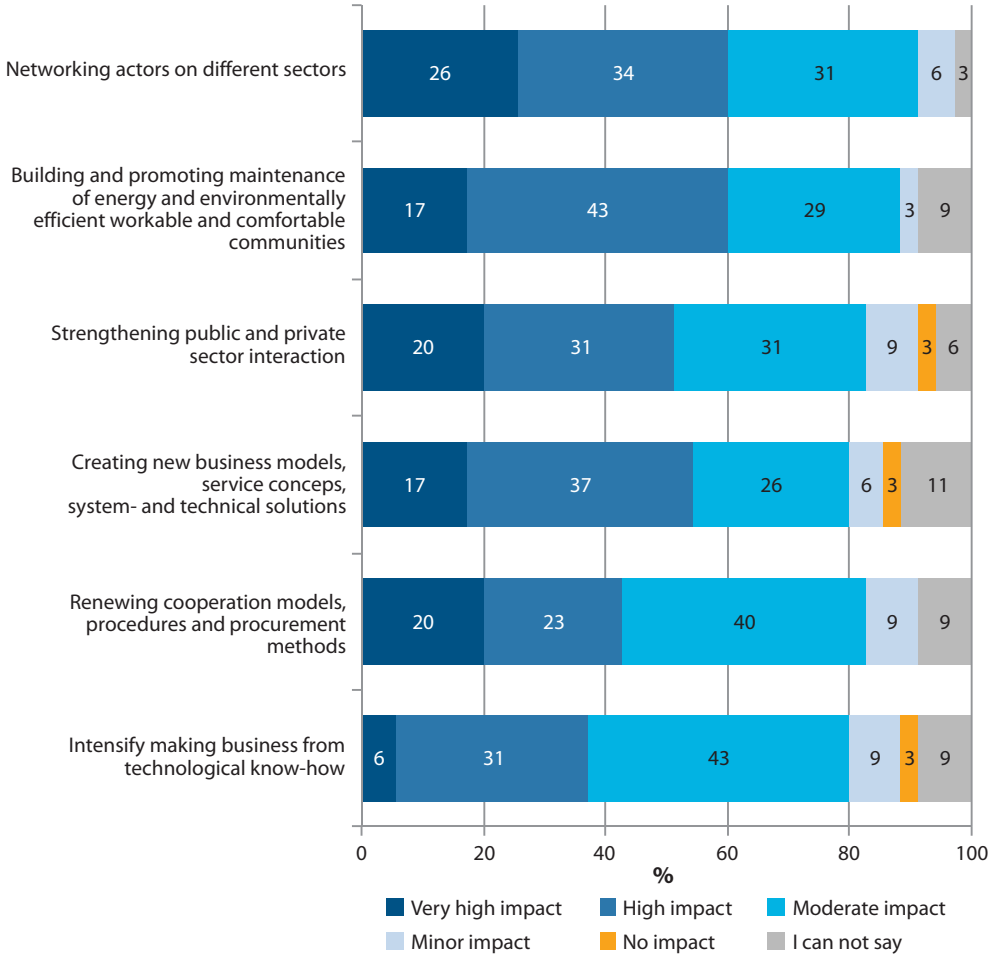
The project was carried out mostly in 2010 and it was implemented by the City of Helsinki. The goal of the project was to study the implementation of new eco efficiency criteria that are to be imposed, in the process of constructing a suburb in connection with a building lot reservation competition and city planning. A building lot reservation competition is one tool for controlling the quality of construction. One aim of the project was to develop this means of control, and to make it into a practice that combined city planning and an implementation plan, which fosters the construction of ecologically efficient residential areas. An internet-aided building lot reservation competition was organized in the project, which together with research co-operation was aimed at highlighting ecologically efficient and feasible construction solutions for detached wooden houses that are high in terms of urban landscape.

The project achieved the objectives set for it, a building lot competition was organized, and new information and learning was obtained through it regarding concrete organizing of a reservation competition and linking it to ecologically efficient construction. Finalizing the town plan was part of the project plan, but there was not time to do the finalization work within the framework of the project because committee hearings took so much time. During the reservation competition, it was found to be an effective and usable model, especially during the reservation and evaluation phase. As a partner outside of the project, Helsinki University of Technology brought added value to the project with its own project, which defined the eco efficiency criteria that were applied in the eco efficient urban village project and building lot reservation competition of Honkasuo. Funding channeled through the Sustainable community programme was significant with regard to implementing the project, and co-operation with Tekes as considered to be constructive. ◀

3.4.2 Impacts at programme level

With the exception of the thematic area of well-being and healthiness, the substance of the research and development projects of the programme were directed fairly evenly across the thematic areas of the programme. Concrete results in projects of the different thematic areas included increased understanding of the industry and its development, the development of new operational processes and models, the creation or renewal of various concepts and tools, and the creation of new assessment methods, gauges and guidelines, etc. There were several individual projects in the different thematic areas of the programme in which good successes were achieved, but based on the views of experts and the project questionnaire, as a whole, the greatest success of the thematic areas was achieved in the subsectors of energy efficiency, land-use planning, building technical systems and construction. However, individual thematic areas were not emphasized in the programme; instead the emphasis was on the entirety of sustainable community development comprised of the different themes. When looking at the whole, based on the project questionnaire, in the target areas that combined different thematic areas, there was particularly great success in the networking of operators from different subsectors, in promoting the construction and maintenance of communities that are efficient and functional in terms of energy and environmental impacts, and in strengthening the interaction of the public and private sector, and in the creation of new business models, service concepts, system solutions and technological solutions. (Figure 10)

Figure 10. Impacts of Sustainable community programme on subsequent target areas of programme.



It is also worth noting that the majority of operators in the project felt that the programme had at least a moderate impact on the renewal of industry's models of co-operation, operating practices and procurement practices. This, combined with the networking impacts of operators, can also be seen as having a wider significance in unifying the sector and making practices more uniform.

CASE

Management support of Kuntademo – partnership town planning

The Management support of Kuntademo – partnership town planning project implemented by the City of Järvenpää was carried out between 12 Feb 2009 and 31 Jan 2010. The objective of the project was to promote a more dynamic and shorter-duration planning model and process by means of partnership town planning. Possible companies in charge of building the area being planned were involved in the partnership town planning, and the actual zoning plan of the town plan was based on an architectural competition that was organised.

The project achieved the goals that were set for it. The project involved the Indica tool of UDM company (a service product for controlling the quality of the planning process), which was accommodated to support the strategy of the City of Järvenpää in order to foster partnership planning. The use of the tool assisted in the organising of a more clear competition process. The project contributed to the strengthening of contacts of the City of Järvenpää, and continuation of co-operation after the project has been natural with construction companies as well as government bodies.

The concrete core of the project was the competitive tendering of the construction of the building lots generated through the town planning, and the co-ordination of the competitive tendering. The competitive tendering was implemented as planned, but the number of entrants in the competition would have ideally been greater. One of the factors that probably contributed to this was the period of time in which the project was implemented, when the growth of the construction industry was modest or negative. The difficulties of the industry were also reflected during the period after the competitive tendering, some of the companies which had succeeded in the competition were unable to begin construction projects due to financial reasons.

Tekes' contribution in the launching of the project was more encouraging than enabling. It was a smallish project in terms of value, which received positive visibility through Tekes' involvement. The experience and results generated through the project have lived on, as construction projects have been started up in the planned and tendered areas, and a partnership planning model similar to the one in the project can be considered for use in future as well. ◀

Based on the project questionnaire conducted in connection with the evaluation, nearly all of the project managers believed that the project achieved the goals set for it. However, it is too early to evaluate the final results and impacts of the project because the impact mechanisms generated by the project are complex and, in many ways, still in progress. Although the impact processes generated by the Sustainable community programme are still in progress, it is already possible to see, at this point, that the programme had the following impacts in its operating environment as a whole:

- Eco efficiency criteria were highlighted strongly in land-use planning and tools related to them were created
- New practices were created for municipalities (such as partnership town planning) in land –use planning
- Several zero energy sites were implemented, and energy efficiency and resource efficiency were successfully brought into the thinking and discussions of the real estate and construction industry
- Functional concepts for commercializing low energy concepts were developed
- Belief in, and the conditions for, regional energy systems were created
- Influenced sustainable thinking in community-level planning
- Contributed extensively to the cohesion of the real estate and construction industry, or from silos to the overall optimization of the know-how and knowledge of different sectors
- Boosted the development of the industry based on multidisciplinary research, and strengthened the innovation basis of the industry
- Raised the level of competence and knowledge in the industry to solve its challenges
- Highlighted the topic of the programme, and subject areas have been successfully brought to the agenda of developers and policymakers of the sector.

CASE

Model 2020 – Development project for Sarvvik-Sundsberg land use

The project was implemented between 2010 and 2012. Participating in the implementation of the project were YIT Rakennus, Eke-rakennus and Sato-Rakennuttajat. The core goal of the project was to produce a 3D tool for the master plan level of planning alongside 2D-level map work. The primary features desired from the tool being developed were simplicity, good usability and clarity. The purpose of the project was to collected this data material into the one and same 3D-level tool. The project was implemented for Kirkkonummi for an approximately 500 hectare pilot area near the boundary of Espoo.

The project achieved its goal, and a 3D-based tool was realised by Pöyry, and it proved to be effective. The co-operation and contact that developed during the project have continued between participating operators after the project. The significance of Tekes and the Sustainable community programme in the implementation of the project is seen as being significant. Implementation of the project without the funding of the programme would have been unlikely. The implementers said it was a positive thing that Tekes was active in the direction of municipalities during the project and organised events in which the tool being developed was presented to municipalities. The unambiguous message of the project to Tekes was that with the positive experience, bold experimental projects need to be carried out in future too. ◀

The Sustainable community programme has played a significant role as an activator of research and development work in the industry. Based on funding information of Tekes, the Sustainable community programme has been the most important form of Tekes funding for the responsible organizations of business projects involved in the programme in the 2000s, and it has activated the R&D activity of these organizations strongly during the time of the programme. Compared to the companies of many other programmes, the funding received by participating companies previously from Tekes or from somewhere else has been little relative to the funding received in the programme in 2008–2012. Likewise relative few of the companies in the programme have received other Tekes funding. It is remarkable that of the 126 responsible organizations of the business projects of the programme (which had a total of 159 projects), as many as 79 (63%) had not previously received Tekes funding in the 2000s. In 2013, when funding ended for the Sustainable community programme, there was clearly a larger group of companies receiving Tekes funding than when the programme began. This is a clear signal that the programme has contributed to the activation of, and increase in, research and development work of the companies. (Figures 11 and 12)

Figure 11. Tekes funding received by companies participating in the Sustainable community programme in 2000–2013. (Source: Tekes)

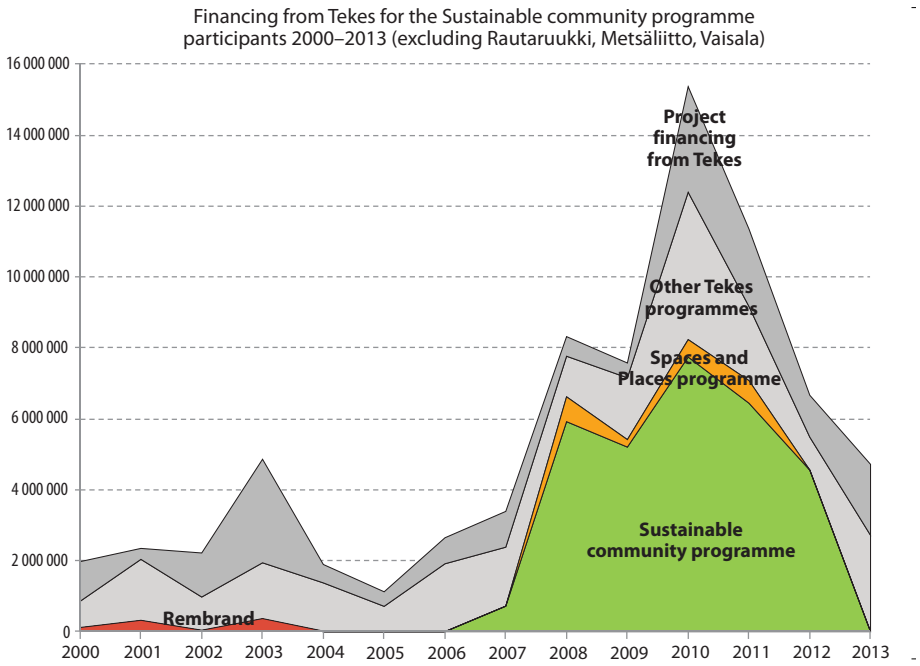
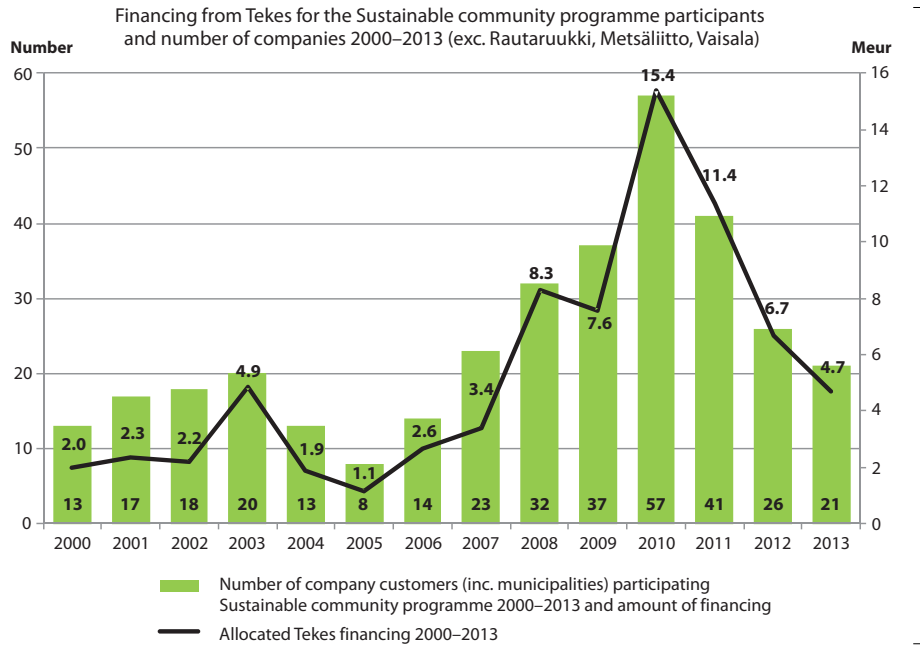


Figure 12. Number of companies participating in the Sustainable community programme and Tekes funding received in 2000–2013. (Source: Tekes)



4 Final evaluation of the Spaces and Places programme

4.1 General information about the Spaces and Places programme

The Spaces and Places programme (Tila) (2008–2012) was implemented simultaneously with the implementation of the Sustainable community programme. The focus of the programme was on the development of business operations related to premises, and a better understanding of the user needs of premises. Premises were defined in the programme as a combination of physical, virtual and social attributes, which when complementing each other, form a functioning business and service platform for the users and utilizers of the premises. The utilisation of ICT technology in the development of premises was strongly emphasised in the development activity of the programme. The objectives of the Spaces and Places programme were:

- Increase premises-related business activity and international competitiveness
- Increase understanding of user needs
- Generate and promote premises-related user-centred business concepts
- Create opportunities for cross-sector and cross-disciplinary networking and co-operatoin
- Increase the experientiality of premises.

The main themes of the Spaces and Places programme, the ones which the programme focused on, were work environments, living, real estate business, public and commercial premises, experientiality of premises and virtual spaces. In 2008–2012 the programme provided funding for 102 business projects and 82 research projects. The total funding for the programme was a little over 77 million euros, of which Tekes' share was a little less than 38 million euros. Tekes allocated 14 million euros into research projects, and a little under 24 million euros in business projects. The highest quantity of projects were implemented by Aalto University Foundation, with 27 projects. Projects were implemented by a total of 108 different entities.

Table 4. Numerical information about the Spaces and Places programme.

Programme financing	
Total budget of all financed projects	77 200 000 EUR
Tekes financial contribution to projects	37 800 000 EUR
Tekes financial contribution to research-projects	14 000 000 EUR
Tekes financial contribution to enterprise-projects	23 800 000 EUR
Projects financed in the program	
Number of projects/of which the number of joint projects	184 projects all together/24 joint projects
Number of research-projects	82 projects
Number of enterprise-projects	102 projects
Organizations that implemented projects	
Total number of organizations that implemented projects	113 organizations
Number of enterprises that implemented projects	92 enterprises

4.2 Strategic success of the programme

The decision to prepare the project was made in the mid-2000s, when a need was recognised in the real estate and construction industry for the user-oriented development of the solutions and services of premises. There was not a strong tradition of developing premises and the related business activity in Finland before the programme; consequently development was started in the preparation work with a clean slate. The main target group of the programme was owners of buildings or properties, and the aim of the actions of the programme was to influence them. At the heart of the preparation of the programme were the questions of how premises can support business operations in work offices, how physical premises and premises-related services and technological solutions can complement each other, and how premises-related business activity can be developed in Finland. The preparation stage of the Spaces and Places programme was a typical 9 month period in which Tekes' own vision-creating work was organised, along with workshops participated by some companies, researchers and experts. At the same time, there was an extensive survey of the world made of what kinds of practices and development trends related to premises existed in the world in the mid-2000s. The starting point for the concept of premises was a combination of physical, virtual and social space.

Before the programme, there was not a strong tradition in Finland related to the development of premises and related business operations. The Spaces and Places programme aimed to launch a new area of development in research and business operations. Indeed the programme was the first Tekes programme in which the subject was physical spatial solutions or layouts. Furthermore it brought into focus, in a new way, the business potential of developing properties and premises. Although the goals of the programme were ambitious and some of the goals related to the development of premises were ahead of their time, there was great success in setting the programme goals in relation to the new business opportunities of premises, which were enabled by technology (such as new types of business concepts). Changes that took place in the use of purpose of premises were also successfully taken into account in the programme. Changes in patterns of use of premises, which mainly were due to users of premises, (virtual worlds, changes in and the business-driven nature of how work is done, ecological aspects of working) have clearly shaped the premises market in Finland. The programme identified the need for the development of special solutions and the user-orientation of services.

The programme identified the business potential of the use of premises well, but in certain areas of focus (such as virtual premises) perhaps the desired development leaps were too ambition in relation to the readiness of industry operators to change. The programme offered "New solutions for new customers of Tekes", and perhaps that is why the goals of the programme were not initially fully understood by the players. After the programme was launched, it was put into specific terms and the content was shaped to better suit target groups.

