KNOWLEDGE-BASED ACADEMIC AND EDUCATIONAL ECOSYSTEM

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ABSTRACT

In this article, we examine the implementation of new innovative operation model in the Institute of Photogrammetry and Remote Sensing, Research Institute of Measuring and Modeling for the Built Environment at Aalto University, and in the School of Civil Engineering and Building Services of the Helsinki Metropolia University of Applied Sciences. The Academy of Finland has selected the Centre of Excellence in Laser Scanning Research, which is represented by the authors, to represent for its part the highest end of research in Finland for the period of 2014-2019. The need for novel operating models, innovations, multidisciplinary expertise and the transfer and combination of knowledge have required several connecting links to attain this. The approach has evolved to depend on the planned utilization of the cross-disciplinary expertise of the ecosystem and the additional employment of coordination and orchestration. The challenge is to additionally enable teaching and research to benefit fields that are tangential to one’s own, also in the cross-disciplinary context. It is equally important to be able to focus on the essential – scientific impact and the ability of research, development and innovation activity to influence both society and industry. Through orchestration and partnerships it is possible to create networks that possess enough critical mass and expertise to attain results of international level. The ability of these networks to exert an impact is reached by working with different enterprises to develop novel methods that are additionally applicable as product concepts for companies and transfer knowledge to Finnish companies. Within an academic ecosystem we have developed methods concerning e.g. orchestration, new forums, publication culture, best practices, knowledge flows, open innovations, and knowledge sharing using the Triple Helix model (collaboration between academia – industry – public sector) and the Knowledge Triangle approach (synergy between research – education – innovation).

1. INTRODUCTION

1.1 The impact of innovative activity

The role of higher education institutions, universities and research institutes is to serve as a bridge between the areas of research and enterprise, as there is an additional demand for the rapid regional utilization of results. Responding to challenges requires one to recognize the overall picture and chain of innovation, anticipation of changes, cross-disciplinary expertise, management of networks and ecosystems, and approaches that are sensitive to the prevailing situation. Increasingly multidisciplinary institutions that cut across fields have been identified as profitable and organisatorial solutions for developing the mutual expertise of various fields. The School of Civil Engineering and Building Services of the Helsinki Metropolia University of
Applied Sciences has utilized its future trends survey and activities (Hyyppä, 2012) to respond to how the operational environment of the future will shape our multidisciplinary requirements.

On the other hand, the Centre of Excellence in Laser Scanning Research, which is also represented by the authors, has been selected by the Academy of Finland to represent, on its part, the high end of engineering research in Finland during the period of 2014-2019. In addition to top-level research (Hyyppä, 2014; http://www.figi.fi/coelasr/stories.html) and teaching, the centre possesses the important task to develop novel operational methods, innovations, multidisciplinary expertise and the refinement of knowledge. Activities aimed at fulfilling the requirements of the centre of excellence have demanded entirely new levels of audacity as well as solutions in combining expertise and other factors in order to obtain the best possible results. Optimizing the communal use and utilization of available personal resources, facilities, equipment and other resources is suited to the purpose of planning and organizing top-level teaching, research and development activities. We have examined this from the viewpoints of 1) scientific impact and 2) the impact of research in society and industry. Demands for the distribution of new types of expertise and interactions with society are changing organizations which traditionally function within the fields of teaching and research. Hence, intangible resources including expertise, achievement and the generation of innovations are for sale within the ecosystem, and these goods must be utilized in the production of results. In fact, the flexible utilization of coordination and orchestration are gradually becoming the operating model of new types of top-level research units and centres of excellences.

The process of learning and education can be examined not only as the number of awarded degrees and credits, but also as improvement of skill and ability to continue lifelong learning.

However, at some stage the actual savings must be monetarily calculable. The impact of research and development (R&D) and innovation activities is frequently explainable via societal effectiveness, as opposed to financial impact. In order for the field to prosper, it is necessary for it to create employment, new business enterprises, improve its turnover with particular reference to exports, and create processes that result in clear financial savings in the community. The development of elevation models via laser scanning and the transition to laser technology within Forest Centre are societally measurable improvements to familiar activities, of which the latter results in yearly savings to society of nearly MEUR 20. Growing levels of employment are increasing the significance of the field and are also creating new R&D opportunities.

Hence two important and well-recognized operating principles have been defined for a successful research group: 1) Publish or Perish and 2) Demo or Die (Clapham, 2005). These principles have additionally become very familiar within the R&D and innovation field. Both involve the need to achieve a greater degree of visibility and, through that, impact.

