Jokapaikan tietotekniikka ja monimuotoinen viestintä (MOTIVE)

Ubiquitous Computing and Diversity of Communication

Programme memorandum

Contents

1 INTRODUCTION

Ubiquitous computing, communication and information retrieval are continuing to increase and expand in all their various forms. Advances in technology have greatly increased the diversity of communication. At the same time, communication has had a profound effect on the economy as well as on patterns of time use and opportunities for social participation. Traditional print media are losing readers and advertisers; with the continuing proliferation of networks and mobile technology and the new individual uses they offer, messages are becoming ubiquitous. One of the most prominent trends in the development of modern information technology is the growth of ubiquitous computing. This has been made possible by computers embedded in the environment and new modes of interaction.

As emphasised by the Ministry of Transport and Communications in its Ubiquitous Society strategy, ongoing advances in communications technologies are having a dramatic effect on people's everyday life and on business. Indeed, the next stage of the information society may be described as the new everyday information society or ubiquitous society. Here, people will have ubiquitous access to communications services and communications networks, smart terminals will become ever more pervasive and affordable, and physical objects and machines will communicate directly with each other. Ubiquitous society will offer unprecedented opportunities to improve people's everyday lives and to increase labour productivity. On the other hand, it is important to make sure that different groups in society have equal and equitable access to services and that general safety standards, information security and consumer protection are maintained.

There is a great social demand now for research into ubiquitous society. The latest Government Programme highlights a number of factors in the realm of ubiquitous computing and communication that have a direct bearing on the nation's welfare, skills and competitiveness. There have also been calls from within the scientific community to step up research in this field. Drawing on programme initiatives received from the research community, the Academy of Finland started in 2006 to make preparations for a **Research Programme on Ubiquitous Computing and Diversity of Communication (MOTIVE).** As the name implies, the main focus of the programme is on ubiquitous society and the growing diversity and ubiquity of communication. The programme has great social relevance in that the information and knowledge it produces will directly support the development of society. A major concern in the programme will be to study how the realms of both work and leisure are affected by communication and ubiquitous computing. Another area of interest is to establish principles and to develop technological solutions that can help to promote the desired

effects. The programme provides a solid platform for future applications of basic research not only in communication, but also in such fields as education, culture and entertainment as well as in service provision in health care and other sectors.

Programme links with other research programmes

The Government of Finland is committed to creating a competitive and human-centric knowledge society: this is the main overriding objective of the national information society policy for 2007–2011 as set out in the Government' decision-in-principle of 21 June. The Government identifies five key areas in the development towards a knowledge society: 1) the development of online services and IT environments in public administration; 2) the use of information and communications technologies in the fields of education, research and culture; 3) the development of the information society infrastructure, media and communication services and business in the communication sector; 4) the promotion of social and health care innovations and online services; and 5) information society issues related to innovations, competitiveness and productivity. The MOTIVE Research Programme supports and promotes these objectives as well as the goals of the Government's National Knowledge Society Strategy for 2007–2015 that was published in 2006.[1] The Research Programme also ties in closely with the Strategic Centre for Science, Technology and Innovation in the ICT sector; the "Ubiquitous Computing" and "Smart Machines" clusters under the Ministry of Trade and Industry's Centre of Expertise programme (2007–2013); and the Tekes technology programme "Ubicom – Embedded ICT" (2007–2013). The aim of the Academy's MOTIVE programme is to support and strengthen basic research in this field. Networking and cooperation among these programmes can help to generate significant potential synergy benefits and added research value.

Serious science and research and the attainment of the best possible knowledge will require not only national but also international cooperation. This has been taken into account in the preparation of the programme. It has three foreign funding partners: the National Natural Science Foundation of China (NSFC), the Chinese Academy of Social Sciences (CASS) and the Russian Foundation for Humanities (RFH). These two countries are identified as priority areas in the Academy's international strategy and are showing strong growth in research in this field.