4.3 Success of implementation method and implementation concept of programme

Programme services and programmatic measures of Spaces and Places programme

Like the Sustainable community programme, the Spaces and Places programme was organised among a management team, co-ordinator and programme director and programme team. On Tekes' side, there was also a person responsible for communications in the programme. The programme contained several traditional services of Tekes' programmes. These included market reviews, seminars and activation events, orientation visits, newsletters, press releases, communications training for researchers, research materials, videos and virtual presentations, project presentations and so on. At the housing fair of Tampere in 2012, Tekes offered the research and business projects the opportunity to present the results of their projects to the general public. Signal sessions, in turn, were information and discussion events of topical information and themes conducted via video conference connections. The most significant new types of social media services in the programme were Tekes Tori and Hankegalleria. In addition to this, Spaces and Places brunches in particular were a new type of event that attracted attention in the programme. There were several Spaces and Places brunches held every year (with the aim of once per month) related to various themes. The brunches were small-scale events for promoting networking; information about the programme and good projects was communicated; and new ideas, business models and project candidates from different sectors were brainstormed with the target group of the invitation.

Activation of the field and project selection

As was the case in the Sustainable community programme, the Spaces and Places programme also invested a lot of effort into activitation by meeting a wide range of operators (such as property owners, design offices and the ICT sectors) in the initial stage of the programme, and by organising events in which the programme was presented and development ideas and proposals were collected. The strong effort in social media and Spaces and Places brunches can also be considered activation activity; these activated the field to join the discussion on the target areas of the programme and thereby participating in the development work of the industry. Similarly the national launching of Tulevaisuuden työympäristöt (*Future work environments*) and VirtuaaliSpaces and Places (*Virtual premises*) networks, which were hosted in the programme to meet the needs of operators, can be considered as activation and a promotion practice. A strategic goal was set for both networks together with the field of operators; in practice these goals were advanced by various actions such as seminars, exchange visits, information about new foreign and domestic research, and new business ideas and potentials.

The programme put a lot of effort into activating the field, but the challenge proved to be – as in the Sustainable community programme – in getting the core message of the programme across, and the activation of real estate operators in using and developing the potential of premises according the goals of the programme. Another challenge of activation was demonstrating the business benefits of R&D activity related to the development of premises, all operators of the value chain comprehensively. This was in part reflected in the lack of initiative by the operators of the field, and in the low number of contacts from the field in the direction of the programme. However, no major entity was left out of the programme, but representation by digital companies, retail sector and property owners remained relatively low in spite of being contacted. However, these sectors were activated in other Tekes programmes. The value chain related to the business operations of premises is a large entity, and when the programme was being launched it was difficult to demonstrate to owners, for example, the business benefits of investing in research and development and participation in the programme.

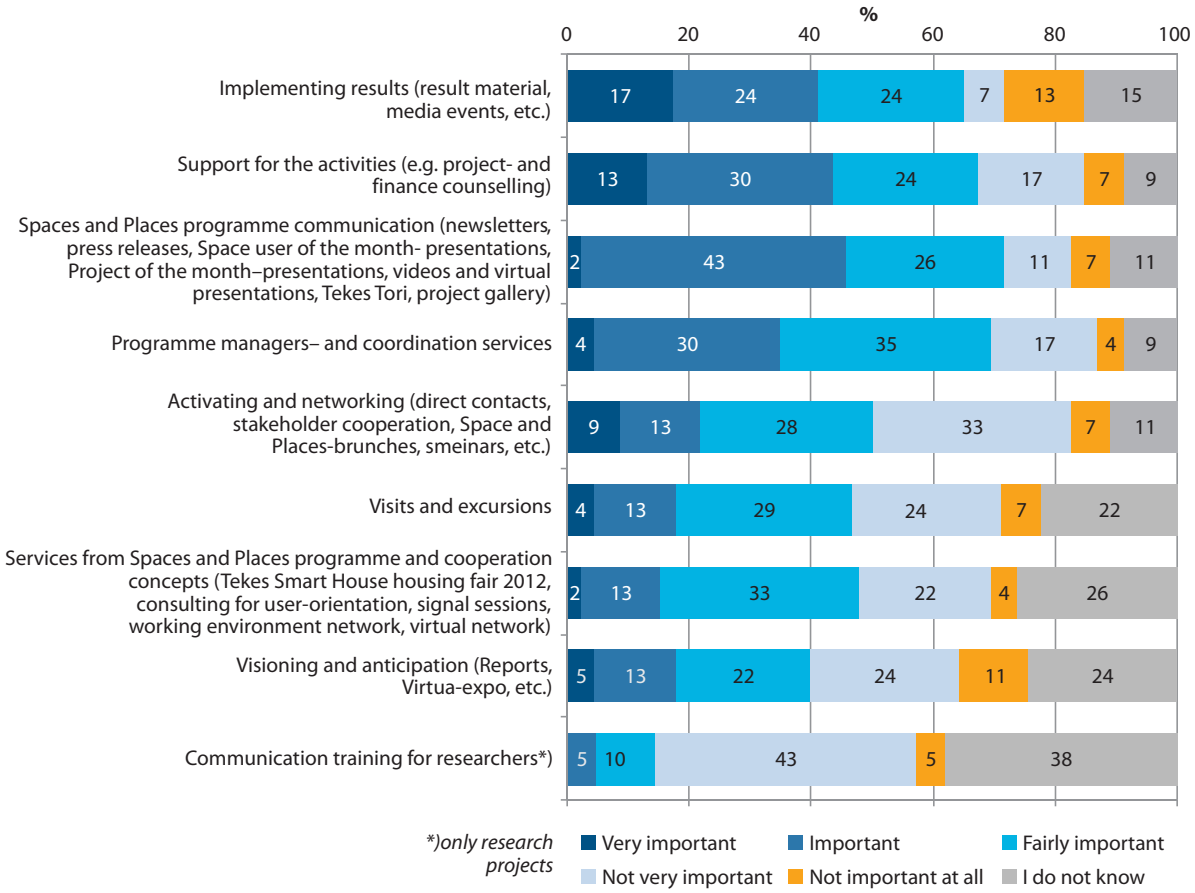
The projects of the programme were directed at its focal areas relatively equally. The highest number of projects were implemented in the focus areas of Living (30% of programme projects) and Public and commercial premises (27%). The smallest number of projects, in turn, were implemented in the focus areas of Virtual premises (11%) and Real estate business (15%). In fact, one minor weakness of the programme was the eventual low number of projects emphasising the development of virtual premises, research on the value chains and revenue logic of the real estate business, and the development of business models. Based on project financing information of Tekes, 55 (60%) of the 93 responsible organizations of the business project had not received funding from Tekes previously in the 2000s. In this regard, one issue that can be considered a success of the programme is the activation of new operators into the programme and under Tekes financing.

Success of the implementation method of the programme

As was the case for the Sustainable community programme, the Spaces and Places programme can also be considered a very typical modern Tekes programme in terms of its method of implementation and programme services, with the exception of the use of social media. One factor that distinguishes it from other Tekes programmes is how much effort the programme put into information networking: Among other things, the Spaces and Places programme created the Future work environments network after it was discovered in the initial stage of the programme that there was a need for closer national collaboration in the development of work environments and for virtual premises. The essential entities were contacted through the email lists of the network, and communication of information on the topics was enhanced. The brunches of the Spaces and Places programme were also new types of programme events in which information was communicated about the programme, networking was enhanced, and information about programme projects, and trends in the development of premises, were conveyed.

Based on a project questionnaire, the problem was successful, especially in implementing results, development support and communication of projects. In the Spaces and Places programme, as in the Sustainable community programme, the communication training for researching, which was a new form of activity, was not well known even among researchers, and a whole its benefits were considered to be relatively minimal. (Figure 13)

Figure 13. Estimated importance of programme actions provided by the Spaces and Places programme with respect to succes of the programme. (Source: Questionnaire for projects of programme 2014. n=36)

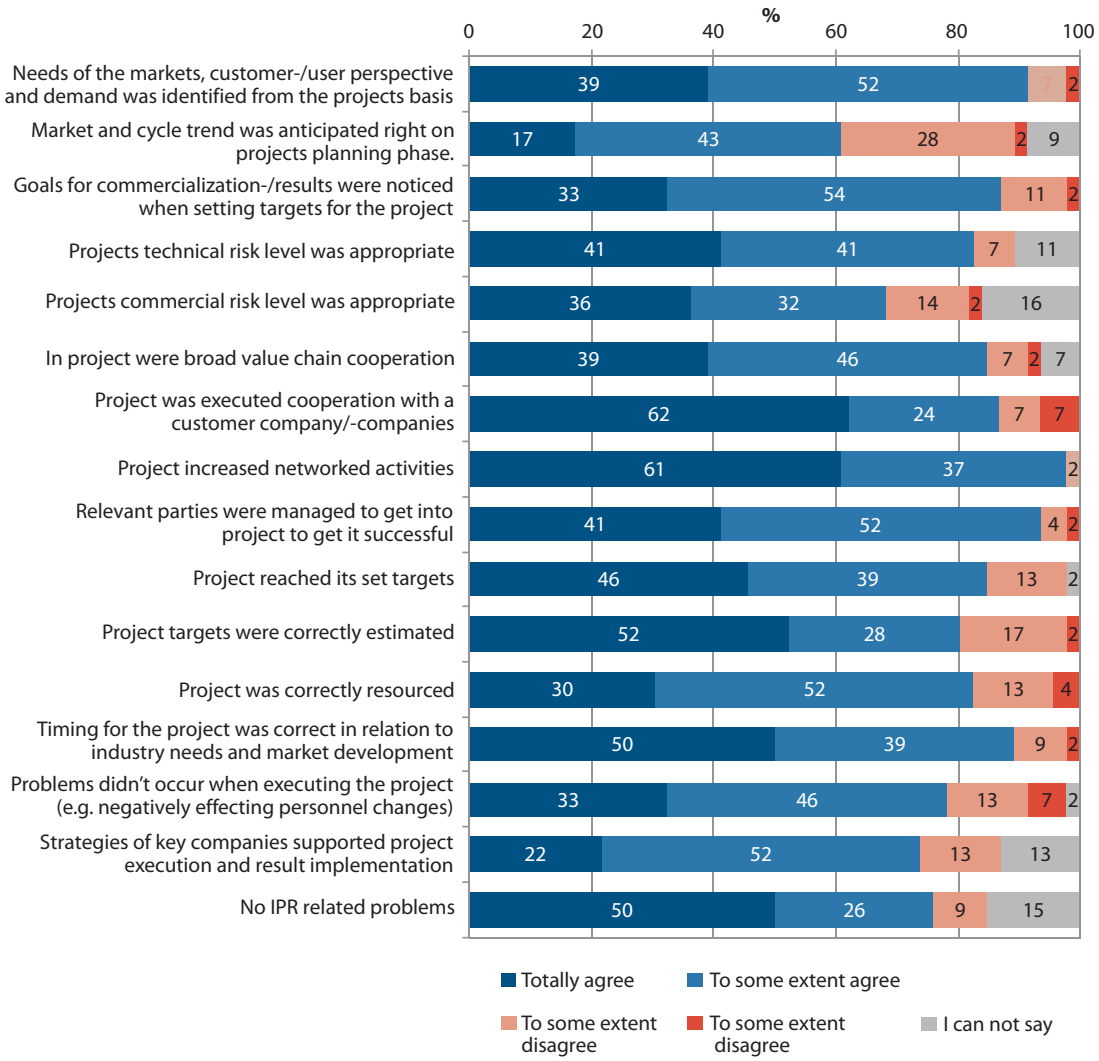


From the viewpoint of achieving its wide range of goals, the method of implementing the Spaces and Places programme was very successful even though the programmatic benefits were not as apparent for the projects as in the Sustainable community programme. Practices that can be considered to be programmatic practices in the Spaces and Places programme include the Spaces and Places brunches as tools for activation, communication and networking, and in results seminars arranged by the programme for the purpose of promoting the implementation of results. Some of the project leaders would have wanted more support from the programme for co-ordination and contact between projects, the programme team and Tekes. Similarly there would have a desire for more programmatic support for mutual communication and collaboration of the projects, especially within the same topic. Also, with regard to the Spaces and Places brunches, there was a feeling that it would have been good to have more upper level management of companies participating.

As a whole, the Spaces and Places programme's method of implementation enabled a good implmentation environment for the projects, and there was considered to be very few problems that would have complicated implementation of the project. In practice, only internal factors of projects, such as staff turnover and partner problems, were seen as having complicated the success of the project. In a small number of projects there was also a feeling that the different interests and operating cultures of research and business organizations complicated the implementation of the project and the gen-

eration of results and impacts. On the research side, people felt like small to medium sized enterprises don't always have enough time and resources for research and development work in joint projects. Based on claims describing the success of the project, the profile of the Spaces and Places programme projects is quite similar to the one in the Sustainable community programme. The projects achieved the objectives set for it, and the programme was particularly successful in generating customer-oriented projects that aimed at utilising results and involving extensive value chain co-operation. (Figure 14) Similarly there was also very good success in the timing of projects in relation to industry needs and the trends in the market, although the programme was implemented in an operating environment that was difficult in terms of market and economic trends and difficult to anticipate during the planning phase of the projects.

Figure 14. Claims describing the success of the project in the Spaces and Places programme. (Source: Questionnaire for projects of programme 2014. n=36)



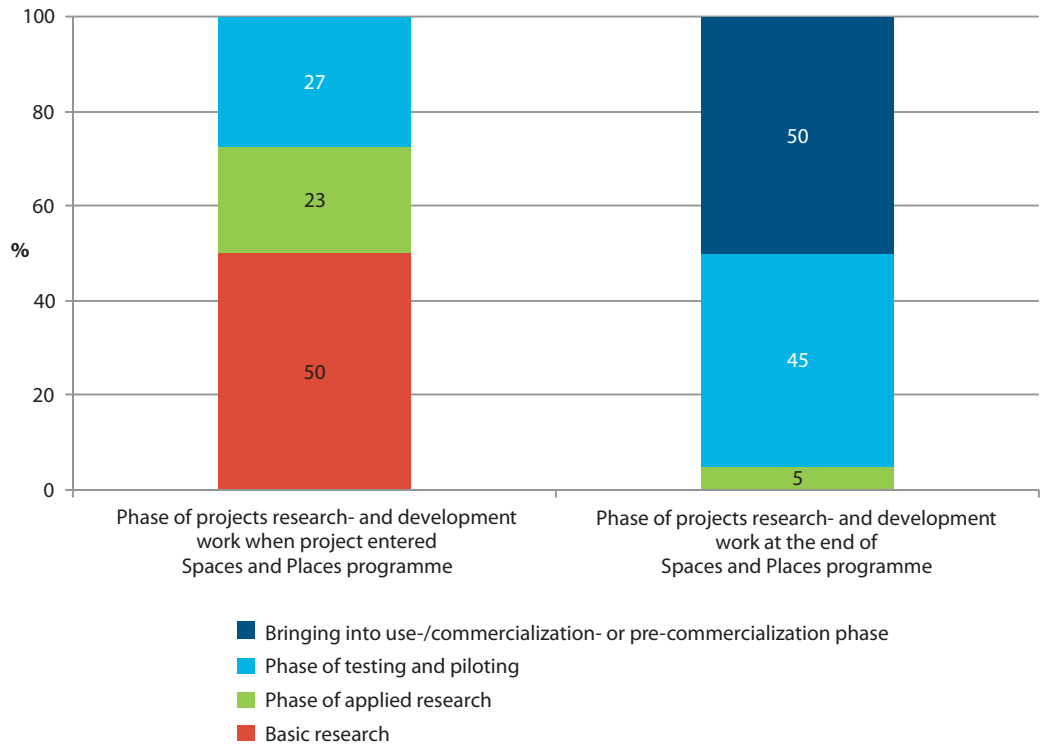
4.4 Results and impacts of programme

The main themes of the Spaces and Places programme were work environments, living, real estate business, and public and commercial premises, experientiality of premises, and virtual premises. There were 102 business projects and 82 research projects funded in the programme in 2008-2012. The total funding of the programme was a little over 77 million euros, of which Tekes' share was a little under 38 million euros. Tekes' allocated 14 million euros to research projects and a little under 24 million euros to business projects. The highest number of projects, 27, was implemented by Aalto University Foundation. Projects were implemented by a total of 108 different entities.

4.4.1 Project-level impacts

As was the case in the Sustainable community programme, at the project level, one of the impacts of the Spaces and Places programme, that can be considered the most significant is the clear leap from the research stage to the phase of commercialisation and adoption of results, which took place on average in the research and development process of the projects during the programme. Based on a questionnaire of the project, three out of four participating business projects were only at the stage of basic research or applied research. After the end of the programme, not a single project in the development work of the project was still in the basic research phase and only 5% of the projects were at the stage of applied research. Instead half of the projects had advanced to the stage of commercialisation and business creation. (Figure 15)

Figure 15. The assessed stage of development work of the project when the project joined the the Spaces and Places programme and at the end of the programme. (Source: Questionnaire for projects of programme 2014. n=25)



CASE

User oriented Y-building (HospiCaseY)

The user-oriented Y-building (*Y-talo*) implemented by the Hospital District of South Ostrobothnia (HospiCaseY) ended on August 2011. The project was a continuation project for the HospiTool project implemented through the FinnWell programme. The aim of the HospiCaseY project was to apply an approach that utilized users' views to the design and construction of the Y-building. This was a research project that supported the actual construction project. In more detail, the aim was better compatibility of the premises and processes of the Y-building. Another goal was to apply a planning process based on management of requirements alongside the designing of the hospital with critical premise entities, and to develop together by learning the processes and business models of companies, in which all parties can participate in planning and the development of the planning process.

The project achieved the goal set for it. After the end of the project, the co-operation network that emerged with it began planning a joint continuation plan for the next hospital environment, for the virtual designing of an intensive care unit. Based on feedback received on the HospiCaseY project, the user-oriented planning was rated as positive practice that can be utilized in future, too. Several different entities were involved in the implementation of the project, including VTT, which was responsible for designing and building the management tool for requirements. The hospital staff considered the user-oriented planning process to be sensible, and would like to continue planning common spaces with the same model, and be a part of transformational leadership. As a result of the project, virtual modelings in collaborating companies of the project, such as architectural offices, are playing a greater role than before.

Funding received through the Spaces and Places programme enabled the implementation of the project because the Hospital District of South Ostrobothnia, which implemented the project, does not allocate resources for similar research and development activity. ◀

According to the views held by the project managers, the results of the projects will be utilized widely by companies or public organizations. The majority of project managers of research projects believed that the results of the project will be utilized in the processes of companies in the industry or public organizations or that a company or public organization will develop a product or service from the results of the research. Similarly the majority of the project managers of business projects believed that the results of the research will be utilized in the processes of their own organization or that the product or service will be developed from the project results in their own organization. In addition to this, one in four project managers believed that the results of the project will also be used more broadly in the sectors of the built environment, in addition the aforementioned (Figure 16).

Figure 16. Estimates by persons responsible for research projects of how research results have been utilized or will be utilized in companies or other organizations in the sector.