Even these operational principles do not guarantee the innovativeness and high quality of research. Because of this, the quality of the activity in question must always be examined from two viewpoints:

1. Scientific impact, which is measurable as the number of citations for publications
2. Societal and industrial impact, which is quite frequently also measurable as novel profitable ways of activity and finally as euros. The further the transition along the innovation chain from primary research into product development, the greater and more immediate is the need for summarising profits.
By adhering to these as the ‘values’ of research and recalling them at the time of decision-making, it is possible to conduct innovative and high-quality R&D and innovation activity that is of service to society. Through the refinement of up-to-date information and expertise, the orchestration of projects, utilizing the Knowledge Triangle model linking research, education and innovation (EU, 2003; Markkula, 2013) and developing publication and popularisation methods for the network, it is possible to respond to societal challenges much more efficiently than via traditional approaches.

1.2 Challenges and trends profile R&D, and modify the innovation chain

A rapidly changing and increasingly complex world as well as societal challenges and increasingly result-driven thinking are continually creating new demands and opportunities for the R&D and innovation activities of polytechnics and universities. The most important questions become worldwide trends that consist of human attitudes and ways of life coupled with the development of technology. There are several grand challenges ranging from aging to learning and know-how within a media-driven society represented in Figure 1. (EU, 2012; TEM, 2013; Hyyppä, 2012; Finnsight, 2006; Academy of Finland, 2013; OKM, 2013). In addition, different themes for the openness and transparency of decision-making, source codes, science etc. and demands for involvement and collaboration are changing and modifying courses of action. Whilst the roles and management models of universities and polytechnics are changing, the public opinion on science has also gradually shifted. (Tiedebarometri, 2013; Ståhle and Ainamo, 2012; Sydänmaanlakka, 2012)

Future challenges that are of significance to humanity consist of broad societal and global-scale questions, the answers for which are being sought via innovative solutions and multidisciplinary expertise. In particular, urbanization and an increasingly aging population represent societal phenomena that set new demands for multidisciplinary expertise. (OKM 2011, 2013)

Changes in the working life as a result of digitalization and the rapid development of information technologies are enabling entirely new forms of service design and models. In order to increase regional innovation capacity, there is a requirement for new lines of action and facilities for collaboration – including our campuses, which encourage various users to participate in creative and enriching interactions. Decision-making becomes more open and the ability of the public to participate in it is facilitated by modern technology; for instance, with reference to urban planning. The development of international activity, on its part, requires planned and dynamic networking. Examples of various challenges are represented by communality, learning and know-how in a digitalized, media-driven society. Indeed, the difficulty lies in continually providing society with the newest information and technology in a way that is compatible with supporting continuing development through the provision of education within various fields. Notable current directions for development also include transparency, green values, mobility, memorability and the need for experiences.

Polytechnics will function together with universities as the engines of regional development, and they will develop and pilot innovations; train multidisciplinary experts through flexible curricula possessing an understanding of media, communications, enterprise, the environment, services and design that is required as part of the working life; and increasingly participate in societal discourse. (Hyyppä, 2012)
With reference to R&D and innovation activities, the entire innovation chain is in a state of change, including research institutes and companies in addition to universities and polytechnics (Figure 2). Different users will additionally operate outside the primary field of activities on a case-by-case basis, which will ideally improve the requisites of the chain to function, of which the recognition of user-specific strengths and their application in project activities are pivotal examples. The focus of polytechnics is on high-quality teaching that has direct relevance to the working life and associated R&D activities, but these roles will change with the introduction of varied collaboration models. (Hyyppä, 2012; Research and Innovation Council, 2010)

The aim of the Knowledge-based Academic and educational Platform (KAP) is to develop a novel rapid and goal-oriented operation model whilst piloting an academic ecosystem at Aalto University and, on the other hand, whilst supporting the education-oriented ecosystem of the Metropolia University of Applied Sciences. In addition and on its part, the target has been to facilitate the integration of new information and innovative, novel expertise as part of national and international networked activities.

This article focuses on depicting the new operating approach of the developed model, which facilitates the creation of a novel solution- and future-oriented culture and its establishment as part of research and teaching communities. The process of learning and education can be examined not only as the number of awarded degrees and credits, but also as skills and the ability to continue learning across one’s life. As such, the challenge is to continually provide new information in a way that promotes life-long learning for everyone.