[1] http://www.tietoyhteiskuntaohjelma.fi/esittely/en_GB/introduction/_files/76222690188788831/default/Strategia_englanti_181006final.pdf

Ubiquitous computing: the concept and research challenges

The concept and vision of ubiquitous computing, as originally coined and developed by Mark Weiser[2], is based on invisible computers embedded in the environment as well as on uses and applications made possible by new modes of interaction. The ubiquitous system automatically adapts to the user's behaviour and actions. The technology may be embedded in an intelligent environment that uses sensors or other devices to monitor and draw inferences about the user's actions and provide advice on how best to proceed with the task at hand.

The technological challenges in ubiquitous computing are enormous and the development of the necessary methods will require substantial input. In particular, research into many interaction modalities and knowledge of how those modalities can be used or combined, is still very much in its infancy. New computational methods are also needed to understand the activities of users and user groups, and that calls for a strong effort in basic research. Ubiquitous environments should be able politely to anticipate and adapt to people's needs (personalisation), whether those needs are related to working life or entertainment. In the field of adaptable or personalised systems there is a need for research on computing methods. Most research interests and applications in computing methods and technical solutions are shared internationally.

Most research on ubiquity so far has focused on the aspect of technological development. At the same time, though, it is crucial to bear in mind that all technology is used by humans. What we need is human-centric ubiquitous computing. Ubiquitous technology impacts our everyday life, our culture and society, and it should be developed on the basis of people's needs and desires.

The diversity of communication: the concept and research challenges

The diversity and ubiquity of communication is accelerating at a remarkable pace; everyday life is being mediatised. Different media technologies and media contents have an increasingly prominent presence in citizens' and consumers' everyday environment. Advances in information technology are changing modalities of communication, the forms of producing, representing and using information. At the same time, media landscapes and communication systems are also changing and re-shaping the relationship between producers and consumers. This is at once a process of national and global change. On the one hand, multinational media groups and national public service broadcasters are moving towards ever greater convergence and developing new electronic contents

[2] Mark Weiser, "The computer for the 21st century." *Scientific American*, September 1991, 66–75.

to supplement their traditional products (newspapers, magazines, radio, TV, film). At the same time, there is a growing proliferation of various kinds of audience and citizen-driven communication: social media (e.g. blogs, wikis, YouTube type services for content distribution), community services (e.g. MySpace or IRC-Galleria) as well as various collective projects for content production (e.g. Wikipedia).

As yet there is only limited research into the diversity and ubiquity of communication, particularly from the point of view of citizens, users and everyday life. In view of the requirements of democracy and transparency in communication, it is important that the changes taking place in the field of communication are such that they provide all citizens better access to services and improved opportunities for participation and influence as well as for self-expression and social community. The growing diversity of communication also requires improved compatibility between hardware and data networks. It is important to research both hardware and services as part of users' everyday life so that both opportunities and potential threats can be identified and so that products can be integrated as part of citizens' and consumers' everyday practices.

A further challenge for research is to conceptualise communication in this new situation in broader terms than simply information retrieval or transfer. Communication must be understood broadly as involvement in culture and society, as an exercise in analysing and organising individual and collective identities and as a form of experiential and creative self-expression.

Themes of the programme

The MOTIVE programme proposes to approach the research challenges outlined above from the point of view of four themes:

- Human interaction
- Impacts of communication
- Products and services
- Human-machine interaction

These themes are not mutually exclusive, but they share several points in common.

Towards multidisciplinarity

The achievement of the objectives set for the programme requires that the rigid boundaries between disciplines can be overcome. This calls for multidisciplinarity and above all a greater convergence between human studies and technology studies. The perspective of one single discipline is not enough to tackle the complex challenges involved in the development of the knowledge society. The phenomena and subjects of interest are such that the most fruitful approach is to work on a multidisciplinary platform. The aim must always be to acquire the best possible knowledge. With these requirements in mind, the programme will give priority to projects that set themselves genuinely multidisciplinary research problems. It is also important to make sure that the projects involved have every opportunity to communicate freely and to learn from one another during the course of the programme. This will also have a direct bearing on the impact of the programme. Furthermore, it is necessary to have enough research themes that are based on well-defined case studies. Even though it is the Academy's mission is to finance basic research, there is also a strong element of practical application in the projects.