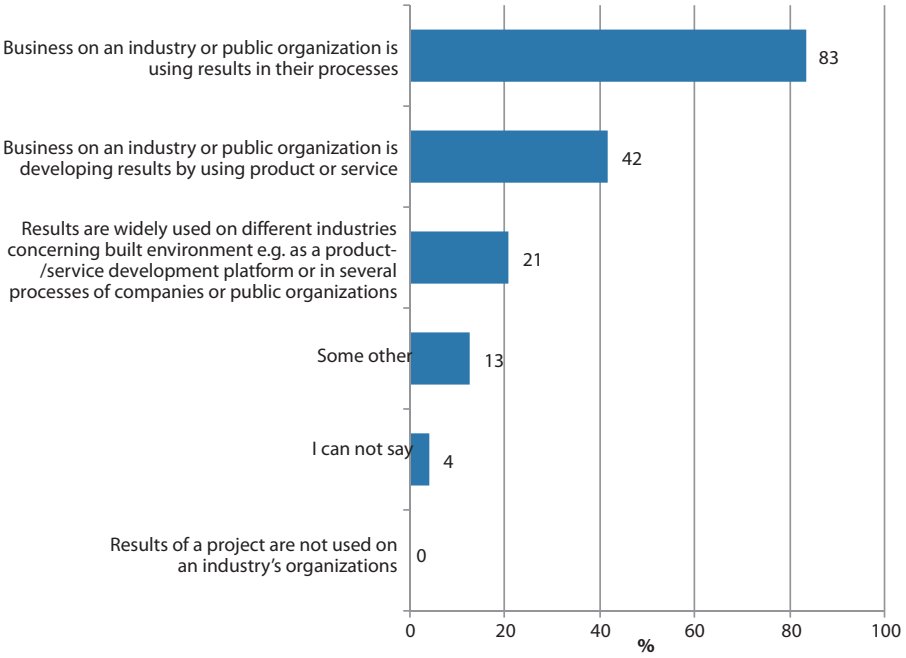
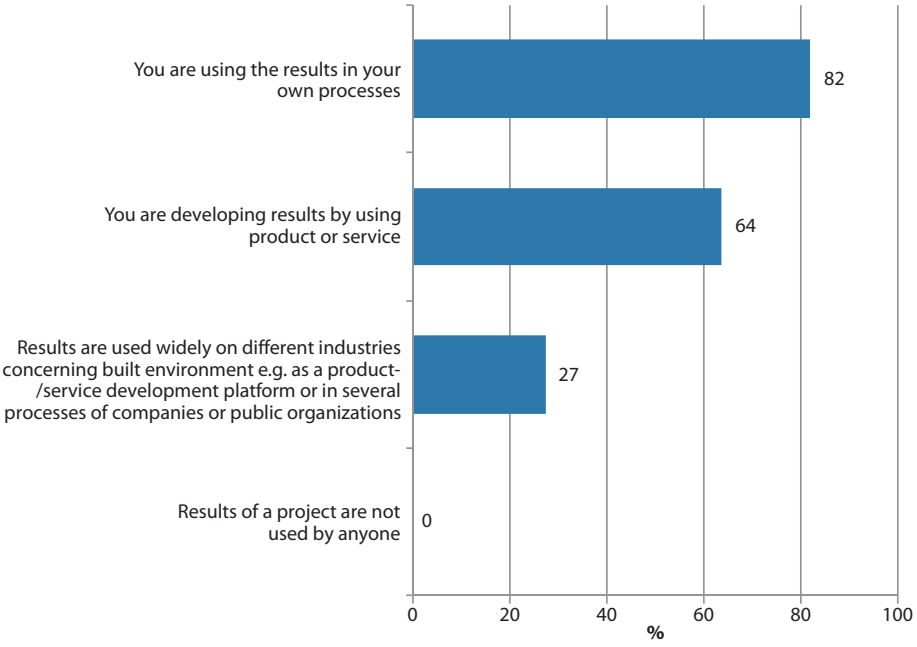


Figure 17. Estimates by persons responsible for business projects of how research results have been utilized or will be utilized in the sector.



Based on a project questionnaire, the Spaces and Places programme has been very successful in the promotion and commercialization of the adoption of the results of research and development. This can be explained largely by the same reasons as in the Sustainable community programme; the programmes were properly timed in relation to needs of the market and business opportunities, the needs/demand of the sector were successfully surveyed in the project, the customer/end users were strongly connected and involved in the starting points and contents of the projects, and a strong communication of results at the programme and project level resulted in successful dissemination and adoption of the results of projects. Based on the questionnaire, the clear difference between the Spaces and Places programme and the Sustainable community programmes with regard to utilization of results was, however, that the individual companies that were utilising the results of the business projects in the Spaces and Places programme played a clearly larger role than in the Sustainable community programme, which had a greater emphasis on society. Similarly, project managers believed that there will be less utilization of results from the research projects of the Spaces and Places programme in companies, particularly more widely in the sectors of the built environment, than in the Sustainable community programme's research projects.

CASE

dSign Vertti Kivi & Co: Development of Ambient Design concept and space model for the international market

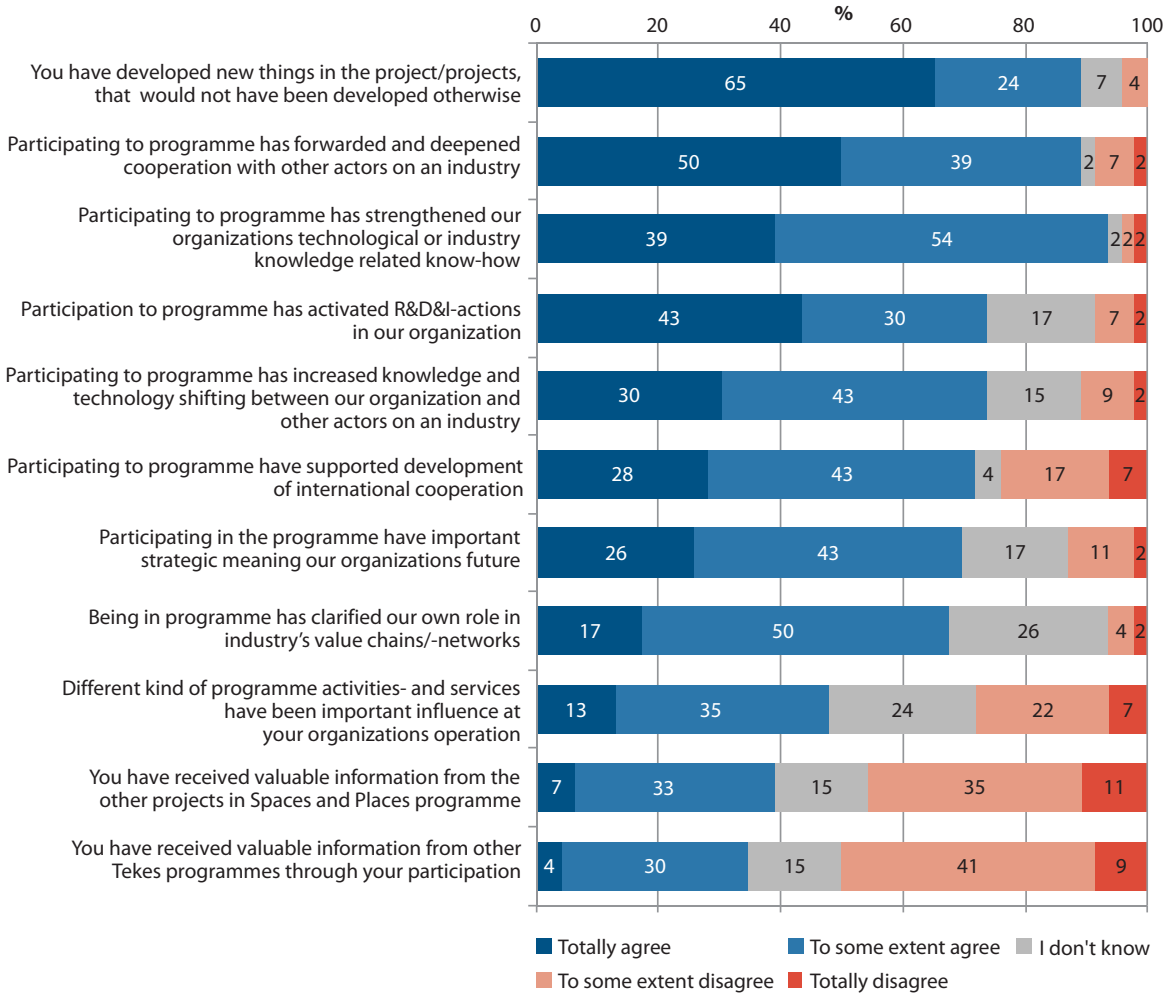
The core activity in the implementation of the dSign Vertti Kivi & Co: Development of the Ambient Design concept and space model for the international market was the development of a model that would be suitable for different kinds of spaces and which had effects that stimulated different senses. The starting point for the design of the concept was a model that is implemented with structural solutions and which is adaptable for different kinds of premises and situations regardless of what the premises or space are. The purpose of the project was to create numerous faces for one space. In practice the creation of more than one face was generated with various lighting, material, colour and audio solutions, as well as moving images, fragrances and even tastes.

Spaces that were considered suitable for the premise concept being developed in the project included public spaces such as restaurants and lobbies. The concrete work of the project in the initial stage was to find the most suitable market areas (internationally), their potential and the competitive situation. In order to determine these issues, hotel managers, company managers and owners of shops were involved in the project.

The absolute competitive advantage of the concept that was generated as a result of the project funded through the Spaces and Places programme is that there are no similar concepts. Also, with the funding, the implementation of the project was possible to the entire planned extent. The project ended in 2011, and subsequently there has been positive development and visibility of the concept in the international networks that grew with the project. With the growth of international visibility, the number of international projects has also grown. The concept that resulted from the project is currently the top product of Vertti Kivi & Co. ◀

Being a part of the Spaces and Places programme has led to project organizations developing new things that would not have otherwise been developed. Nearly 60% of project managers estimated that the project would not have been implemented in any way without the Spaces and Places programme. Belonging to the programme has also significantly promoted and deepened collaboration among operators in the sector, boosted the knowledge base of technology and industry awareness of organizations, activated the R&D&I activity of organizations in the sector, and increased transfer of expertise between operators in the industry. (Figure 18) In addition to this, research organizations have received concrete benefit as, among other things, there is an increase in research know-how of the topic, there is increased appreciation of the research information of the topic in their own background organization, and more broadly in social and business; opportunities for international co-operation have improved, and the projects have created opportunities for the further development of results that have now been obtained. In addition to the development of know-how and networking, concrete benefits of the business projects in the participating organizations, have been the generation of new products and product concepts, improved market know-how, and changes and new business areas that have occurred in the trend of the business (especially services).

Figure 18. Claims related to the benefits of participating in the Spaces and Places programme. (Source: Questionnaire of projects of programme 2014. N=36)



CASE

HOAS-Laboratory

The HOAS-laboratory project of the Foundation for Student Housing in the Helsinki Region (HOAS) was implemented between October 2010 and May 2012. The core contents of the project were wisdom and community of living. The themes of wise living and community included caring about the apartment and the environment, as well as consideration of other residents. The development of wise living and community has been advanced with dozens of experiments carried out through the project.

The project has demonstrated that good practices generated through development activity are reflected best through practical pilots. These experiments have included updating the concept of dormitory living and energy saving competitions. It was observed in the project that development work needs to shift away from a building orientation toward a resident and user orientation. Resident and user orientation was successfully fostered by improving communications, for instance.

During the project, the entire service model of HOAS was renewed, which makes it difficult to identify individual benefits to HOAS before and after the project. As the new service model was being activated, the results obtained from the project were found to be in line with, and suitable for, the new service model.

Tekes' significance in the project has been encouraging during the start-up phase of the project. Getting funding for the project encouraged HOAS to start up the project because Tekes also recognised the potential of the project and the benefits that would be generated from it. After the project, the results of the project have lived on, observations that have been made later through the project have recently been implemented into HOAS' operations and the best functioning pilots have been continued in different sites. Another major benefit from the project has been the networking with various operators during the project, with whom collaboration has continued even after the project. ◀

4.4.2 Impacts at programme level

At the project level good results were achieved particularly in the development of work environments and in virtual premises. The development of work environments included successful business projects as well as extensive research projects that resulted in both large concrete changes in the work environment as well as new theory and know-how for future use. Similarly several successful business and research projects were carried out on the housing side. Changes on the housing side are slower, however, than in the development of work environments, and will become apparent only in the longer term. In the thematic areas of virtual premises and environment, several research and pilot projects were carried out, and development work related to combining virtual worlds and reality, among other things, (Avatar concept). During the project, a leap was taken forward in research and development related to virtual premises. In relation to market readiness, the topic may have been before its time because no significant concrete business was generated in the project in that topic. There were numerous projects in the thematic area of public and commercial premises, and experientiality, but no great technological or business leaps in the thematic area was achieved in the projects. On the commercial side, the value chain of the real estate business was not fully ready yet to see the business benefit from developing premises.

Overall, based on the project questionnaire, the thematic areas of the programme were very successful in increasing understanding new user needs (especially work environments and their end users), increase in cross-sector and scientific networking and co-operation, and in the generation and promotion of user-oriented business conceptions. Also, with regard to the two other target areas of the programme, the experientiality and increasing premises-related business operations, there was moderate success, especially given the fact that they were direct goals in some of the projects (compare to the large proportion of EOS responses). (Figure 19)

CASE

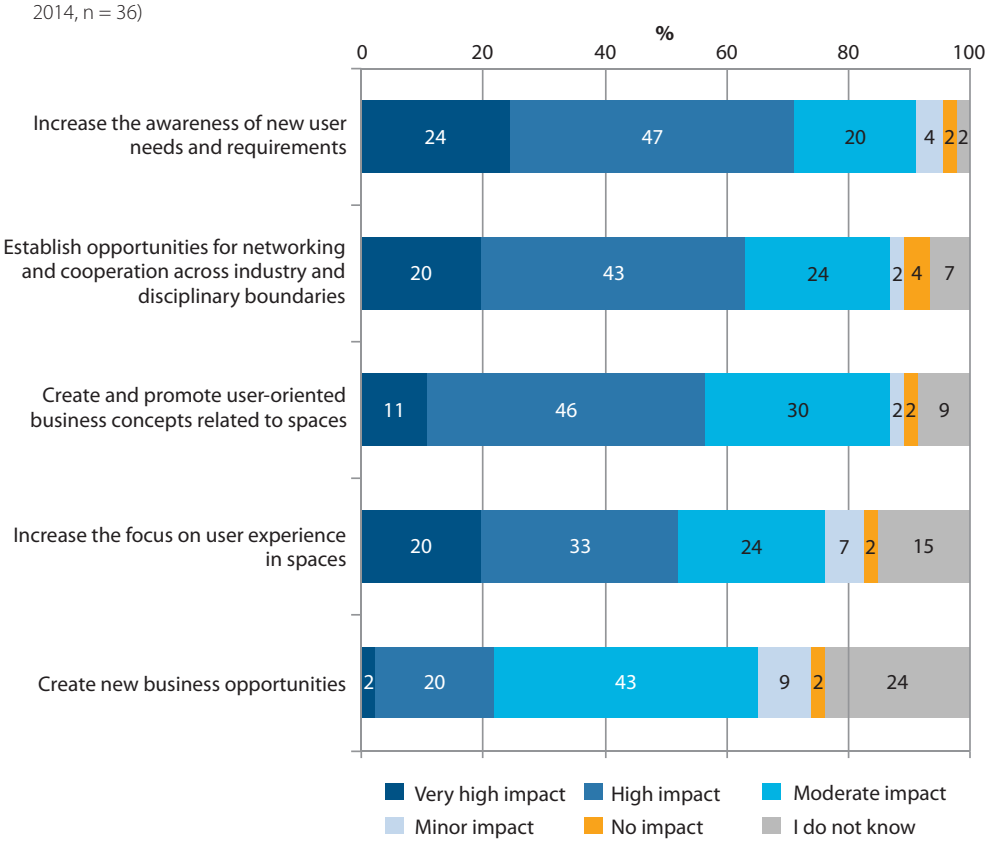
Conference hotel of tomorrow

The Conference hotel of tomorrow project, which was implemented by Haaga Helia, was launched in November 2010 and concluded in April 2012. The goal of the project was to find out how conference practices and conference rooms will develop in future based on the needs of conferences, and to create a concept that supported the development. The needs of the conference facilities of the future were studied from the perspectives of physical, virtual and social space. In practice the work of the project was divided into two main lines: what will the conference facilities of the future be like, and what kinds of service concepts need to be built for conference situations.

The project achieved the goals set for it. In order to perceive and understand the physical dimension, a pilot room Griini was built into Haaga Helia's facilities; it is the physical manifestation of the project's main goal. In this space it is possible to test and observe various ideas in a real physical environment, and present them to partners. The pilot space proved necessary because meeting conveners were often not aware of what kinds of solutions can be made for conference rooms. In the area of service concepts, the conference designer-service was developed. The core idea in the conference designer-service was that a designer specialised in conference arrangements approaches conference conveners and maps out content-related questions of a conference, the space requirement, need for furnishings and presentation equipment, as well as the objectives desired from the conference.

This was a research project that received 75% funding for the costs of project through the Spaces and Places programme of Tekes. According to the implementer of the project, no project like it could have been implemented without funding because it made many different companies to co-operate. After the programme, the use of the pilot space Griini has been active after the project, as is the conference designer-service, which was commercialised around a company that was to be established already during the project. In addition to this, the courses offered at Haaga Helia now include conference designer training as a further training option in their executive assistance training programme. ◀

Figure 19. Estimated impacts of projects in project areas of the programme. (Source: Project questionnair 2014, n = 36)



CASE

Graphic Concrete: Internationalization and development of production technology

The purpose of the Graphic Conrete: Internationalization and development of production technology was to improve and promote the export of graphic, surface decorative concrete products and the supporting production technology. The project ended at the end of 2013. The project's goal-directed plan was built largely on the strategy of the company, and the project plan in the multi-year project was updated to meet the developments paths that had emerged through the project. The project was carried out through three subprojects whose contents were: 1. Get production to a level that supported internationalization, 2. Networking with partners that supported international growth and 3. Development of service processes of products.

Development of production and quality improvement has been realised as desired. The essential aspect in the development of production has been the management of production and the streamlining of the production process so that work steps are better linked to each other and no waste of time or material is generated. A more controlled production process has increased anticipation, and with the development of work methods, the end product has been made to support internationalization goals in terms of quality. As part of the project, co-operation partners who support internationalism were sought. The goal of developing a network of partners was to find potential market areas, and also entities which would be responsible for sales in the target country. The internationalist strategy is based on the use of agents; service packages were created for their work. Service descriptions, product descriptions and other marketing material suitable for each target market were made for the concrete content of the service packages.