The activation of talents to pursue interesting science should already be achieved at the youngest age possible. This can be attained, for example, through the application of investigative learning,
project-oriented learning, creative discoveries to arouse one’s interest, and by utilizing life-long learning.

Figure 2. The traditional innovation chain in Finland is changing through the gradual shift of different users towards a higher degree of activities outside the presented field of activities. (Adapted © Nivala and Hyyppä, 2013)

Figure 3. The links between the modernized Triple Helix and Knowledge Triangle. (Laitala and Miikki, 2011)
The modernized Triple Helix model presented in Figure 3 is a collaboration between academia – industry (companies) - public sector - people (individuals and communities). Knowledge Triangle (KT) means jointly fostering research, education and innovation, and of paying due attention to the linkages and orchestration between them. (Laitala and Miikki, 2013; Viitanen et al., 2013)

2. THE ATTAINMENT AND REFINEMENT OF KNOWLEDGE AND EXPERTISE

In top-level research, the information required by various projects is collected and obtained in an orchestrated fashion, utilizing the expertise and experience of the entire group. Information is also collected by participating and organizing networking events and forums, following publications and the Internet, completing measurement campaigns and various experimental designs, and participating in different kinds of social and scientific activities and associations, etc. Top-level teaching and research always require smart specialization and appropriate solutions for the selection of collaborators.

Modern research and expert organizations are characterised by networked activity models, in which the attainment of impact is increasingly based on information obtained via the life-long learning of individuals and organizations. Information based on individual observations is refined into models and theories, which are utilized by the individual and organization in their respective activities. Information and communication streams within an information-based organization consist of information transferred between individuals, groups, information stores and organizations. (Ahlavuo and Hyyppä, 2009)

Successful organizations possess the ability to predict and observe changes and enterprise-related opportunities by following the great waves of development, i.e. megatrends and weak signals in support of their activities. Indeed, globalisation and new technology have brought worldwide networks along with themselves, and these have become sources of new wealth and continuous renewal.

The refinement and distribution of novel information, whether self-produced or externally sourced, requires the organization to be dynamic and possess an operating model. The model suggested by Nonaka and Takeuchi (1995) has been modified by taking into account the pressures of societal trends and weak signals in the socialization of information, and the need for renewal. By combining knowledge with the interlinking of science, technology, the arts and the economy, it is possible to create new meanings and value for pre-existing information. Learning and assimilation by doing is made more effective by the living lab operating model by the application of demonstrations, by increasing the degree of visualisation and the holistic orchestration of activities. (Ahlavuo et al., 2011)

In the Living Lab model, products or services have been developed together with workers and end users in genuine every-day settings. One of its manifestations is Urban Mill, which was created in Espoo’s Otaniemi. Urban Mill is a facility which aims to function as flexibly as possible to assemble buyers, facilitate meetings and refine new ideas into projects. Activities taking place at Urban Mill are novel in the sense that events and meetings which take place there are connected to the development network, based on available opportunities. Urban Mill also aims to function as a facility that possesses memory. According to Mikkelä et al. (2013), Urban Mill attempts to memorize what has previously occurred at the facility and to distribute this information to those coming later to the facility as well as to those who are virtually connected to the facility. This memory is supported by social, physical and virtual channels both before and
after the events, and of course during them as well. This is achieved through the continual implementation of various idea-generating and development events.

The importance of expertise-related human capital has become more pronounced as the entrepreneurial world is shifting from production to services and information-based activities. Indeed, with reference to The School of Civil Engineering and Building Services of the Helsinki Metropolia University of Applied Sciences and the Aalto University Research Institute of Measuring and Modelling for the Built Environment, the aim is to enable the understandable and easy collection of up-to-date information concerning dissertations, research outputs, projects and the future of the field, including its use within broader management activities and society. This is achieved by utilizing indicators and measurement criteria established by the Ministry of Education and Culture. Although various demands for societal impact have been set for research, development and innovation activity, most of this inherently valuable activity will never reach a sufficiently large audience. (Hyyppä and Ahlavuo, 2013)

From the viewpoint of research institutes, it is most important to rapidly and comprehensively enable the availability of all information for supporting the organization and its management. The aim is to utilize existing information and expertise to transform activities and expertise within the organization into a competitive advantage. Teaching involves a high degree of so-called visible (shared and explicit) information. Research information and research projects are for the most part classifiable as silent information. Attempts to improve the visibility of silent information have been made through the use of data banks, the development of documentation, more efficient approaches to the presentation of research, portfolios, new operating models, networks aimed at life-long learning, the KAP concept of research platforms, and the popularization of information.