A major challenge in multidisciplinary projects is that the teams involved operate with different conceptual apparatuses and have different goals for their research. In order for multidisciplinary research to succeed, it is necessary to develop new research approaches and also to look at the theories (concerning communication, ubiquitous technology and their relationship), concepts, methods and methodologies of research itself. The research teams need to exchange information at all stages of their work. The information needs in different research traditions are also complementary of one another if they can be offered and exchanged at the right time. Technology development projects, for instance, often need from the outset a requirements definition that is compiled on a multidisciplinary basis, to serve as a base for project planning; that definition cannot wait until the end of the project, even though iteration later on is certainly recommended. The challenges that emerge in practical life can be overcome by collaboration – by integrating the knowledge of experts who have studied the same real-life phenomena from different directions.

Among the disciplines that are expected to contribute to the MOTIVE programme are computer science, language and communication sciences, cultural studies, language and communication technology, behavioural sciences, economics, law, and psychology.

2 AIMS OF THE PROGRAMME

The Research Programme on Ubiquitous Computing and Diversity of Communication aims to:

- generate basic knowledge and related solutions to facilitate the development of human-centric ubiquitous computing applications
- generate high-level competence and know-how
- produce new information about communication, the diversity of messages and their role in people's everyday life
- inspire and encourage interaction between researchers in different fields
- support the development of centres of expertise in the information sector

To qualify for participation in the programme, projects are expected to:

- focus on the research themes identified
- have a multidisciplinary organisation and orientation
- exercise an impact in the area of the research programme

3 RESEARCH NEEDS

Human interaction

People today are more and more in contact with one another both at work and during their leisure. Their messages are increasingly diverse and multimedial, and they have an increasing diversity of functions in the lives of individuals and communities. Possible themes of interest in the Research Programme include messages, methods of communicating messages, language, language choices and interpretations of messages.

There has been some multidisciplinary technology research in the field of both human-computer interaction (HCI) and computer-supported cooperative work (CSCW) as well as in information systems science (IS), but most of the development of ubiquitous technology so far has been governed by engineering intuition. The understanding accumulated by researchers in different fields has provided only limited guidance to the development of applications.

Human beings are relatively unchangeable, but the massive exposure to which they are subjected in a world that is increasingly pervaded by information technology is having effects that need to be better understood. Research can also help to uncover the impacts of information technology and find out how the technological environment can and should be shaped to achieve the most desired impacts. Studies of special needs groups and aids developed by using the best knowledge available can provide useful information about important technological applications. These kinds of experiments have long been underway, but much more work is still needed.

There are a host of major issues that call for research. For instance, the development of new applications in the fields of ubiquitous computing, communication and interaction should not necessarily work on the assumption that "richer" messages (i.e. those communicated using several sensory modalities and making ever better use of their possibilities) are inherently better for people than narrower communication. It is important to leave room for individual thinking and in this way to allow for more individual and creative outcomes. The key lies in how the message is interpreted and in what kind of action it elicits. It must also be borne in mind that the nature of media changes and evolves as they are used. Media and technology must not be studied in isolation of their environment. Existing assumptions must be challenged. For instance, the original vision of ubiquitous computing was based on assumptions that we now know were partly erroneous or that only have limited applicability. Concepts and their contents must still be treated with a critical eye. Furthermore, the methods developed for studying traditional operating environments must also be called into question. Work to develop new methods must take a broad and unconstrained approach so that any new emerging phenomena can be detected.

The predominant trend in mobile communications uses around the world is one of divergence rather than convergence. It is useful to try and gain a deeper understanding of this diversity by means of research. Likewise, it is good to remember that the importance of written language to communication is not the same the world over: either a written language does not exist at all (e.g. sign language), or it is not used to the same extent as in Finland, even if that were possible. Unesco statistics show that there are more than 861 million illiterate adults in the world and that more than 113 million children receive no schooling. The growth and proliferation of mobile communications may help to improve literacy in these countries, and research can certainly play a part in this.