The Tekes funding directed through the Spaces and Places programme has had a key impact in implementing the project. Without the funding, it is unlikely that the content of the project would have been started in the same scope. The results obtained with the project is expected to have a long-term positive impact on the company's business activity. ◀

Based on the questionnaire conducted in connection with the evaluation, 85% of project managers believe that the project achieved the goals set for it. However, it's still premature to assess the final results and impacts of the projects, because the impact mechanisms generated by the projects are complex and in many respects is still ongoing. Although the impact processes achieved by the Spaces and Places programme are still in progress, it is already possible at this point to see that the programme, as a whole, has had the following impacts in its operating environment:

- Significantly boosted the understanding of user needs in the planning of premises and in premises-related business activity
- Concrete changes were achieved in the development of the work environment
- A leap forward was taken in the development and technology related to virtual premises during the programme.
- Brought about a discussion and was influential in the development of premises and a change in attitude related to business thinking
- Raised the level of expertise and understanding in the sector to solve challenges
- Raised the topic and subject areas of the programme to the agenda of the developers and decision-makers of the sector

The Spaces and Places programme has played a significant role in the research and development of the industry as an activator during the programme. According to funding information from Tekes, the Spaces and Places programme has

clearly been the most important form of Tekes funding for participating responsible organizations of business projects in the 2000s, and activated the R&D activity of these organizations strongly during the programme. Compared to the companies of many other programmes, the amount of funding received from Tekes previously or from somewhere else by the companies participating in the programme has been low relative to the amount of funding from the programme in 2008–2012. Similarly, a relatively low number of companies participating in the programme had received other funding from Tekes. Participating in the Spaces and Places programme also seems to have increased companies' activeness in applying for funding from Tekes.

An aspect that is worthy of attention is that of the 93 responsible originations of the business project (which had a total of 159 projects) as many as 55 (59%) had not previously received funding from Tekes in the 2000s. However, if funding from Tekes is considered to be the measure, the programme does not appear to have had an activating effect on companies' research and development work after the conclusion of the programme. In 2013, after the end of the funding of the Spaces and Places programme, there were fewer responsible organizations (companies) of business projects than before the start of the programme. In part his may also suggest that a large number of the projects participating in the Spaces and Places programme were aimed a certain individual solution, in which the research and development process was completed during the programme and there was no immediate need to fund the start of a new development process. (Figures 20 and 21)

Figure 20. Funding received by companies participating in the Spaces and Places programme in 2000–2013.
(Source: Tekes)

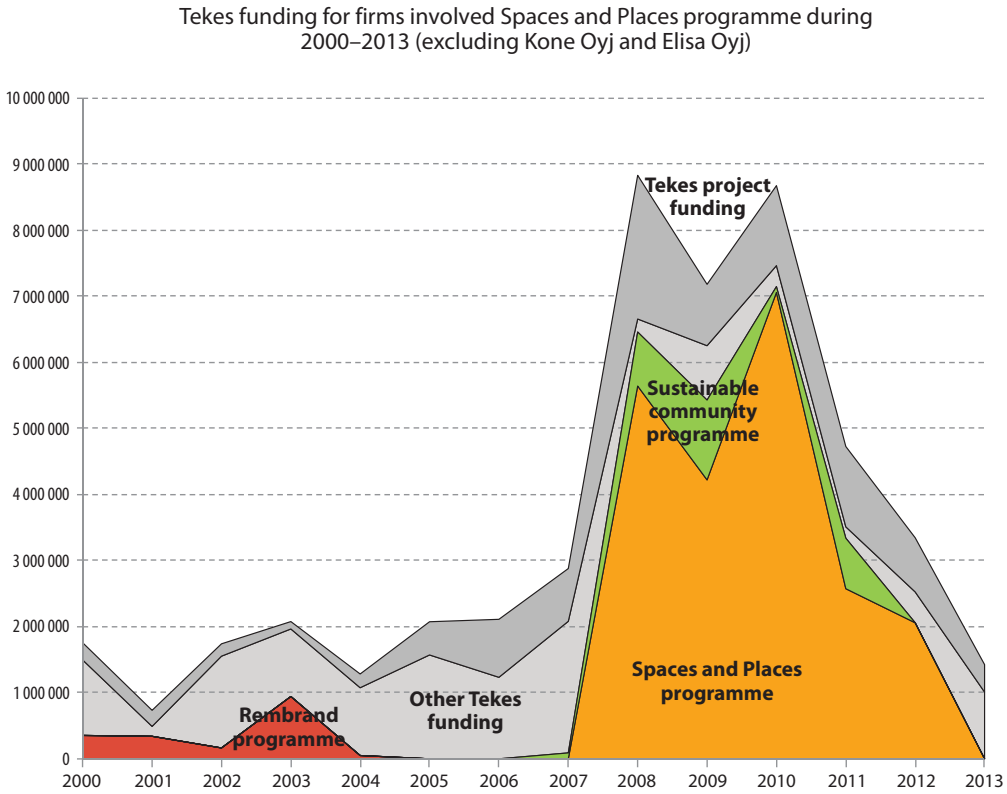
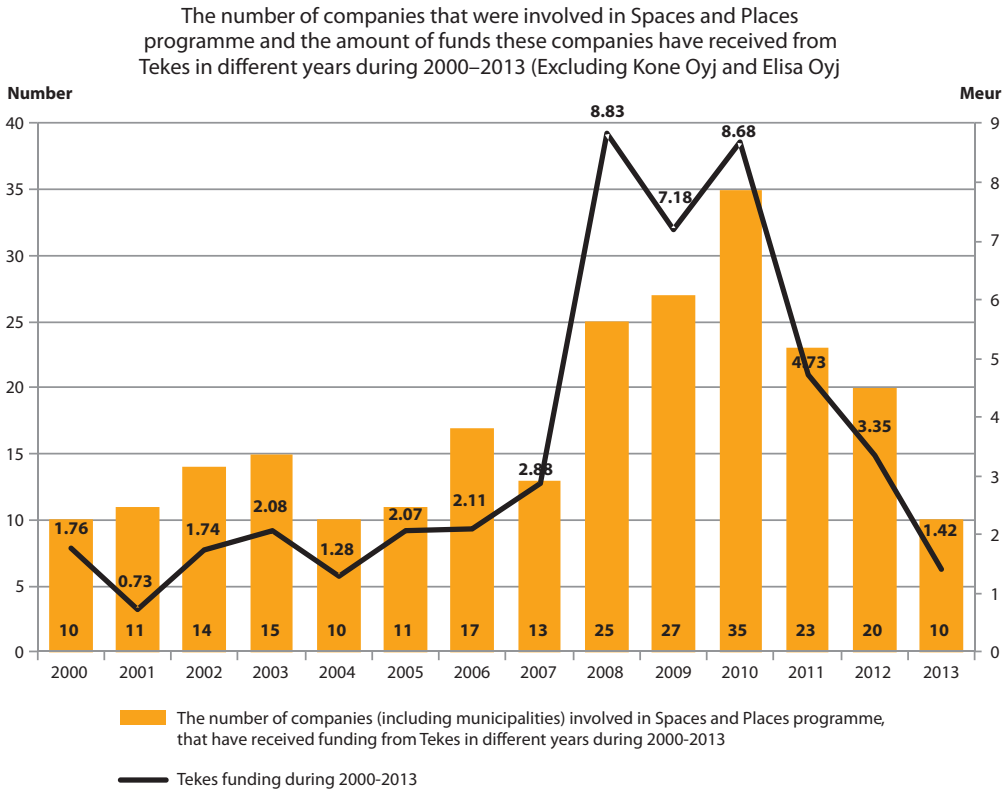


Figure 21. Number of companies participating in the Spaces and Places programme and Tekes funding received in years 2000–2013. (Source: Tekes)



5 Ex-post evaluation of Rembrand programme

5.1 General information about the Rembrand programme

The Rembrand programme was implemented in 1999–2003. The programme focused on the development of the real estate industry at the turn of the millennium, when the industry was undergoing a period of transition in Finland. In the 1990s, there was a desire to change the nature of the real estate industry, which was production- and product-oriented into one that was more service- and customer-oriented. Influences for this had come from other industries and development of the real estate business that occurred abroad. In the 1990s Finland shifted to an open international market economy that enabled the gradual loosening of the societal grip on the real estate and building cluster, as well its formation into a genuine, transparent and ordinary business sector. The furthering of the internationalization of the sector, and to also the development of the real estate and building cluster, were seen as the key goals of the programme. The vision of the programme became "Customer-oriented real estate operations combine the functions related to a space into a service product that brings value to its user".

There were 130 projects funded with a total of 25.7 million euros in the programme. Tekes' share of this funding was 11.95 million euros. Of the support from Tekes, 7.95 million was support of companies, and 4 million was support of research institutions. There were 37 research projects in the programme and 93 business projects. There were a total of 73 implementing entities in the programme.

Table 5. Numerical information about the Rembrand programme.

Programme financing	
Total budget of all financed projects	25 700 000 EUR
Tekes financial contribution to projects	11 950 000 EUR
Tekes financial contribution to research-projects	4 000 000 EUR
Tekes financial contribution to enterprise-projects	7 950 000 EUR
Projects financed in the program	
Number of projects	130 projects
Number of research-projects	37 projects
Number of enterprise-projects	93 projects
Organizations that implemented projects	
Total number of organizations that implemented projects	73 organizations
Number of enterprises that implemented projects	60 enterprises

The aim of the programme was to highlight the service nature of real estate operations and related elements, such as innovation, utilization and application of technology in business, and the informational content of products and services. The aim was to use these to add to the profitability and efficiency of the real estate cluster, and the ability to offer a competitive operating environment for both customers and customers. There was a desire to make the Finnish real estate cluster into one that was internationally competitive and developing entity that had a common customer and common aims. The programme was Tekes' first technology programme focused on the service sector and service innovations.

The following were specified as focus areas of the programme and their goals:

- Service concepts: Networked service product concepts are competitive alternatives to the international service offering.
- Real estate business: The capital and data structures of the real estate cluster are being used efficiently and support the user's operations
- New work and housing environments: The characteristics of a building are understood as a key factor that affects the core activity of the user.
- Functionality of the market: Real estate and property service market, as well as functions related to properties are world class in terms of transparency.
- Lifecycle collaboration: Lifecycle collaboration models have blurred the traditional boundaries of sectors.
- R&D and training: The real estate cluster has integrated training, research and development as well as rapid technology diffusion.

In addition to the permanent goals, there was also emphasis in the programme on annual themes. The purpose of the annual emphases was to highlight the key ideas of the programme and topical perspectives. The emphasis in project selections was on projects that were in accordance with the annual themes. The themes were as follows:

- 1999: brands: productisation and making operators aware of the service concept
- 2000: service concepts: services as part of the offering
- 2001: customership: highlighting the significance of customer-orientation
- 2002: development of work environments: significance of services for the user of a premises
- 2003: networking and increasing the customer's competitive advantage: networking when meeting the changing needs of the customer.

The programme was launched by a decision of the Tekes Board of Directors in April 1999 after a preliminary and preparatory phase lasting one and a half years. The preliminary study looked at the structure and volume of the real estate and building cluster, and looked for key development gaps, with any eye on focus areas of the programme. In connection with the preliminary study, information was gathered from abroad about practices and foreign customs. The preparatory phase was comprehensive even though according to the final evaluation of the programme it was too narrowly focused in some matters (the use of models or examples from other fields was ultimately considered to be limited, and no serious scientific research on the theory of networking and on cluster models themselves were clearly brought to support the preparatory work).[18] The role of RAKLI - The Finnish Association of Building Owners and Construction Clients was significant, particularly in the preparatory phase of the programme.

The Rembrand programme differed from previous Tekes programmes because of the development target of the programme. The programme focused on the development of a service business instead of the development of a traditional technology. This also affected the method of implementation of the programme. The implementers had no examples of a programme concentrated on a service technology, instead the idea of what kinds of projects should be funded had to be created in the programme itself. An essential aspect in the implementation of the programme was to bring about a process that promoted change and which was created together with the operators of the sector.

---

[18] Rakenteiden uudistuminen – teknologiaohjelmat taustatukena ja muutoksen veturina. Final evaluation of iWELL-, Puuenergia-, Rembrand- ja Uusi teollinen toimintatapa (UTT) programmes. Authors: Mari Hjelt, Juha Vanhanen & Tuomas Raivio. Teknologiaohjelmaraportti 12/2004. Evaluation report.

Early in the programme, its contents raised questions about how a new type of programme and service technology would fit among Tekes' traditional programme activity. Indeed one of the main challenges in implementation was the fact that the limits of Tekes' activity were being developed along with the industry. Another challenge of the early stage of the programme was the getting SME companies to commit, regional coverage, linking the customer and user perspective into projects, and the small size of the programme relative to the size of the construction cluster. The goals and implementation of the programme were supported by several processes affecting the industry at the same time, including Visio 2010 work, and the launching of the Kiito doctoral training programme.

5.2 Impacts of proramme in light of qualitative data

The most significant results of the Rembrand programme, when evaluated after the end of the programme, are the service innovations achieved by the programme projects in the customer interface and in the real estate business; and when viewed at the programme level, the enhancement of the networking of industry operators. The results of the thematic area of service innovations in the customer interface include technological solutions developed between the service provider and owner, which can be used to manage, monitor and market properties. In the thematic area of service innovations in the real estate business, with the aim of enhancing the efficiency of property asset management, studies were produced on the nature and quality of information required for the efficient management of building stock, as well as on the possibilities of utilising information technology. Networking was enhanced by, among other things, model contracts and tools for service operations, which were created within the framework of the programme, as well as partnership evaluation criteria. These have helped in the conclusion of various agreements for purchases of services etc., and contributed effectively to the networking of the industry.[19]

In several of the projects of the programme, service concepts that had not significantly existed in Finland previously were developed. Indeed service concepts for the real estate business were created in large part in precisely the Rembrand programme. In the period of time after the programme, these kinds of operating models have been significant with respect to the development of the industry and in the enhancement of the service nature of the industry. With regard to the functionality of the market, structures and tools needed to develop the industry into one that was a market driven and transparent business were also created in the programme. These kinds of created structures and tools have, among other things, enabled the enhancement of the management, documentation, evaluation, monitoring and marketing and further development of properties. These have significantly helped to improve the access to information and transparency of the market. The new business concepts and tools that emerged in the programme and were developed in the projects have been adopted and developed in the industry in various organizations and companies after the programme.

Furthermore the thematic area of Real estate business was significant from today's point of view because the actual field of business related to real estate, as it is known today, was formed in Finland during and after the programme. Important to the development of the sector was a change in the way of thinking that took place during, and partly due to, the programme. The change in ways of thinking encouraged the field of operators to see the industry more like a business operation, and to see properties more from the perspective of business profitability, instead of the traditional thinking in terms of resources. Progress was made in the programme regarding the development of the business operation perspective in the real estate industry at the turn of the millennium. During the period after the programme, the business creation of the industry has improved. Today the real estate industry is a more professional and established business sector in Finland.

---

[19] Rakenteiden uudistuminen – teknologiaohjelmat taustatukena ja muutoksen veturina. iWELL-, Puuenergia-, Rembrand- ja Uusi teollinen toimintatapa (UTT) -ohjelmien loppuarviointi. Tekijät: Mari Hjelt, Juha Vanhanen & Tuomas Raivio. Teknologiaohjelmaraportti 12/2004. Arviointiraportti.

CASE

Total service agreements for property management project

In the late 1990s, a new research group specialised in the research of the service business of the real estate industry was created in the laboratory of construction economics and management of the Helsinki University of Technology; the Rembrand programme had a major influence on the creation of this group. A total of six research projects under the Rembrand technology programme of the entity in question were carried out in the laboratory of construction economics and management. Of these, the goal in the Total service agreements for property management project (implemented in 2000–2002) was to develop a contractual practice for total property management services, purchasing and controlling quality methods, as well as service concepts and offering activity.

During the period of time before the project, Finland did not have any well-established contractual practices and operating models for property management services. The project reviewed total property management service concepts used abroad, and the related contractual practices. In addition to this, the project examined the expectations of owners and users of a domestic property regarding services. Various models for outsourced services in facilities management were modeled based on management responsibilities and contractual relations. Results of the project were: a report on total services of property management, a report on foreign property management agreements and service concepts, a report on expectations and needs of domestic property owners and users, example contractual documents and examples of alternative contractual terms for different types of agreements and process descriptions, and guidelines for the purchasing of services and offering activity of companies. The results of the project were achieved as part of the research of two doctoral dissertations.

In the period after the project, the project results (for example on service concepts, agreements, process descriptions and descriptions of practices) have improved clarity in the structures and practices related to property management and total services, and with them also contributed to the emergence of new business in the real estate business. In addition to this, structures that supported the results of the Total service agreements for property management project were developed for industry operations at time same in other projects of the project implementers. As a whole, these have affected the operations of real estate industry today. Furthermore contractual practices of the industry were also developed and there have later become established as part the general contractual practices of the industry.

The study also modeled the property management business models that are currently used in the real estate industry. After the end of the programme, these have been a catalyst for new development projects in companies and other organizations for the further development of property management models. A large share of the companies in the industry today operate largely according to these business models.

The project and the further development projects that followed it have played an important role in the development of the real estate industry in the current Aalto University. On the research side, the project launched a research project called The development of the organization and quality control of facility services, among others, and several other post-Rembrand projects. In practice the project produced the BES research group, which worked in the department of civil engineering of Aalto University, and which has conducted research that is important to the industry in the years following to the project. The research group has produced nearly ten doctoral theses thereafter. ◀

CASE

Brand thinking and products in the real estate business project

The aim of the Brand thinking and products in the real estate business project, which was carried out by the Helsinki University of Technology and VTT Technical Research Centre of Finland in 2000–2003, was to develop brand thinking to develop business operations in the real estate industry as well as related ways of thinking. In the real estate industry, during the Rembrand programme, the concept of branding related to properties was completely new. The industry changed during the programme into a more service-based business activity, as a result of which there was a need to develop the branding of products related to properties. There were no ready operational models for this in Finland.

The project utilized theories related to branding from overseas, and developed descriptions of what the branding of products related to properties would be in Finland. The project was implemented by developing ideas of brand thinking in working groups and the management team of the project, and in addition to this by making companies visits in which branding related to properties owned by the companies were worked on in co-operation with the companies. This thinking was accommodated to the situations of the participating companies. Development work was also conducted in Finnish municipalities, in which real estate brands were developed from the viewpoint of municipalities. Also, evolving and growing business parks benefitted from the ideas and operating models of the project.

The project served as the first creator of thinking of branding related to properties in Finland. The Brand thinking and products in the real estate business project has been followed by several projects aimed at developing brand thinking in the real estate industry, whose work has been based on this pioneer case project. With its example, the project increased the investments made in branding in the real estate industry and also in related research and development at VTT. In these follow-up projects, there has been further development of concepts and ways of thinking related to the branding of properties, and the promotion of the diffusion of brand thinking in companies. From today's perspective, the project served as the initiator of brand thinking and as the platform of brand thinking for the follow-up development work that has been carried out in companies and in VTT, for instance.

From the perspective of brand thinking, the project enhanced the professionalisation of the real estate sector by developing new business philosophies and operational models for Finland. Tools suitable for developing brands in the real estate business were implemented in the projects; in many respects these have served as the basis for the development of branding related in properties in Finland. Today brand thinking in the real estate business is part of the business operations of many operators. The project has been one factor, a part and initiator of one trend, in which the real estate industry has changed into the more market-drive business operation functioning today.