The distribution of information has been further examined and utilized by various units with respect to several topics including the individual, the science community and societal impact. Based on the information collected (Figure 4), the aim has been to develop activities within the organization, for example via analysing the knowledge capital of the organization and by developing the mutuality of staff expertise. As part of recruiting activities, the obtained results have been accounted for in several ways, including the selection of experts who possess a suitable theoretical background as part of the research group, and to support the potential of the group to develop.

The curiosity of the public towards science has also continually increased, as has life-long learning. The challenge for researchers and teachers is to participate in novel ways of collaborating in both the production and visualisation of new information. The immediate utilization of information requires researchers and teachers to think and act in new ways. In addition to traditional models of studying and working, people demand the opportunity to work, learn and study wherever and whenever they wish.

The utilization of relevant information within collaborative networks and related process-based decision-making also ensures the development of scientific research. The challenge presented for the research and teaching community is to actively participate in a global user network. From multidisciplinary and cross-cultural collaboration, progress is made to address communally solvable phenomena. Information must be transferred between owners and produce not only information, but novel future-oriented activities. Virtual worlds, the Internet and cloud computing services are challenging researchers and teachers. The presumption that all information is available via the Internet can be frustrating to the seeker of fragments of information. Planned collaboration with selected networks enables the discovery of the required information.
3. KNOWLEDGE-BASED ACADEMIC AND EDUCATIONAL PLATFORM

Developing the activities of the Knowledge-based Academic and educational Platform (KAP) has been facilitated by the need to conduct research into great societal challenges across the world. The cycle between global, national and local challenges is very clear. The model of the research and teaching environment accounts for the important parts played by societal impact and its diversity within the strategic activities of the research group. Research, teaching and innovation activities are in a state of developing interaction with the entrepreneurial world, teaching and research institutes, and public users. Traditional indicators do not entirely match the required results. Responding to challenges requires one to recognize the overall picture, anticipation of changes, cross-disciplinary expertise, networking, new operating models and initiative.

The Research Institute of Measuring and Modelling for the Built Environment was founded in 2007 as a shared institute of the Helsinki University of Technology and the Finnish Geodetic Institute, after it was felt that old ways of interacting within the research field were insufficient. The institute was developed as a virtual organization (Katzy and Löhl, 2003). The aim was to actively mediate work between different collaborating groups, and to combine expertise and research goals. On the one hand, the institute has focused on publication activities and in the result-driven coordination of projects and groups, i.e. the research funding stream. Yet on the other hand, the benefit of this activity lies in its strongly cross-disciplinary and international nature, and in the genuine sharing of project tasks between several mutually supportive research organizations. The institute advances the renewal of research of different participating groups so that a clear partnership has formed between the groups which is visible, for example, in the
number of shared staff members, several research projects, patents and publications; so this has gradually resulted in the attainment of notable synergy-related benefits.

The basis of the KAP model lies in understanding the overall picture and the comprehensive utilization of expert knowledge. In order to specialize in fields within which one’s own expertise and work are clearly separated from the mass, it is necessary to employ global-scale information to discover the relevant knowledge and operators. The skills of researchers and teachers to utilize scientific theories and the most efficient research and teaching methods with respect to a given situation in both a multidisciplinary fashion and within changing groups are essential. Recognizing the best situation-specific approaches and presenting one’s own special skill sets are beneficial to collaboration in changing projects. Visual ways of demonstrating knowledge have become increasingly important when there is a requirement to transfer expertise and knowledge from research groups into society.

The aim has been to develop flexible operating models and processes for transferring expertise and knowledge to society and teaching by combining information streams, innovations and technology. The distribution and transfer of information to society creates demands for the quality, transparency and transferability of knowledge.

KAP has been developed to ease the functioning of one’s own organization with various connecting groups. A user-based mental culture guides the utilization of research results. A single organization or several of them share and develop their expertise in both the production of information and the reporting of results. The ecosystem is moulded through changes in the surrounding environment to respond, for its part, to those requirements presented to it by the changing environment.

Figure 5. The impact of an innovative teaching and research environment and the activity of a novel environment as part of societal impact. © Hyyppä and Ahlavuo
In addition to the best practices for conducting research, appropriate sections of different theories are applied in a manner that improves the efficiency of activities within the group. For example, these include supervision via knowledge, leadership, orchestration, coordination and management. Innovations and the best practices produced by the group are made into a visible part of society by research publications written from the viewpoint of the target audience. KAP represents a functional approach to distributing know-how and skills within a group and to refine the silent information within the research group into a visible part of society (Figure 5).