Research needs to focus on the processes of interaction and especially on the reciprocal impacts of communication as well as on the compatibility of expectations and assumptions. In addition, more research is needed into citizen participation and influence. As regards values and questions of influence, research is furthermore needed into children's and young people's media environments and the distinctive patterns of their media use. Key areas of interest here include commercial influences and impacts on identity formation. It is also necessary to study the impacts of technology on perceived quality of life, on how people experience the diversity of communication in their own life. The impacts of communication on sustainable development should cut through the whole programme. Importantly, research should recognise the increasingly diverse role and impact of technology in people's everyday life and focus on the reciprocal interactions and impacts between humans and technology.

Impacts of communication

Changes in the communication environment can be studied from the vantage-point of social structures and social practices. Identifying individuals and ascertaining rights of access is important: this will add to service flexibility but at the same time increase control and the checking of rights. Information may be sensitive and therefore access must be controlled. Privacy, reliability and data protection are all set to become increasingly important to individual citizens. The control of impacts calls for new architectures that support the decentralised processing of information and its management.

Impact studies are widely scattered across different disciplines. Earlier research has looked among other things into the social, cognitive, societal, psychological and health effects of communication. The main focus in this line of work has been on the risks of media or communication. The design of ubiquitous technology is very difficult, and earlier usability studies need to be complemented by new research outside of laboratories. This research needs to be able to show how technology intermeshes with everyday practices, including the diversification of communication as well as different user groups and identities. The approaches needed in this kind of research are only just beginning to evolve and require special attention.

More research is needed that explores communication in its diverse contexts and that aims to understand it via its societal meanings. Diverse communication involves diverse messages and diverse media, just as it does diverse communicating groups, communication situations and

processes of interaction. One of the key areas of development is research concerned with the locus of communication. The locus of communication (local, global, the relationship and tension between local and global) and the practices of communication in those locuses may provide a unifying approach and perspective for research into ubiquitous computing and communication. Research should be extended to cover the diverse situations of communication and the different kinds of groups involved (including immigrants as well as different genders, age groups and social groups). Research designs are needed that deal not just with one-way impacts, but that recognize and address the interweaving and mutual influences between the communication practices of individuals and groups of people, institutional practices and cultural understandings and values.

Products and services

New services[3] and new products are created in the world of diverse communication almost on a daily basis. These innovations are also changing the nature of earlier services. Newspapers and other print media are changing as they now have to compete for the time of consumers with digital and interactive media. Communication is becoming ubiquitous: information and services are available and accessible everywhere, via various technical devices. For this vision to materialise, it is necessary that the hardware components and information networks are mutually compatible and that the contents are intelligent. There is a growing demand for ontology-based products and services in different fields of application. Access to information is a universal right. At the same time, information and messages are becoming marketable commodities to which property rules apply.

Under EU legislation already in place, information society services comprise both online services and digital contents. Almost all services are produced in processes that involve information and communication technology. Digital and other products are also created through similar supported processes. The differences between products, services, works and processes are becoming increasingly blurred. The services covered in the MOTIVE programme include not only communication services, but also other ubiquitous digital services – commodities that generate added value to individuals and communities.

The everyday perspective and the user perspective are central to studying services. At the same time it is important to recognise the broad array of service producers and their various combinations.

[3] Services can also be defined in a broad sense as comprising works and processes.

Different agents may also have multiple roles, even simultaneously. The roles of producer, author, citizen, consumer, user, client and recipient are not mutually exclusive, but are closely interwoven as information technology continues to develop and become ever more ubiquitous.