The project has also had a major impact on the training of the real estate industry, in which the final report of the project has been used as an educational work in the 2000s and partly also today at the courses of the Helsinki University of Technology, among others. In follow-up projects, the results of the Brand thinking and products in the real estate business project have also resulted in several university theses in the 2000s. To this day, people from abroad have asked for the work after the project to be used as teaching material as part of the university level education overseas. In the 2000s the report was one of VTT's most downloaded publications from VTT's website and can still be read online in an electronic format.

The project has also served as an example project in the shift of the research and development activity of the Technical Research Centre of Finland toward a direction that is more strongly serving business operations in the early 2000s. This trend has continued in VTT's operations to this day. ◀

During its time, the Rembrand programme played a key role in the development of research and education. Likewise, the programme played an important role in the development of the cluster of the real estate and construction industry. Today the real estate and construction sector is considered to be a more coherent entity in Finland than before the programme, even though the field of operators continues to be fragmented. The programme accelerated the changes that were occurring during the period of transition of the real estate industry, which contributed to the ways of operating and thinking that prevail in the real estate industry today. A significant part of the structures and tools that have been the basis for the development of the real estate basis into its current form were developed in the programme for the real estate industry. Various contractual practices and different model contracts, development of industry-related terminology, operating practices and examples, data collection and sets of criteria for management, methods and registers have partly been created in the projects of the programme, and they have been developed in accordance with the needs of the industry after the programme. Although the structures created in the framework of the programme have been developed after the programme, many of the structures, are however, based on the development work done in the programme. On the basis of the structures, access to data and market transparency have improved significantly. Rembrand also had an effect on changing the ways of thinking and operating in the industry into ways that are based on service operations. The programme promoted the emergence of a market-driven model in the real estate industry, advancing the emergence of the contemporary real estate business. The Finnish real estate industry today is very different from what it was in the 1990s.

CASE

Measuring the efficiency and functionality of office premises based on workstation analysis project

The Measuring the efficiency and functionality of office premises based on workstation analysis project was a project that received funding from the Rembrand programme and implemented by the Technical Research Centre of Finland (VTT). The project as a study of the efficiency of premises of companies engaged in knowledge work, and concrete indicators were developed to measure the features of different kinds of premises. Office premises are a strategically important resource for an organization engaged in knowledge work.

An example of an indicator created during the project is a cost index moddel that measures the cost significance of office premises for an organization. Among other things, the project measured office cost per employee. In addition to this, an international benchmarking study was conducting in the project on the topic, in which the use of facilities by Finnish companies was compared to international points of comparison. A set of measures was also developed in the project for mapping out the satisfaction of office employees with the workstation and its features that he or she normally uses (3 T index). The empirical data of the study in Finland came from 14 office buildings or apartments being used as offices. Several major Finnish companies in whose offices the study was conducted participated in the study.

The project produced information that was new at the time and new measures of the use of office space and office characteristics in Finnish companies. In retrospect, the project especially promoted interest and discussion in companies about their use of office space and produced information that has enabled various organizations engaged in knowledge work to better utilize and develop their premises. In the 2000s, increasingly more attention is paid to the use of office space in companies and other organizations and to the working conditions of employees.

The debate inspired by the project, and the new information that enabled international comparison, also attracted the attention of the media and in the developers of office spaces. The project contributed to the proliferation of debate about office spaces and the investment in the development of the use of premises, as well as to research more broadly among researchers and property owners and users. The project has affected the office premises industry by producing usable tools and new data about requirements that were to be imposed on office premises from the perspective of companies engaged in knowledge work. In other research institutions the results of the project have been utilized in follow-up development work related to the topic.

At the end of the project, a research report was published that can still be downloaded and utilized from the internet. The project has been followed by follow-up research work, especially related to the efficiency and usability of office premises at VTT and other operators. At VTT the project served as one example of research related to premises, based on which research related to office premises and properties has been developed to this day. The project involved researchers and trainees who have in later years produced new research information, partly based on the project, at VTT and other organizations related to premises. VTT continued research related to premises partly on the basis of this programme in the Spaces and Places programme. ◀

Some business concepts and tools that were at least partly developed in the business projects of the Rembrand programme have become important products and product entities for some companies in the time after the programme. It is often possible to identify a particular part in the development processes of these business concepts and tools as being a project of the Rembrand programme.

CASE

Development of a service product intended for managing the premises of an organization project

The Development of a service product intended for the premises management of an organization project, which was carried out by Rapal Oy (in 2003–2005) was a continuation of the development work in the development of information systems for properties. The issue in the project was a stage in which elements were created to change an earlier product into an SaaS (Software as a Service). The goal was to improve the accessibility and coverage of the Optimaze.net expert service. An information management process for an investment project, a service for management decision-making points, a management concept for the time dimension, and a system solution for graphic space management were attached to Rapal's existing service concept. The goal was to create a system as a place for managing lifecycle-type information. The project was part of Rapal's broader Optimaze.net 2005 product development project.

The concrete development work of the project was the coding of the software project that was done on the basis of the planning work. The support received from Tekes was significant for the company, and it sped up and expanded its development work. The development work in question would have been carried out otherwise, but not on the same schedule. The project boosted the development work being implemented and directed the company's product development work in future years behind the development of the product in question.

The current Optimaze.net, a part of which was developed as this project of the Rembrand programme, is a service for comprehensive management of facility management and real estate assets. For the tenant of a premises, the service produces information on the use and costs of space in order to support decision-making, and enables savings by intensifying the use of space. For property owners the service provides new practices in order to improve efficiency of leasing operations and management of real estate assets. Optimaze.net is used to manage over 15 million square metres of space and the amount is growingly continuously according to Rapal Oy. Optimaze Inc. has also been exported to international markets. It has operated for one year with five employees in Silicon Valley. There is a pilot stage underway in China and a market research phase underway in Central Europe.

From today's perspective the development work of the project is part of a long development process aimed at the development of the product. A significant part of the groundwork in the development of Rapal Oy's current Optimaze.net product was created in the project. The results of the Rembrand project still live on in the company in the form of the current product, whose development work has been continued after the project to this day as a continuous process in the company. The role of the product in question is significant in the company's range of products and large group of various operators benefit from its use. The product is being used by several corporate customers and it is used for, among other things, for managing the accounts of a State corporation (Senate Properties). The use of data has changed from the days of the Rembrand programme in a substantially more dynamic direction. At this moment, the development work of Optimaze has already shifted to the development work of the next generation. The project carried out in the Rembrand programme is, however, an important part of the foundation on which future development phases of the product will be built. The project and Tekes' funding in product development work played an important role in developing a product for the market that doesn't necessarily immediately produce a large cash flow. ◀

A major development after the programme has been the internationalization of the Finnish real estate business. Particularly significant from the perspective of the internationalization of the industry were the enabling of the transparency of the market, and the collection and registration of data related to new structures and the real estate market. Internationalization occurred in Finland because the conditions were favourable and ready for international operators and capital. In the past Finland lacked the framework for business by foreign operators, particularly in terms of access to data related to marketing, general Finnish practices, and entering the Finnish market. The Rembrand programme played an important role in enabling this development.

In summary, the Rembrand programme accelerated the change of the real estate sector in a business direction. The majority of the changes and things developed in the Rembrand programme to meet the needs of the development of the market would have probably occurred anyway over time. From today's perspective the programme accelerated and intensified the change, however, in the early 2000s and thereafter. According to views by experts, internationalization of the sector in particular would have occurred as rapidly without the programme.

CASE

Scenario working of management team of Rembrand programme

At the end of the programme and gauging the future development of the real estate industry, three future trends were formed that aimed at the future vision of the real estate business for 2020. Scenario working was implemented with the management team of the Rembrand programme and an outside research group. Three alternative scenarios of the future of a real estate business with service were presented as results of the scenario working: A) controlled by mobility (users), B controlled by required rate of return (investors) and C) controlled by wellness services (ageing users). All of the scenarios aimed at the vision of the group developing the scenarios "Business-driven Finland 2020", with an emphasis on a variety of themes that will affect the development of the industry. The realisation of the scenarios in 2013 was assessed in a discussion forum organised by Rakl and RYM Oy. Based on the discussion forum, ten yeas after the programme it looks like no scenario has been realized as such, but some parts of every scenario has materialised. The key conclusions of the forum were:

- Properties have become a natural investment instrument and a wealthy ageing population is in reality already one target group.
- Of the changes that have affected the development, the ones that have been surprising in their strength is the coming of sustainable development and energy efficiency into part of all activity, and the long economic crisis.
- As a demographic factory, multiculturalism was not successfully anticipated as being significant enough to cause a change in the operating environment alongside ageing. ◀

5.3 Separate statistical review of the impacts of Rembrand, Sustainable community and Spaces and Places programmes on companies that participated in the programmes

Another aim of the evaluation work was to analyse statistically the impact of funding received from the programmes on the development of sales turnover in the companies. The special challenge in this work turned out to be the "tattered nature" of statistical data related to companies and their business operations, the low number of observation units and the and the one-off nature of the funding received from the programme.

Material used

Tekes provided data of the companies that participated in all three of the programmes, the funding granted to these companies within the framework of each programme, and the total funding during the period under review. On the basis of this data, an order was placed with Suomen asiakastieto Oy for a collection of information from all the companies for which information was available, turnover, operating profit and number of employees for the period of 2000–2012. This financial information was matched with the funding information provided by Tekes so that the final result was a set of data that shows three indicators of the development of the business operations for each company, as well as the funding received from the Rembrand, Sustainable community and Spaces and Places programmes, as well as the period of time, and all of the funding received from Tekes including dates. All of the findings described below are built on this set of data.

The general view of the data is that companies are observed over very variable time periods. The material contains a large group of companies that are observed for only a few years. For a small portion of the companies there are observations for the entire period of 2000–2012. The number of companies that would have been observed in 2000–2012, and which would have participated in the Rembrand programme, is still lower. These observations are the same as ones made earlier in connection with Tekes programme evaluations. In part, this is probably affected by natural dynamics in the business field. Companies are born and disappear over the years and this turnover can be significant, depending on the sector. Another possible explanation for why it is a challenge to observe the development of companies over a longer period of time is gaps in the registers of Suomen Asiakastieto. Table 6 describes the scope and time period covered of combined statistical data.

5.3.1 Observations of Tekes funding received by companies participating in the programmes

Figure 22 shows the temporal distribution of the whole Tekes funding of the companies in the data set in 2000–2012.

As Figure 22 shows, most funding decisions are worth less than one million euros per year. There are a few occasional decisions that exceed this limit in different years. Figure 23, in turn, shows the distribution of all the Tekes funding of companies participating in the Rembrand programme per year, and the distribution of funding received from the Rembrand programme per year.

Figure 23 shows that the companies that participated in the Rembrand programme have received funding from Tekes even after the programme has ended. This constitutes one key challenge in the assessment of the separate impacts of an individual programme. From the perspective of the company, it almost doesn't matter what programme or instrument it receives funding from, so in this sense the programmes and all of Tekes' activity form a continuum.

Figure 24 shows a comparison of funding received from three programmes, Rembrand, Spaces and Places and Sustainable community, at the company level. The names of the companies in the figure are replaced with indicators.

Table 6. Number of companies contained in the data set and time period covered.

	Total	Observed in year 2010	Observed at least in yeras 2000–2010
Companies in data set	262	139	94
Participated in Rembrand programme	56	52	25

Figure 22. Tekes funding received by companies 2000–2012. (Source: Funding data provided by Tekes, Tempo's analyses)

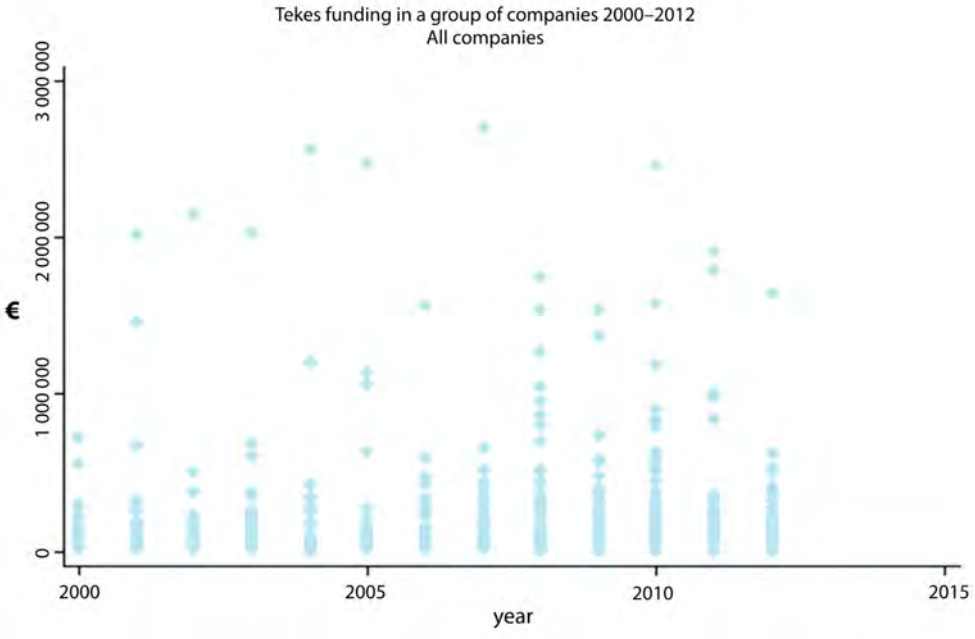


Figure 23. Tekes funding received by companies 2000–2012. (Source: Funding information provided by Tekes, Tempo's analyses)

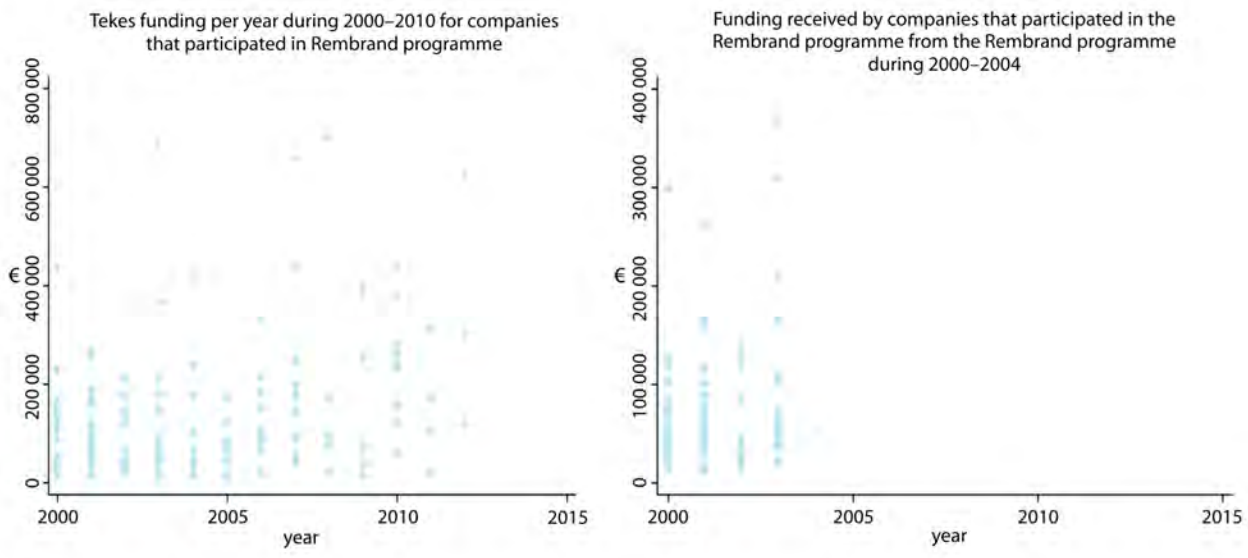


Figure 24. Tekes funding received by companies from different programmes at the company level. (Source: Funding information provided by Tekes, Tempo's analyses)

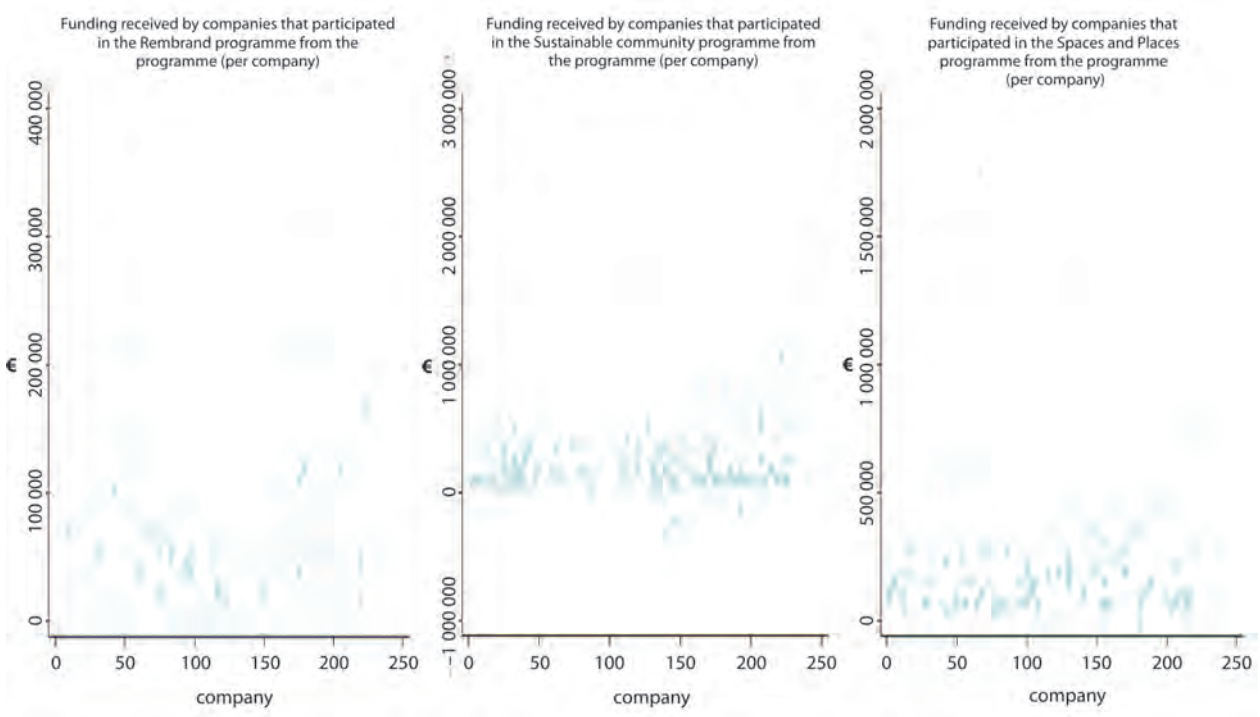


Figure 24 shows that the "funding profiles" of different programmes have diverged. Funding received from the Rembrand programme has typically been under than 100 000 euro in size. Funding received from Sustainable community and Spaces and Places programmes, on the other hand, has been several hundred thousand euros on average. With regard to the Sustainable community programme, another noteworthy aspect is that there are several negative funding observations in the data set. In these cases there has apparently been a recovery of funding. The observation of differences in funding profiles in different programmes is also supported by a more detailed examination. Table 7 shows the distribution of funding in the different programmes.