Goals defined by the strategy of teaching and research units are synchronized with activities if the goals and indicators are correctly set (Hyyppä and Salonen, 2011). Since 2007, the academic indicators of research have included degrees, publications, patents, dissertations, received research funding, internationality and societal impact. In practice, however, research activity is project-based, so the composition of the group and its renewal constitute a relevant component of the success of research activity. Information is stored within the group as the development of both individual- and group-specific expertise. In a well-functioning research environment, information is stored in databases to anticipate the novel needs-based utilization of knowledge.

Competitive research and development funding is dependent on results obtained by the research group and its ability to adapt its activity to the terms of funding. The full-scale utilization of results requires a great degree of visibility.

One of the aims of KAP is to ensure the recognition of correctly timed required information and its refinement for the needs of the target audience. Identifying the level of the client’s knowledge is also required by the quality of the desired information. It is easy to create opportunities for the recognition of any desired silent information in which information which has been identified as mutually valuable is made visible. Improving the visibility, management and distribution of information has been developed particularly by employing the opinions of Gupta and Govindaraja (1991), and Alavi and Leidner (2001). With reference to the created knowledge and knowledge flows produced by the organization, the models of Van Winkelen and McKenzie (2007), and Nonaka and Takeutchi (1995) have also been employed. (Ahlavuo et al., 2011)

We have systematically developed the following skills: communication skills, the ability to interpret source materials, client relationship skills and partnership skills, initiative, the carrying of responsibility and decision-making skills. Multidisciplinary skills benefit one’s capacity for renewal, interactions and innovativity, which in turn contribute to the development, acceleration and rationalisation of the processes under work. Multidisciplinary expertise enables the ability to comprehend full service chains and facilitates the prediction of future changes. Frequently, an employee will possess an area of specific learning that is necessary to broaden as well as a number of other areas of learning which depend on individual interests, for which it is desirable to increase one’s degree of expertise.

Together with the Finnish Geodetic Institute, Aalto University, and the Universities of Turku and Helsinki, the School of Civil Engineering and Building Services of the Helsinki Metropolia University has developed a working model whose focus has become the communal development and distribution of information in a way that enables the societal utilization of expert knowledge in several different ways. The publication and popularisation method of the expertise network – the ‘Business and Science Breakthroughs’ model (BSB 2.0) – has been developed since 2009 for the management, popularisation and technology transfer of networked research projects and new measurement techniques, knowledge capital and information streams to society. (Hyyppä and Ahlavuo, 2013)
Popularization and publication activities have been identified as a prerequisite for the successful functioning of teaching and research organizations. Popularization and publication additionally support the integrated marketing communication of the organization. New open access publications are gradually replacing familiar academic publications as a publication channel.

4. FROM TRADITIONAL PROJECTS TO ORCHESTRATED NETWORKS AND THEIR UTILIZATION

Over the years and alongside traditional R&D and innovation activities, the collaborative network has evolved into a client with both individual and thematic wishes concerning the practical and immediate utilization of expertise. However, traditional modes of operation have changed within modern networks. Within ecosystem networks, it may be difficult for the client in question to present a requisition, because the requested product cannot be immediately defined and it is impossible to establish a price for the project and collaboration at the outset.

4.1 Orchestration consists of combining and coordinating several skills

Within an ecosystem, users must be familiar with the strategies, visions and responsibilities that guide activities. Even activities completed with a few collaborative partners and with the same vision must be managed in a coordinated fashion. Coordination is sufficient when communication between parties is natural.

![Figure 6. It has been possible to gradually shift from traditional individual projects to mutually supportive project portfolios. (Adapted from Markkula, Miikki and Pirttivaara, 2009) © Hyypää and Ahlavuo.](image)

Orchestrating the ecosystem (Wallin, 2006, 2009) already sets a demand for several parties acting within the ecosystem to perform mutual inspections of the direction for obtaining the desired...
goal. Even so, one of the most central questions pertaining to the competitiveness of organizations and companies involves the recognition of changes in the working environment, and rapid reactions (Eskelinen, 2011). Markkula (2013) proposes orchestration as a dynamo for the regional activation of the ecosystem (Figure 6).

The concept behind orchestrated action is to comprehensively manage project portfolios and networks. Part of the R&D work takes place in several value-related and other networks, resulting in the increased importance of orchestrating within the network, and users gradually make a transition towards their own specific fields via smart specialisation. The challenge for R&D work is to utilize various active and multidisciplinary networks in support of project management, and to enable networks to function as based on the so-called network of network concept.