Key research needs and interests with respect to products and services comprise a wide range of issues from information technology to culture and society. Important areas of study include the operation and meanings of products and services from the points of view of everyday life, users and citizens. This will highlight such aspects as reliability, availability, accessibility and quality of services; consumer rights and copyrights, questions of privacy and data security. Other prominent issues include the readiness of different user groups to adopt new services, or their “ubireadyness”. The impacts of changes in communications modalities and ubiquity in society and culture are an important subject of study. Specific areas of interest here include the re-alignment of the relationship between producers and users; implications of the changes from the point of view of publicity, democracy and the communication system; and their impacts on the media landscape and more broadly on the fields of culture and arts.. Likewise, the formation of professional identities and changes in those identities in ubiquitous society is identified as an important issue.

Human-machine interaction

In order to take good advantage of technological development it is necessary to have good dialogue between humans and machines. It is important to take account of the growing demands and expectations of comfort as well as the multidimensionality of user experiences, such as the role and impact of affective factors. Interaction does not need to be confined to a single individual, device or place. That is why it would be fruitful to research not only the dialogue between *humans and machines,* but also interactions between *humans and ubiquitous environments*.

Interactions between humans and machines have attracted some research attention in Finland, but there has not been enough interdisciplinary cooperation. There is clearly a need for new research methods and new research paradigms both within and between different disciplines. Usability research, for instance, can no longer be content simply to ask how well a certain environment supports a certain function. It needs to shift its focus to studying the interactions between different information systems and users in a variety of different contexts and situations. Computational methods have been applied to modelling the actions of both individual users and user networks. These methods have been used when interaction has relied on multiple modalities, such as natural language, speech, eye movement or affective factors. Projects under the Academy of Finland’s

earlier research programme on Proactive Information Technology conducted some important work along these lines.

Information retrieval is an important part of communication in today's environment of information overflow. Finland has some research expertise in this field, but so far very little work has been done on ubiquitous environments. Another important research question is how to guarantee the access to interaction and non-discriminating technology so that certain population groups such as the elderly, the disabled and various minorities are not discriminated against. It should be possible to predict how a technological system will be received by the public and to take account of other sociological and psychological phenomena from the earliest planning stages and in this way to minimize any undesirable impacts. The question of how people are encouraged and taught to use new communications technology is a separate matter altogether (media literacy, communications literacy).

Ethical questions and the protection of privacy must also be addressed. People may be reluctant to have any personal information collected about themselves, and on the other hand they may want to know for what purposes that information is collected. When personalisation and information retrieval methods are used, users must be able to select the criteria on which the information retrieved is shown to them. Systems must not be allowed to become "black boxes" that cannot be switched off.

4 IMPACT

The impact of the MOTIVE programme can be considered in the light of the targets set for the programme. First of all, the programme is expected to have an impact on the development of science and research. The generation of new knowledge, skills and competence and the growth of interaction is an important instance of impact. Reference was made earlier to the programme's potential synergy benefits and the added value it can offer to, and on the other hand gain from, other programmes with similar interests. The impact of the research programme can also be considered in a much broader perspective. Scientific research has an impact when it brings about change. Research can change attitudes and opinions, beliefs, people's behaviour or society at large. It may also have a direct impact on the economy, politics and health. The MOTIVE programme can be expected to produce cultural, social, economic and societal impacts. One of the major functions of programme coordination is to promote the impacts of the programme and by the same token its

added value. On the other hand, the assessment and measurement of change and impact is extremely difficult and challenging. Indeed, not all impacts can be measured in terms of volume or value in the first place, but they have to be considered against a deeper analysis of society, culture, health, etc. Nevertheless, the impact of scientific research will receive prominent attention during programme coordination.

By way of a starting-point for the research programme, it might be useful create a vision for some point in time in the future (say, 2020) and then gear the programme to achieving that vision. That vision could portray a health centre or art exhibition of the future and their IT, service and communication needs. Multidisciplinary consortia could then be set up around that theme, with the various groups approaching the theme from their respective vantage-points and interests. The theme provides a concrete framework for the research and at the same time supports the coherence of the programme and its objectives as well as genuine multidisciplinarity. It is better to ground such a vision in a set of values that one wants to promote rather than in technology and in definitions of desirable technological features. Among the most important values that should be taken onboard are inclusiveness, accessibility and the identification of diversity. At the same time, it is important to remember that the achievement of the vision requires substantial input in the development of the actual technology.