Table 7. Distribution of progarmme funding.

Distribution%	Rembrand	Sustainable community	Spaces and Places
Programme funding (euros)			
1	11 773	-287 680	26 500
10	18 218	32 000	46 000
30	38 834	69 640	74 775
50	50 228	120 000	122 375
70	71 850	187 800	180 883
90	156 287	500 000	386 350
99	366 000	2 062 560	1 90400

Table 8. All Tekes funding received by companies participating in the Rembrand programme in 2000–2012 compared to others.

Two-sample t test with equal variances						
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	531	215672	14386.89	331523.3	187409.7	243934.4
1	183	146208.4	13025.53	176206.1	120507.9	171908.8
combined	714	197868.3	11261.16	300907.1	175759.3	219977.3
diff		69463.69	25679.9		19046.31	119881.1
diff = mean (0) – mean (1)						t = 2.7050
Ho: diff = 0					degrees of freedom =	712
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0	
Pr (T < t) = 0.9965			Pr (|T| > |t|) = 0.0070		Pr (T > t) = 0.0035	

We can conclude from Table 7 that median funding from the Rembrand programme has been about 50,000 euros. Respectively median funding from the Sustainable community and Spaces and Places programmes has been about 120,000 euros.

The differences in the funding profiles of the programmes also extend to differences in the general Tekes funding received by companies that participate in the programmes. Table 8 shows results from a so-called t-test, which compares the Tekes funding received by companies that participated in the Rembrand programme for the entire period under review 2000–2012 to the funding received companies that participated in other programmes.

In the table, group 0 are companies which have participated in programmes other than Rembrand. There are a total of 531 funding decisions related to these companies in the data set. Companies have received an average of about 216,000 euros of funding. Similarly group 1, or Rembrand companies, have received 183 funding decisions in the entire data set, and their size is an average of about 146,000. The difference is statistically significant.

Another observation related to companies and the different programmes is that some of the companies that participated in the Rembrand programme have also received funding from other programmes. There are three companies in the final combined data set that have received funding from both the Rembrand and Sustainable community, eight companies that have received funding from both the Rembrand and Spaces and Places programme, and two companies that have been funded by all three programmes.

5.3.2 Observations of the development of the business operations of companies that participated in the programmes in 2000–2012

The development of business operations was assessed with three metrics: Development of turnover, development of the number of employees, and the development of operating profit margin. Figures 25 and 26 show the development of two indicators, turnover and average operating profit margin. There were such great fluctuations in the third indicator, or number of employees, from year to year that statistics cannot be considered reliable in this respect. For this reason the observations illustrated below are related to the developments of turnover and operating profit margin.

Figure 25 shows that the turnover of the entire group of companies has grown in 2000–2012. The development of sales turnover of companies participating in the Spaces and Places programme has the most rapid in a visually recognisable manner.

The average annual operating profit margins shown in Figure 26 are calculated based on the medians of operating profit margin. The data set typically contains small companies which have indicated very large negative operating margin percentages in individual years. Using median numbers instead of arithmetic means reduces the distorted view of the development of the entire group of businesses that is caused by this. With respect to operating profit margins, it can be said that the operating profit margins of companies participating in the different programmes have been roughly similar, and there are no obvious clear trends in their development. This is a very expected finding. There are no reasons based on economic theory to assume that the operating profit of a certain group of companies would develop as a trend in one direction or another unless major changes occur in the competitive situation.

Figure 25. Development of the sales turnover of companies that participated in different programmes 2000–2012. (Source: Suomen asiakiastieto Oy, Tempo's analyses)

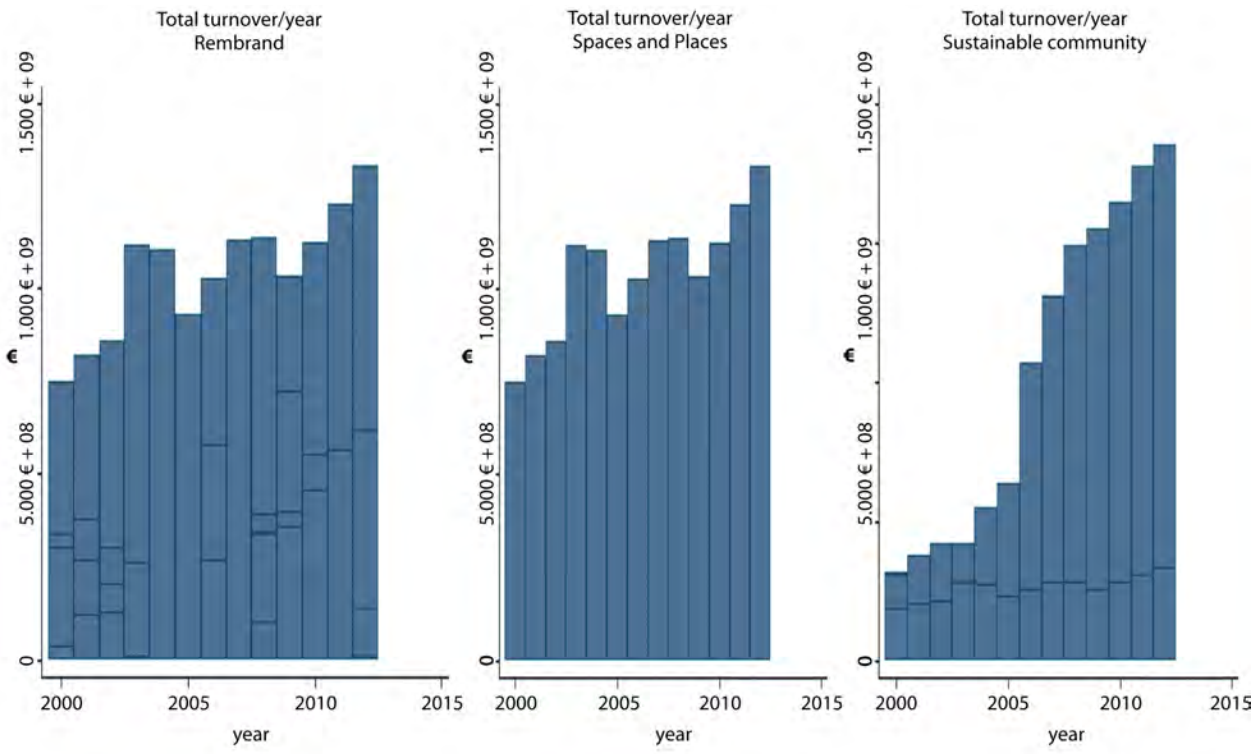


Figure 26. Development of average operating profit margin of companies participating in the different programmes in 2000–2012.
(Source: Suomen asiakastieto Oy, Tempo's analyses)

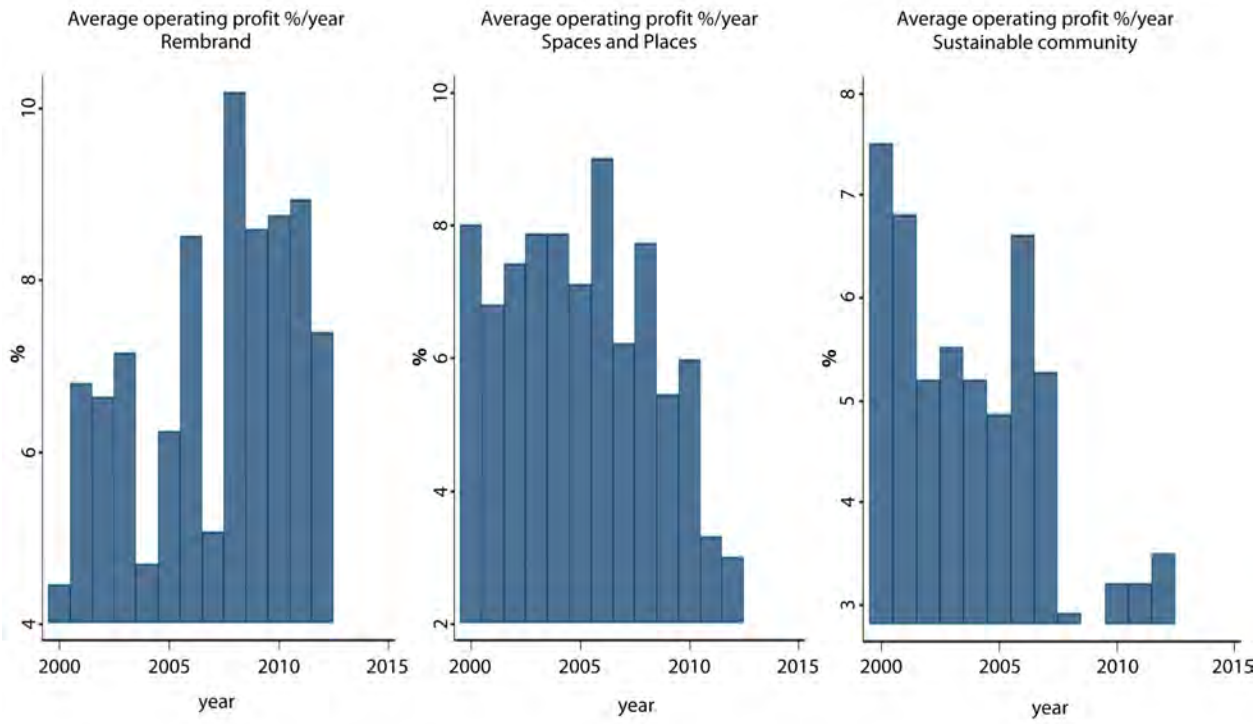


Table 9 illustrates results of the so-called t-test regarding the turnover of companies participating in the Rembrand programme in 2000–2012 relative to other companies.

In Table 9, group 1 again consists of Rembrand companies and group 0 of others. As can be concluded from Table 9, there is no statistically significant difference between these two groups. One interpretation of this is that when considered as a whole, the profile of Rembrand companies compared to the companies of the other two programmes is not significantly different, at least in terms of turnover.

Table 9. Development of the turnover of companies participating in the Rembrand programme in 2000–2012 compared to others.

Two-sample t test with equal variances						
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	1611	7.94e+07	1.15e+07	4.60e+08	5.69e+07	1.02e+08
1	461	8.65e+07	9910669	2.13e+08	6.70e+07	1.06e+08
combined	2072	8.10e+07	9179693	4.18e+08	6.30e+07	9.90e+07
diff		-7098129	2.21e+07		-5.04e+07	3.62e+07
diff = mean (0) – mean (1)						t = -0.3215
Ho: diff = 0					degrees of freedom =	2070
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0	
Pr (T < t) = 0.3739			Pr (|T| > |t|) = 0.7478		Pr (T > t) = 0.6261	

Table 10. Correlation between certain key figures of companies participating in the Rembrandt programme.

	Turnover	Operating Profit %	Tekes Funding	Rembrand Funding
Turnover	1.00			
Operating Profit %	0.06	1.00		
Tekes Funding	0.15	0.12	1.00	
Rembrand Funding	0.14	0.08	0.56	1.00

As a further analysis of the relationship between the turnover and development of turnover of Rembrand companies and funding received from Tekes by these companies, Table 10 presents the aforementioned correlations with each other.

A correlation coefficient can have values between -1 and 1. The figures shown in Table 10 suggest at least the following findings:

- There is some level of correlation between all the Tekes funding received by companies and Rembrand funding. In practice this means that the share of Rembrandt funding of all funding has been reasonably high.
- There is no statistically noticeable correlation between Tekes funding or Rembrand funding and the turnover of operating profit marge of the companies that received funding.

5.3.3 Econometric analysis of the development of the business operations of companies that received funding

The final statistical analyses of the collected statistical data were econometric analyses of the of the development of Tekes funding and the business (turnover) of the funded companies. One of the reasons for the small amount of statistical data is that the different variations of statistical models used to conduct the econometric analysis were rather limited. In other words only a few independent (explanatory) variables were included in the models to explain the development of turnover (or its logarithm). All of the estimated models are so-called fixed effects model. The fixed effect is the company. In other words the models consider differences between companies that remain unchanged over time. Special attention should be drawn to the fact that the models take into consideration the different sizes, industry, regional location and other similar factors of the funded companies (all of these are either constant factors or ones which change very slowly).

The following is a presentation of results from two different statistical models. In one, the factor to be explained (dependent factor) is the turnover of the companies that participated in the Rembrand programme (model 1) and in the other, the turnover of companies that participated in all three companies (model 2). For both models 1 and 2, the results of statistical specification are illustrated below, in which turnover is explained by the development of Gross domestic product and with funding received from Tekes. For Rembrand companies, too, the model utilizes all Tekes funding, not funding received from the Rembrand programme, for two reasons: On the one hand, as was discussed earlier, Tekes funding is a continuum from which the separation of different programmes or instruments is difficult and partly artificial. On the other hand, there was ultimately so few funding observations of the Rembrand programme for an estimation sample that it was not possible to have statistical analysis rely on them.

In both models 1 and 2, variables are brought into the model as logarithmic transformations. The practice is a standard choice in econometric modeling[20] and at the same time, the regression coefficients produced by the model for the variables can be interpreted directly as the elasticity/flexibility of the dependent variable relative to a particular variable. The models are also estimated in a linear manner. Furthermore various model structures have been tested by introducing a so-called trend variable, or the square of this variable, into the model, which captures changes over time that are not taken into account by the actual independent variables. The use of

[20] The reasons for this are technical: This allows the models error term to have a distribution, where it can also get negative values.

Table 11. Results of estimations related to the turnover of companies that participated in the Rembrandt programme.

Fixed effects (within) regression				Number of obs	=	91
Group variable: nro				Number of groups	=	29
R-sq: within	= 0.4877			Obs per group: min	=	1
between	= 0.1689			avg	=	3.1
overall	= 0.0819			max	=	8
				F (2, 28)	=	9.70
corr (u_i, Xb)	= 0.1375			Prob > F	=	0.0006
				(Std. Err. adjusted for 29 clusters in nro)		
lnliikevai~o	Coef.	Robust Std. Err.	t	p> | t |	[95% Conf.	Interval]
lnbkt	3.116654	.7324433	4.26	0.000	1.616311	4.616996
lnrahoitus	.10283	.0591913	1.74	0.093	-.0184179	.224078
_cons	-21.61682	9.914374	-2.35	0.026	-40.45064	-2.783001
sigma_u	2.4865834					
Sigma_e	.4269743					
rho	.9713597	(fraction of variance due to u_i)				

a trend variable did not affect the results in practice. In total a few dozen different statistical specifications were tested. Table 11 presents the results for model 1.

The following findings can be highlighted from Table 11:

- The number of observations was 91 and the F-test rejects the hypothesis of the joint non-significance of the independent variables.
- The variable ln-rahoitus, which represents the total funding provided by Tekes to companies, gets a coefficient of 0.10. This coefficient is statistically significant at the lowest level of significance commonly used (so-called p-value) of 10%.
- The Gross domestic product (BKT) variable, which represents the general development of the economic cycle, gets a coefficient that is very statistically significant, as expected.
- The absolute values of the coefficients of both Gross domestic product and Tekes funding are as expected and positive.

Table 12 gives the results for model 2.

The following findings can be highlighted from Table 12:

- There were 414 observations and the F-test rejects the hypothesis of the joint non-significance of the independent variables
- The variable ln-rahoitus, which represents total funding provided to companies by Tekes, gets a coefficient of 0.04. The variable is not statistically significant
- The Gross domestic product (BKT) variable, which represents the general development of the economic cycle, gets a coefficient that is very statistically significant, as expected.
- The absolute values of the coefficients of both Gross domestic product and Tekes funding are as expected and positive.

Table 12. Results of estimates related to the turnover of companies that participated in all three programmes.

Fixed effects (within) regression				Number of obs	=	414
Group variable: nro				Number of groups	=	172
R-sq: within	= 0.3533			Obs per group: min	=	1
between	= 0.0049			avg	=	2.4
overall	= 0.0028			max	=	9
				F (2, 171)	=	34.56
corr (u_i, Xb)	= -0.2097			Prob > F	=	0.0000
				(Std. Err. adjusted for 172 clusters in nro)		
lnliikevai~o	Coef.	Robust Std. Err.	t	p> | t |	[95% Conf.	Interval]
time	.0089659	.0012851	6.98	0.000	.0064292	.0115025
lnrahoitus	.0385869	.0497425	0.78	0.439	-.0596016	.1367754
_cons	14.48518	.5289923	27.38	0.000	13.44099	15.52938
sigma_u	2.5193837					
Sigma_e	.50647073					
rho	.96115686	(fraction of variance due to u_i)				

In summary, it can be stated with regard to the econometric analysis that was conducted that a variable that represented Tekes funding more broadly typically received values between 0.05–0.10 in different specifications. Most of the time the variable was not, however, statistically significant. Although the results should not be interpreted as estimates of the separate impacts of Tekes funding, and even though the Tekes funding variables did not receive statistically significant coefficients in most cases, the results indicate, however, that Tekes funding has had a statistically significant impact on the turnover of the companies.

According to a literal interpretation, a value of 0.05 would mean that a 10% increase in Tekes funding would, on average, increase the turnover of companies participating in the programmes by 0.5%. A corresponding interpretation of the value of 0.10 of model 1 of companies that participated in the Rembrand programme is, of course, that a 10% increase in Tekes funding received by these companies would have increased turnover of the companies by an average of 1%.

5.4 Summary of Rembrand programme

The Rembrand programme accelerated changes that influence the practices and thinking of today's real estate industry, and which occurred during a period of transition in the real estate industry. The programme influenced the changes in the ways of thinking and practices in the industry into one that based on services and emphasizes business functionality. However, it is impossible to precisely evaluate the separate impacts of the programme on the change in the industry's operating environment.