Orchestration produces additional value for the clients and members of the network (Figure 7). During orchestration, the network is perceived as a comprehensive unit that attains a competitive advantage. In order for the orchestrated network to function, market potential is necessary, the costs of coordination must be lower than the value produced by collaboration, and members of the network must share a mutual value set, culture and attitudes. In addition, the verticality and horizontality of the network will regulate the role of the network and its mutual relationships. (Wallin, 2009; Möller et al., 2004).

Research projects are no longer independent. Instead, they form a single contiguous mega-project within the research programme as a whole. A shared vision with its own interests guides the independent activities of individual parties. Through collaboration, it is possible to attain a competitive advantage and to utilize novel forms of information with new partners. Complete

\[ \text{Figure 7. Orchestration of activities of the Knowledge-based Academic and educational Platform. Ba is a space, where members of the network feel safe and knowledge refines. (Adapted from Markkula, Miikki, Pirttivaara, 2009 and Nonaka, Toyoama and Hirata, 2008). © Hyyppä and Ahlavuo.} \]
operation models and tolerating uncertainty are part of the process. The profits are collected by those who are capable of participating in teamwork and are aware of their own result-driven goals along the short-term, long-term and intermediate scales.

4.2 Knowledge Triangle

The Knowledge Triangle model is additionally combined with the KAP operating concept, where activities are developed in collaboration with universities, research institutes, public users, companies and, in a broader sense, with general citizens.

The aim of the Knowledge Triangle (KT) concept is to enable a situation where research, teaching and innovation activities are in a state of natural interaction with one another in a way where each user obtains significant additional benefits from this concept-based activity. The goal of KT is to improve the level of education and to give rise to new nationally and internationally significant research, and demonstrations and practical demonstrations based on this. In order to reach this goal, there is a need for immediate and natural interaction between teaching, research, development and partners. (Laitala, 2011; Laitala and Miikki, 2013.)

As part of development projects arranged between companies and the public sector, there is a need for a platform or hubs which transfers products from the university to the entrepreneurial world. As a side product of collaboration, significant benefits are striven for within several separate sectors.

5. CONCLUSIONS

This paper described the implementation of Knowledge-based Academic and educational Platform (KAP) to attain results of international level from the viewpoints of scientific impact and the impact of research in society and industry. As part of the Triple Helix and Knowledge Triangle concepts research, innovation, and education activities are developed collaboratively between universities, research institutes, public organizations, companies, individuals, and communities. It is equally important to be able to focus (smart specialization) on the essential scientific impact and to influence both society and industry. Our research has already created 30M€ annual savings to Finland, more than 10 international projects coordinated, during 2007-2012, and about 30 international projects participated. Based on all databases, many of our researchers belong to the top 20 in the world in the field of laser scanning and mobile mapping. We have initiated several new openings (new research areas) in the field of laser scanning (LS), recently developed a totally new low-cost miniature LS technology, backpack mobile laser scanning also known as wearable laser scanning system, ROAMER mobile laser scanning system, 1st prizes in design competitions, top cited journal papers, and US patents. (Hyyppä, 2014; FGI, 2014)

The ultimate result is the Centre of Excellence in Laser Scanning Research, which has been selected by the Academy of Finland to represent, on its part, the high end of engineering research in Finland, during the period of 2014-2019. Several international events including the Laser Scanning 2007 and SilviLaser 2007 conferences, and research, development and innovation-related sessions taking place at Helsinki Metropolia University are examples of opportunities to present matters and factors relevant to a theme which connects several different fields.
In addition to high-end research and teaching, the centre possesses the important task to develop innovations, patents, multidisciplinary expertise and the refinement of knowledge. Activities aimed at fulfilling the requirements of the centre of excellence demand entirely new levels of audacity as well as solutions in combining expertise and other factors in order to obtain the best possible results. Optimizing the communal use and utilization of available personal resources, facilities, equipment and other resources is suited to the purpose of planning and organizing top-level teaching, research and development activities.

Our innovative approach has combined coordination, orchestration, best practices, partnership models, publication and popularisation culture, cross-disciplinarity, living labs, incubators, marketing, knowledge management, and so-called swarm intelligence activity to attain required results. Although the process of learning and education can be examined not only as the number of awarded degrees and credits, but also as skills and the ability to continue learning across one’s life.

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