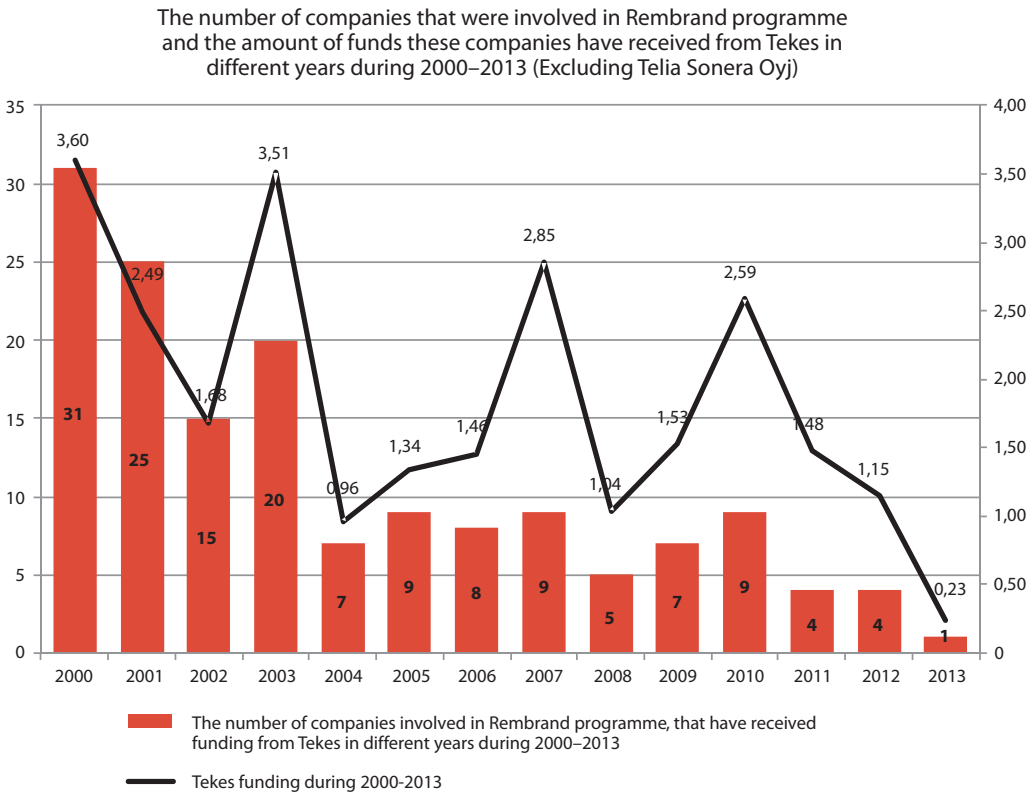
Some of the things that have enabled by the structures and tools created in the programme include increased efficiency and further development of the management, documentation, evaluation, monitoring and markets of properties. Based on them, access to information and transparency of the market have improved. The new service concepts and tools that emerged in the programme have been adopted by companies. The new service concepts used in the programme have contributed to the development of the service nature of

the industry. New ways of thinking also contribute to people treating the industry more like a business operation, and to dealing with properties from the viewpoint of commercial viability instead of in terms of resources. The programme also promoted a market-driven model in the operations of the real estate industry, furthering the emergence of current state of the real estate business.

When it was started up, Rembrand was very successful in activating industry operators to join the effort to develop the real estate industry, and promoted the emergence and development of a real estate and construction cluster in Finland. Some of the research and development processes that were launched in the programme have continued later in the Spaces and Places programme, for instance. However, Rembrand did not significantly activate participating companies to engage in long-term R&D&I activity. According to funding information of Tekes, only a few of the approximately 60 responsible organizations of business projects has received funding from Tekes after the end of the programme. In particular, the amount of funding that has been received in some way other than through the programme has been limited. The most important programmes in which companies of the Rembrand programme have participated are Spaces and Places, Vera, Sustainable community and Serve programmes. (Figure 27)

For one programme, (Rembrand) conducting an ex-post evaluation and assessing separate impacts of the impacts of the programmed proved to be challenging in terms of method. The main finding of statistical analysis can be considered the fact that for participating companies, the share of Rembrand funding of all funding received from Tekes has been reasonably high, but there is no statistically significant correlation between Tekes funding or Rembrand funding and the turnover or operating profit margin of funded companies. With regard to quantitative evaluation, the aspects that can be considered

Figure 27. Number of companies participating in the Rembrand programme and amount of Tekes funding received in 2000–2013.



challenging are the "tattered nature" of statistical data related to companies in particular and their business operations, the low number of observation units, and the one-off nature of the funding received from the programme. Furthermore the statistical analysis of the separate impacts of the Rembrand programme would be challenging even if there were more observations because companies have received other funding from Tekes, typically more than the programme funding. The statistical separation of the impacts of these different forms of funding is impossible in practice. The third challenge related to method in assessing separate impacts is that the impact of public R&D&I funding is transmitted through R&D&I investments. For this reason, it would be particularly important to be able to control the level of R&D&I investments of companies before, during and after the programme. This kind of information was not available.

With regard to qualitative evaluation, the challenge became the difficulty of reaching the people who were involved in the programmes, the difficulty of remembering old things, and difficulty of evaluating or linking the effects of old actions on development that has occurred, for example at the company level. The situation also been complicated in part by the fact that major changes in the ownership structures, which occurred after the programme, have made it difficult to retrospectively trace impact chains caused by the Rembrand programme. For the above reasons, one aspect that can be considered a key challenge in ex-post evaluation with regard to monitoring the development of companies is how long it is possible to track and identify investment areas made several years before. In this sense, 10 years after the conclusion of the programme would seem to be too long of a time for conducting an ex-post evaluation, at least for one of the programmes.

6

Summary and conclusions of the success of the strategy and method of implementation of the programmes and the impacts of the programmes

6.1 Strategic relevance of programmes

Relevance of Tekes' strategies to challenges of the development of the built environment in 2002–2011

The built environment theme has been give the key role in the strategies of Tekes in 2002–2011, and its contents have been developed, slightly revised and focused, logically building on what existed before. In Tekes' strategies of 2002 and 2005, the real estate and constructor sector or the built environment are not highlighted as its own theme; instead they indirectly mention the priority areas of applications that support the R&D&I activity of the real estate and construction industry, such as environment and energy; renewable products and business models; service business; intelligent products, processes and systems, as well as work and leisure time. In Tekes' latest strategies, the built environment has been promoted to be its own thematic area: in the 2008 strategy the built environment is its own thematic area (as are the theme of intelligent systems and environments) and in the 2011strategy, in turn, Intelligent built environment.

Tekes' strategies for 2008 and 2011 have been very relevant, proactive and future-oriented in their time. The strategies have very successfully identified the challenges of developing the real estate and construction industry (such as renovation, eco-efficiency), and accurately anticipated the challenges and future development opportunities of the real estate and construction industry and the built environment more generally. In certain themes (such as service business, maintenance service models, digitality and virtuality), Tekes' strategy can be seen as been far in advance relative to the development readiness of the industry. The strategies have had a clear connection to the content of the programmes being evaluated, particularly ICT development, energy efficiency, customer and demand-orientation, service business and digitality. The identified development drivers, challenges and themes have been, however, quite generic in Tekes' strategies. They partly leave room for interpretation with regard to how the real estate and construction industry and community planning are defined and what Tekes' concrete future choices/investment targets in these areas are.

Tekes' areas of responsibility have expanded greatly in the 2000s and at the same time Tekes' strategies appear to have become wider ranging and increasingly complex. This appears to also have led to a wider range of objectives and contents in Tekes' programmes. As a new factor determining the contents of Tekes' strategic content, the significance of partners and customers in the making of choices about the future has increased. Indeed at this moment Tekes is preparing its new strategy in close co-operation with its partners (The Academy of Finland, Finnvera, Sitra and VTT). While there are more voices and customer needs involved in the defining of Tekes' strategy, the strategy may expand and become distant from the practical measure level.

Strategic relavance of Rembrand-, Sustainable community- and Spaces and Places-programmes

The timing of the Rembrand programme was good for the changes occurring at the period of transition in the real estate industry, and its agendas highlight the demands brought about by the point of chance of the industry for new ways of thinking and for the development of the structures of the industry. The business activity priorities, goals for service-based business, and the objectives related to the profitability and efficiency of the operations of the real estate cluster (such as the use of capital) were very attached to their times, considering when the programme was launched, but perhaps ahead of time relative to the readiness of the real estate and construction industry to develop in the early 2000s. The development of the industry into one that is more service-based, and the promotion of customer-orientation and internationalization, can be seen from today's perspective as very essential targets of development at the turn of the millennium related to the changes of the real estate industry. The programme served as an instrument in the acceleration of the change in question. Some the processes it launched have continued later in the Spaces and Places programme.

The criteria for launching the programmes in the Sustainable community and Spaces and Places programmes, which were implemented after the mid-2000s, have been clear and relevant. On the goal-level the programmes have corresponded will with the developments of the industry/sectors, and also been successful in anticipating changes of the industry. In principle, the strategy work of the programmes has been successful and the goals have been relevant with regard to the challenges and opportunities of the operating environment. The programmes have been very successful in "riding the wave" of development.

At the goal-level, all of the programmes have successfully corresponded to the prevailing trends of the development concerning the real estate and construction industry as well as the built environment, and they have also been successful in anticipating changes. The starting points of the projects have also been strongly oriented to the operating environment and linked to Tekes' strategy. The goals of the programmes (especially Sustainable community) have been, however, very wide ranging. Due to their wide-ranging focus and fragmented nature, the projects in the programmes have not entirely formed sufficiently systematic development entities (such as networked structures of operators, combining know-how, and the generation of new know-how).

The programme activity of Tekes has played the role of a wake-up call in the real estate and construction industry. The challenge has not so much in the identification of the changes and opportunities of the operating environment but on the relevant timing/offering of programmes to industry operators. The themes of the programmes served as new ideas or recommendations for the operators in the industry. A lot of activation work has been carried out in the direction of the operators in all of the programmes, and the message of the programme themes have been delivered to operators. During the programme, the programmes have also focused programme priorities in a way that is oriented to customer needs.

Some dispersion of resources was observed in the programmes due to the wide range of project applications. Indeed the relevant issues are how wide-ranging of a programme is it appropriate to build from the perspective of programmatic added value (cf. project funding), and to what extent is it appropriate to use the instruments of political guidance and strategy guidance that are based on societal goals or Tekes' strategy in the defining of the programme content, and to what extent the guidance that emerges from market demand.

6.2 Success of the method of implementation of the Sustainable community and Spaces and Places-programmes

With the exception of the use of social media and a major emphasis on communication, both of the programmes can be considered typical modern day Tekes programmes in terms of methods of implementation and programme functions. Factors that can be considered as differentiating it from other Tekes programmes include the scope of the objectives of the programmes, the slimness of the R&D culture in the real estate and construction industry (or more broadly of the built environment), as well as the length and fragmented nature of the value chains in the industry, which imposed challenges to delivering the core message of the programmes, the success of activation, and use and balance of programme services between different elements of the programme.

Both programmes were very successful in activitating the field, and there was no shortage of players or thematic areas that were essential to the success of the programme. However, property owners and investors only played a minor role in the programmes.

From the perspective of achieving goals of the programmes, the method of implementing the programmes was been successful, and programmatic services had brought added value to the projects and to the target sectors of the programmes more broadly. The programmes were very successful especially in disseminating results, development support of the projects, and in programme communications. Through programme measures, the programmes and the real estate and construction industry have received plenty of media visibility, through which important things been made public, and at the same time the real estate and construction industry has been awakened to renew itself more broadly.

As a whole, the implementation method of both programmes enabled a good implementation environment for the projects, one in which there were not many problems experienced that would have complicated implementation of the project. The projects were particularly successful in generating projects that were customer-oriented, aimed at utilizing the results, and contained broad value chain collaboration. Similarly there was success in implementation actions that promoted the adoption of the results of projects. Good and functional practices in the Sustainable community and Spaces and Places programmes have included the follow:

- Linking customer needs to research projects by having representatives of both the provider and purchaser sides sit down at the same table to discuss needs and supply (Sustainable community)
- Tekes tori as an instrument for activation and networking (both programmes)
- Strong commitment to the use of different media (both programmes)
- Dialogue with the field through electronic networks (especially Spaces and Places programme).

Success in the adoption and commercialisation of the research and development work can be explained at least in part by the strong demand-orientation of the programmes and by the programme methods that matched the supply and demand of research and development work, such as surveying customer needs and linking them to research programmes, as well as strong communication of results. It can also be assumed that another factor that has contributed to the adoption and commercialisation of research and development work is the practical nature of the research and development that was conducted in the programmes, and the direct linking of the application and adoption of results to domestic and societal demand (customer and distribution channels ready). In this sense market risks have not been particularly great in the projects of either programme.

The promotion of internationalization has generally proven to be a challenging area of development in the programmes. The resources and programmatic means of the programmes have been limited relative to the efforts that would be necessary for internationalization and entering a new market area, for instance. The perceived benefit from the programmatic internationalization services is often limited for companies by the fact that companies are often in a very different kind of phase of international development, and there is a lot of variation in their interests regarding networking and contact visits or tours. Similarly research institutions generally already have strong international research connections and ready networks of relationships with international universities and research institutions; consequently the combining of the various interests of project players into common programmatic measures is often challenging in this kind of situation.

Based on earlier evaluation findings, the importance of programmatic activities to the projects appears to clearly be more significant in the Sustainable community and Spaces and Places programmes than, for instance, in programmes that are more limited to certain industry or technology sectors. Indeed, when properly implemented, the programme services that enhance networking, implementation of results and activation and visibility appear to function well in the Sustainable community and Spaces and Places types of programmes, whose implementation environment in which the value chains of different operators are wide (horizontal) and where the results of research and development are generated and become visible through the joint action of different operators (society is also a customer and the subject of joint action). In this case, the importance of programme services appears to grow in the co-ordination of the various interests, and in value chain collaboration.

Due to the one-off nature of the programme activity, they do not support long-term research and long-term cross-disciplinary co-operation very well. Although the programmes generate a new type of know-how, enhance the emergence of networks, and create the conditions for the emergence of wide-ranging social impacts, the risk is that these impacts will be non-recurring, and after the programme they won't continue and cumulate through positive externalities, for instance, into desired social impacts. Tekes invests strongly in the planning and strategising of programmes, as well as programme services while a programme is ongoing. However, not very much effort has been directed at securing the continuation of the impact processes created in programmes, or the means are limited. There is a risk that the long-term development processes and co-operation processes may break off when the programmes end. For this reason, there should be a greater commitment in the programmes to activities of the final stage of a programme, for example to themes (such as directing to other programmes, funding, international initiatives etc.) that can help secure the continuation of long-term research and development work after the end of the programme in advance. Indeed what are needed in the tail end of programmes are a systematic termination plan and a supporting action programme (Exit plan) that enhance the effectiveness and externalities of the programme, and which would be aimed at creating the conditions for both the commercialisation and adoption of programme results and the continuation of long research and development processes after the programme ends.

6.3 Results and impacts of programmes

Research and development processes tend to be long in the real estate and construction industry. Consequently it is generally possible to advance only a part of an R&D&I process with a 2 – 3 year project funding. At the project level, one of the impacts that can be considered to be one of the most significant generic impacts of the programmes is the fact that a clear "leap" has taken place in the research and development processes of the projects that were part of the programmes during the programme from the research phase to the commercialisation and adoption phase of the results.

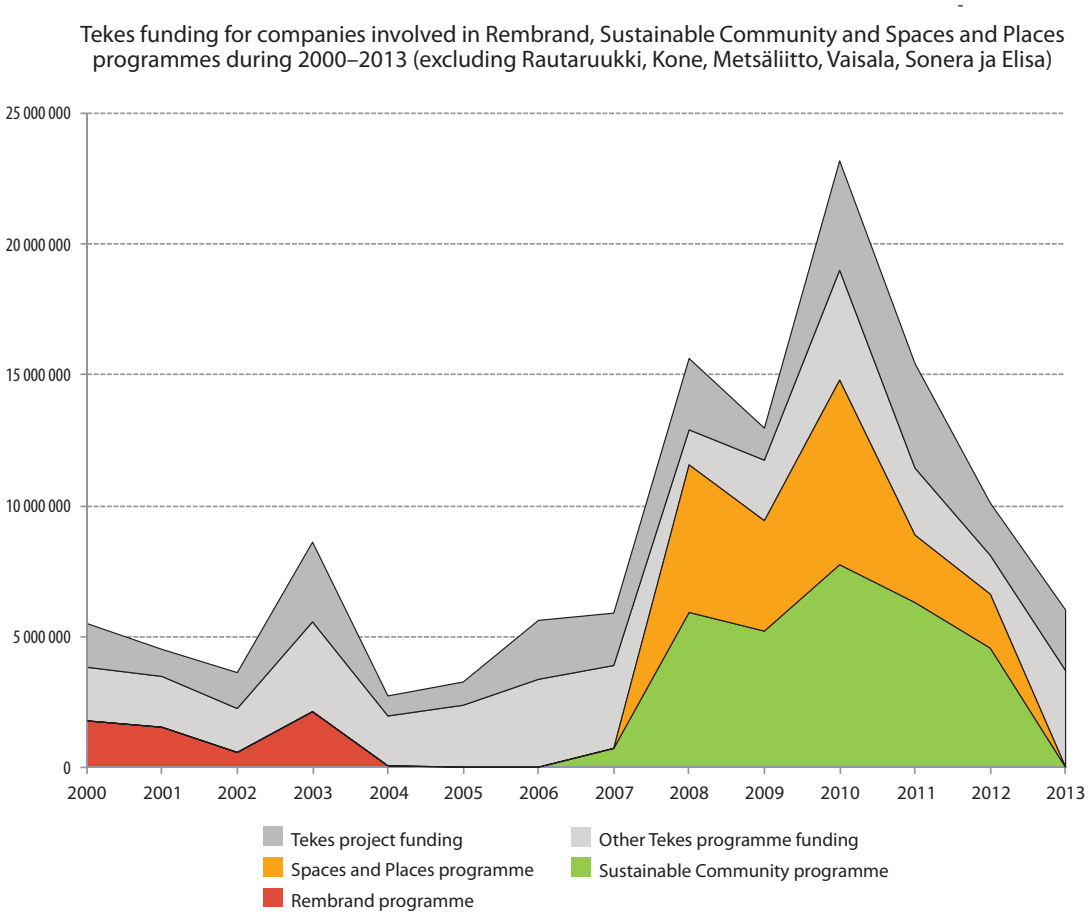
At the project organization level, being a part of the programmes has particularly boosted the knowledge based of organizations that is technological or related to industry knowledge, enhanced and deepened co-operation among industry operators, clarified the roles of various operators in the value chains or networks of the industry, and activated the R&D&I of industry organizations.

The programmes have had a major impact as a booster of the R&D&I activity of participating companies. The funding granted to participating companies through Tekes' programmes has been many times greater than the other funding received by the companies from Tekes in 2000–2013. Furthermore the majority of the companies participating in the programmes were so-called new customers of Tekes. Indeed based on earlier research information, it can be assumed that the increased investments by Tekes on the R&D&I activity of companies in the sector has also likely increased the companies' own investments in R&D&I activity.

Based on a project questionnaire, the Sustainable community and Spaces and Places programmes were particularly successful in promoting the adoption of the results of the research and development work. This may be explained in part by the fact that the programmes were properly timed with respect to the needs of the industry and the demands of the market, the needs of the sector had been successfully identified in the projects, and the customer/end users were strongly involved in the starting points and contents of the projects. Another element that contributed to the successful dissemination and adoption of the results of the projects was a strong communication of results at the programme and project level. Another aspect that contributed to the adoption and commercialisation of the results of the programmes is the fact that their results have had a direct social or business use value (customer exists and is close). And even though the real estate and construction sector has globalized, the results of the programmes are mainly utilized in the homeland (no challenges and delays of accessing global markets).

It is premature to assess the final impacts of the Sustainable community and Spaces and Places programmes because the impact mechanisms generated by the programmes are complicated and in many respects still ongoing. Although the impact processes of the programmes are still ongoing, wide ranging effects of the programmes can be identified in the

Figure 28. Tekes funding of companies participating in a programme in 2000–2013.



real estate and construction industry, and more broadly in the built environment sector, including on the following issues:

- Enhanced user- and customer-oriented thinking as the starting point for innovation and business activity, thereby challenging the well-established and supply-based operating models of the industry.
- Created concrete sustainable solutions for the energy and ecological efficiency of regions and buildings, and enhanced the integration of the business opportunities introduced by sustainable development into the business operations of companies
- The sector has been renewed and unified from within by identifying industry challenges and development opportunities, by reconciling together different kinds of interests and views, by bringing together and networking industry operators, and by allocating R&D resources into commonly defined areas of development.
- Raised the level of expertise in the industry and enhanced the development and innovation foundation that is based on multi-disciplinary research.
- Thanks to its cross-technological and multidisciplinarian approach, the programme brought together the operators

in the field. Project clusters that benefited from each other's results emerged in the programmes, some of which have continued joint research and development work even after the programmes.
- Significantly activated the research and development work of the industry and enhanced the conditions for, and the abilities of, the industry's operators to utilize the results of RDI activity in their business operations.

Financial information was collected of the responsible companies of business projects that participated in the three programmes, from Suomen Asiakastieto Oy for the available period. For the Rembrand programme, an evaluation was attempted of the separate impact of the programme on the development of the business operations of participating companies. The key finding was that the share of Rembrand funding for participating companies has been reasonably high relative to all funding received from Tekes, but there was is no statistically noticeable correlation between Tekes or Rembrand funding and the turnover or operating profit margin of the funded companies. In other respects the development of the business operations of companies participating in all three programmes were examined for 2000–2012. A key finding of the impacts of the programmes on the development of the business operations of the companies was that it not possible to conduct a statistical analysis of the separate impact of the programmes with the data that is available. The key reason for this in terms of methods is the fact that the funding received from the programmes is typically rather minor and one-off in nature, and it is generally only a part of the funding received from Tekes as a whole. Furthermore the effect of other factors besides the effect of Tekes' funding on the development of the business operations of companies is great.

7 Proposals for development

Future development of the R&D&I activity of the real estate and construction industry or the built environment sector

Both the Sustainable community and Spaces and Places programmes were wide-ranging in focus and somewhat difficult to comprehend. The following reason can be considered as partly responsible for this: the operating environment (target areas) of the programmes was loosely defined, which made it more difficult to activate the field/project applications, and to allocate resources appropriately. The challenge in wide-ranging programmes include fragmentation of funding, difficulties in managing and steering the whole programme, and the difficulty in producing programme services that create added value to the projects.

1 Proposal for development. As Tekes' strategies are increasingly focused on the built environment, Tekes should more carefully define what that means concretely in its strategy (a broad definition of the built environment or adhering to the real estate and construction industry). This would aid in the definition and delimiting of investment targets in future.

The real estate and construction industry has partly been left somewhere in the middle of the principles of public R&D funding (Academy of Finland, Tekes), as a result of which there can be considered to be a gap in the research and development activity of the industry – a market disruption in which both society and companies invest too little in R&D relative to the challenges of the industry and the social harms/problems resulting from them (such as VTV 2013). Also, the criteria for research funding do not fit particularly well with developing thinking that is experiential and exploratory, whose drivers are the new opportunities in the real estate and construction sectors created by the forces of change (digitality etc.). The programmes provided the industry with a one-time boost with research and development activity, but their affect in activating research and development activity does appear to be permanent. The securing of long-term research and development work, and the securing of the accumulation of the know-how and innovation potential that results from it requires a review of public research funding as a whole.

2 Proposal for development. The sector needs a public funding tool that is more systematic than programmes (development money, common development fund for different administrative sector etc.), which would fill the funding gaps and better highlight the needs of intangible capital

3 Proposal for development. Tekes should act (even) more actively in the role of an intermediary organization, helping the companies and research institutions that are participating in the programmes get into national and international programmes, networks and research queries.

Tekes should focus development funding more clearly into buildings and regional and community structures. First, new nanomaterials and technologies will create unprecedented opportunities to produce and renew our building and real estate reserves, and to make premises more flexible and adaptable. The business potential of these is substantial. Secondly, the continued accelerated development of digitalisation creates opportunities not only for intelligent premises but also for intelligent regional and community structures on a larger scale. For example, they can cover the guidance of intelligent information and the flow of energy and material on the regional and community level, as well as intelligent transportation and decentralised energy networks.

4 Proposal for development. Tekes should consider directing its support measures in a more focused manner toward two focal areas that support the development of the built environment. One of these is tied to the level of properties and premises, and the other to the level of regional and community structures.

5 Proposal for development. Tekes' ongoing Fiksu kaupunki (Witty City) programme could be expanded in content even more strongly than currently to the regional structural level.

Development of Tekes' programme activity and other operations

A lot of effort in the programmes is directed toward the preparing of programmes and on services that support the implementation of projects while the programme is ongoing. However, a programme project generally only deals with a certain segment of the R&D process. There should more emphasis in the programmes on the activities of the final phase of a programme in order to secure in advance the continuation of long-term research and development work after the programme has ended (such as directing people into different programmes, funding, international initiatives etc.)

6 Proposal for development. What is needed in the tail end of programmes is a systematic termination plan and a supporting action programme (Exit plan) that enhance the effectiveness and externalities of the programme, and which would be aimed at creating the conditions for both the adoption and societal impact of programme results and the continuation of long research and development processes after the programme ends.

7 Proposal for development. Tekes could take advantage of the experiences and operating models obtained from the Netherlands, Germany and the USA and highlighted in this evaluation (such as the Green Deal programme, ProgRess programme, Urban Growth Boundary model) and promote the admittance of national operators into development networks.

Programme services that enhanced networking, implementation of results, and activiation and visibility functioned will in programmes in which the value changes of operators are extensive and the results of research and development work are generated and become visible widely through the joint work of different operators.

8 Proposal for development. In programmes that extensively cover value chains, it is worthwhile to invest strongly in mapping out customer needs, activating and networking the field, and implementing results. Examples of good practices of these in the Sustainable community and Spaces and Places programmes included the Tekes tori as a tool for activation and networking, a strong investment in the use of different media, and a dialogue with the field through electronic networks.

Productive and effective implementation of the results of the programmes require that there be a sufficient amount of information about the steering effects of programmatic measures, and about progress in achieving objectives, to support the making of decisions concerning the programme. In programmes like the Sustainable community and Spaces and Places programmes, which are wide-ranging and far-reaching in terms of goals, specification of intermediate objectives and the metrics indicating achievement of objectives, and the systematic monitoring of results on the project level would make it easier to monitor the implementation of a programme and the steering effects of the programme measures.

9 Proposal for development. To support the implementation of programmes, particularly to support the use of programmatic measures, Tekes programmes should include the use of programme-specific strategy guidance models that describe the operationalisation of goals, or equivalent guidance models that describe the relationship between goals and means of implementation, as well as control effects.

10 Proposal for development. For the purpose of monitoring the achievement of objectives, clear intermediate goals that reach the project level should be set for programmes, as well as measures indicating their achievement with their target levels.

Control or steering that is done by means of market demand and supply (so-called listening to the field) appears to be an appropriate practice, especially in a social impact type of programme like the Sustainable community programme, in which the public sector plays an exceptionally significant role as a customer, creator of markets and regulator of the operations of the industry. On the other hand, the programmes also need strategic guidance in order to achieve Tekes' goals and society in general. The challenge of managing the programmes is finding the appropriate combination between bottom-up type market control and topdown type of strategic control.

11 Proposal for development. To support the management and control of programmes, alternative leadership models should be developed in order to be able to justifiably utilize the means of market and strategic control.

Improving the effectiveness of research and innovation policy in addition to Tekes' activities

This evaluation did not highlight any particular findings that could be used as a basis for making far-reaching conclusions about the functionality of the national innovation system or for giving recommendations regarding the effectiveness of the research and innovation policy that is to be pursued.

The main finding of the evaluation is related to an observation that has been highlighted in several earlier evaluations regarding the need for co-ordination among the entities that fund the national innovation system. Particularly in the built environment as a whole, the requirement for multidisciplinary nature of research and development work imposes new kinds of pressures on the functionality of this collaboration (Tekes, Academy of Finland, Sitra, RYM oy, ARA) and the need to bolster co-ordination at all administrative levels.

12 Proposal for development. Of Sitra's three current main themes, the thematic area of "A resource wise and carbon neutral society" in particular deals largely with the same issues as the Tekes' activity on developing the built environment. Consequently Tekes and Sitra could engage in closer co-operation in addressing the issues in question, with mutual benchmarking activity, for instance. Substance would also be found for the mutual benchmarking activity of Tekes and Sitra from a comparison of the practices of the two organizations and their effectiveness, because in 2012 Sitra shifted away from its earlier programme-based approach to a project organization based on thematic areas, while Tekes is continuing its programme-based approach.

13 Proposal for development. A new strategic research council to be established in the Academy of Finland also offers a great opportunity for research that supports the development of the built environment. The council funds problem-oriented research aimed at finding solutions to major social changes and problems.

List of References

Altes, W.K.K. (2009). Taxing land for urban containment: Reflections on a Dutch debate. Land Use Policy, 26 (2), pp. 233–241.

Asgary, A., Klosterman, R. & Razani, A. (2007). Sustainable urban growth management using What-If? International Journal of Environmental Research, 1 (3), pp. 218–230.

Busck, A.G., Hidding, M.C., Kristensen, S.B.P., Persson, C., & Præstholm, S. (2008). Managing rurban landscapes in the Netherlands, Denmark and Sweden: Comparing planning systems and instruments in three different contexts Geografisk Tidsskrift, 108 (2), pp. 1–16.

Bäcklund, Pia & Mäntysalo, Raine (2009). Yhdyskuntasuunnittelun teorioiden kehitys ja asukkaiden osallistumisen tarkoitus. Terra 121 (1), 19–31.

Gennaio, M.-P., Hersperger, A.M., & Bürgi, M. (2009). Containing urban sprawl-Evaluating effectiveness of urban growth boundaries set by the Swiss Land Use Plan. Land Use Policy, 26 (2), pp. 224–232.

Green City -esite: http://www.fwtm.freiburg.de/servlet/PB/show/1199617_l2/GreenCity_E.pdf.

Han, H.-Y., Lai, S.-K. , Dang, A.-R., Tan, Z.-B. & Wu, C.-F. (2009). Effectiveness of urban construction boundaries in Beijing: An assessment. Journal of Zhejiang University: Science A, 10 (9), pp. 1285–1295.

Hjelt, Mari (2013) KIRA-alan tulevaisuuden haasteet ja mahdollisuudet? artikkeli selvityksessä *Tutkimus- koulutus- ja innovaatiotoiminnan hyödyntäminen kiinteistö- ja rakennusalalla* 2/2013. VTV. Keskustelunaloite.

Hjelt Mari, Juha Vanhanen & Tuomas Raivio (2004) *Rakenteiden uudistuminen – teknologiaohjelmat taustatukena ja muutoksen veturina. iWELL-, Puuenergia-, Rembrand- ja Uusi teollinen toimintatapa (UTT) -ohjelmien loppuarviointi.* Teknologiaohjelmaraportti 12/2004. Arviointiraportti.

Jokelainen, Timo ja Mäntysalo, Raine (2007). Kylien käänteinen kaavoitus: maaseutuoloihin sovitetun maankäytön ohjausmenetelmän hahmottelua. Yhdyskuntasuunnittelu 2007:3.

Kaleva Hanna (2010) *Kiinteistö- ja rakennusalan toimijat ja sidosryhmät -roolit, päätöksenteon ja ansainnan logiikka.* Ympäristöjohtamis-menettelyn strategiatyöpaja, FIGBC, 16.11.2010. KTI Kiinteistötieto Oy.

Kirkinen, Johanna 22.11.2013. Saksa resurssiviisauden suunnannäyttäjänä. Blogikirjoitus Sitran sivuilla: http://www.sitra.fi/blogi/saksa-resurssiviisauden-suunnannayttajana

Klosterman, R.E., Siebert, L., Kim, J.-W., Hoque, M.A., Parveen, A. (2006). What if evaluation of growth management strategies for a declining region. International Journal of Environmental Technology and Management, 6 (1–2), 79–95.

Kokkala Matti (2013) KIRA-klusteri: osaamis- ja innovaatio. järjestelmän haaste vai ongelma? artikkeli selvityksessä *Tutkimus- koulutus- ja innovaatiotoiminnan hyödyntäminen kiinteistö- ja rakennusalalla* 2/2013. VTV. Keskustelunaloite.

Kytö, Hannu ja Kral-Leszczynska, Monika (2013). *Muuttoliikkeen voittajat ja häviäjät – Tutkimus alueiden välisistä muuttovirroista.* KAKS – Kunnallisalan kehittämissäätiö. Tutkimusjulkaisu-sarjan julkaisu nro 76. Sastamala.

Laitinen, Karitta, Roininen, Janne, Oksanen, Emmi, Niemi, Petteri ja Mäntysalo, Raine (2013). *Maapaikka-hallintamalli. Maaseutumaisten alueiden maankäytön ja palveluiden paikkatietopohjaisen suunnittelumenetelmän kehittäminen.* Aalto-yliopisto, Maankäyttötieteiden laitos. Yhdyskunta-suunnittelun tutkimus- ja koulutusryhmä. Aalto-yliopiston julkaisusarja TIEDE+TEKNOLOGIA 2/2013. Sähköisenä: https://aaltodoc.aalto.fi/handle/123456789/9008

Lindstedt, Tuomo ja Junnonen, Juha-Matti (2009). *Energia-tehokkaat ja teolliset korjausrakentamisratkaisut Suomessa ja kansainvälisesti.* Suomen itsenäisyyden juhlarahaston Sitran selvityksiä 11/2009. Helsinki.

Mäntysalo, Raine & Roininen, Janne (2009 toim.). *Kuinka alueellista muutosta hallitaan – parhaat keinot ja käytännöt.* Esiselvitys Sektoritutkimuksen neuvottelukunnan Alue- ja yhdyskuntarakenteet ja infrastruktuurit -jaostolle (teema 3). Teknillisen korkeakoulun Yhdyskuntasuunnittelun tutkimus- ja koulutuskeskuksen julkaisuja C 71. Espoo. Myös sähköisenä: http://lib.tkk.fi/Reports/2009/isbn9789512299263.pdf

Sitra (2010). Kaupunkiseuduille eheämpi yhdyskuntarakenne - Portlandin UGB-malli apuna. Blogikirjoitus Sitran nettisivuilla 8.12.2010. http://www.sitra.fi/blogi/2010/kaupunkiseuduille-eheampi-yhdyskuntarakenne-portlandin-ugb-malli-apuna. Viitattu 18.5.2011.

Song, Y., Knaap, G.-J. (2004). *Measuring urban form: Is Portland winning the war on sprawl?* Journal of the American Planning Association, 70 (2), pp. 210–225.

Työ- ja elinkeinoministeriö (2013). *Kestävää kasvua materiaalitehokkuudella.* Työryhmän esitys Kansalliseksi materiaalitehokkuusohjelmaksi. Työ- ja elinkeinoministeriön julkaisuja 33/2013. Helsinki.

Valtiontalouden tarkastusvirasto (2013). *Tutkimus- koulutus- ja innovaatiotoiminnan hyödyntäminen kiinteistö- ja rakennusalalla.* Yhteenveto VTV:n työpajasta 11.4.2013. Valtiontalouden tarkastusviraston selvitykset 2/2013.

Tekes' Reports in English

6/2014 Boost to the sector – Evaluation of real estate and construction programmes. Mikko Valtakari, Janne Roininen, Toni Riipinen and Juho Nyman. Evaluation Report. 89 p.

5/2014 Evaluation of the Finnish Distinguished Professor (FiDiPro) Programme. Mikko Wennberg, Olli Oosi and Mia Toivanen. Evaluation Report. 42 p.

3/2014 Evaluation of the NeoBio and SymBio programmes. Peter Stern, Anders Håkansson, Marja Tähtinen, Jelena Angelis, Tiina Saksman Harb and Tomas Åström. Evaluation Report. 78 p.

7/2013 Tekes Functional Materials Programme 2007–2013. Sustainable material solutions – From Finnish research to global business. Markku Lämsä, Markku Heino and Vilja Vara (eds.). Final Report. 166 p.

2/2013 Path to ceating business from research – Evaluation of TULI Programmes. Joakim Ketonen, Laura Juvonen, Nils Gabrielsson, Matti Kuusisto and Pekka Koponen. Evaluation Report. 71 p.

7/2012 BioRefine – New Biomass Products Programme. Tuula Mäkinen, Eija Alakangas and Niina Holviala (eds.). Final Report. 100 p.

6/2012 Navigating New Routes to a Better Boat Industry – Executive Summary of the Research Programme 2007–2011 in Finland. Markku Hentinen, Sirpa Posti and Kari Wilén (ed.) Final Report. 69 p.

2/2012 Software, mobile solutions and games industry – Evaluation of Tekes software related programmes. Tuomas Raivio, Johan Lunabba, Erkka Ryynänen, Juhani Timonen, Markku Antikainen and Santeri Lanér. Evaluation Report. 83 p.

6/2011 Co-operation to Create Converging and Future Networks – Evaluation of Five Telecommunications Programmes. Annu Kotiranta, Olli Oosi, Mia Toivanen, Jaakko Valkonen and Mikko Wennberg. Evaluation Report. 69 p.

4/2011 GIGA – Converging Networks programme 2005–2010. Final Report. 217 p.

1/2011 FinNano Technology Programme. Final Report.

6/2010 From Spearheads to Hunting – Evaluation of Nano Programmes in Finland. Tuomas Raivio, Piia Pessala, Jatta Aho, Tiina Pursula, Alina Pathan, Jukka Teräs and Kaarle Hämeri. Evaluation Report. 67 p.

3/2010 MASI Programme 2005–2009. Niina Holviala (ed.). Final Report. 137 p.

4/2009 ClimBus – Business Opportunities in the Mitigation of Climate Change 2004–2008. Final Report. 564 p.

6/2008 Finnish participation in the EU 6th Framework Programme – Evaluation of Participation and Networks. Soile Kuitunen, Katri Haila, Ilpo Kauppinen, Mikko Syrjänen, Juha Vanhanen, Paavo-Petri Ahonen, Ilkka Tuomi, Pekka Kettunen & Teemu Paavola. Evaluation Report. 91 p.

Subscriptions: **www.tekes.fi/english/publications**

Tekes

Kyllikinportti 2, P.O. Box 69
FI-00101 Helsinki
Tel. +358 2950 55000
www.tekes.fi

Further Information
Pekka Pesonen
Tekes
pekka.pesonen@tekes.fi

November 2014