In order that Finland can continue to pursue its ambitious leader position in the development of information and communication technology, it is essential to fully embrace the fact that what matters most is not just technological quality, but knowledge and expertise in ICT development. Clearly, a prominent issue on the research agenda of any project hoping to improve the quality of technology must be the role of humans as technology end-users. In the development of the information society, it is paramount to gain a deeper understanding of the human individual, the group, community, organisation, society and culture than can be achieved on the strength of the intuition of each individual, i.e. each technology developer. The vision should be to achieve the same high level of quality standards in human applications and in technological excellence. This is an ambitious challenge indeed.

The development of ubiquitous communication has so far been very much technology-driven. The MOTIVE programme provides a useful framework for developing the concepts and theory of ubiquitous communication as well as new research methods and paradigms. In addition to purely technical solutions, the programme could generate computational methods that may be used both in technical solutions and in commercial products and in social research, for instance for purposes of

describing social networks related to communication. This programme has a clear national dimension – it is important to understand the national characteristics of communication. On the other hand the understanding achieved in this research effort can be applied internationally as well as commercially, for instance, in the development of new products and services.

The programme will transcend the boundaries of human sciences and technological science in researching diverse communication and everyday life in ubiquitous society. It will produce new understandings, new conceptualisations of ubiquitous society, new concepts, theories and research methods. Furthermore, it will produce a more in-depth understanding of the changes taking place in publicity, democracy, culture and arts with the development of information technology. Additionally, the programme can be expected to generate better practices of institutional communication among others in the fields of laws, contracts and education.

The programme provides a useful platform for the development of new service production processes and for more human-centric technical solutions that are more practicable from an everyday life point of view. It can be expected to yield improved technologies for different user groups, applications where the technology is adjusted and adapted to people's needs rather than vice versa. Genuine collaboration between different disciplines can produce a common "language" that creates a solid foundation for future research and development.

The democratisation of communication and the development of everyday communication practices are also important results. This will help to narrow the digital divide and allow different communication groups and situations to be better taken into account. Research into this theme will pave the way to a more comprehensive understanding of the impacts of communication, which in turn will contribute to the comprehensive development of the communication system. In particular, we will learn how ubiquitous computing can help to improve the impact of communication.

5 IMPLEMENTATION OF THE PROGRAMME

5.1 Programme funding

The MOTIVE research programme is based on the funding cooperation between three funding agencies. The main funding agencies of the programme are the Academy of Finland, the Russian

Foundation for the Humanities (RFH, www.rfh.ru) and the National Natural Science Foundation of China (NSFC, www.nsfc.cn).

The Academy of Finland, the RFH and the NSFC each fund the research to be carried out in their own country. The Academy of Finland funds research teams working in Finland both in national projects and in international joint projects. Within the Finnish-Chinese joint projects, the NSFC funds research teams in China, and correspondingly, in Finnish-Russian projects, the RFH funds research teams in Russia. The Helsingin Sanomat Foundation is also interested in funding cooperation within the MOTIVE programme. The international funding cooperation will be confirmed by 2 January 2008, when also detailed information on this cooperation will be available at www.aka.fi/motive.

The Academy of Finland has reserved for funding for the Ubiquitous Computing and Diversity of Communications Research Programme nine million euros from the 2007 authority. The projects to be selected to the programme will be funded for a maximum of four years.

If accepted by the programme steering group, other Academy-funded projects relating to the thematic areas of the research programme may be included in the programme.

5.2 Timetable

The application process of the MOTIVE research programme is divided into two stages for the Finnish project proposals (individual and consortium projects). **The call for letters of intent** opens on 2 January 2008 and expires on 31 January 2008. The projects going to the second stage will be notified by 29 February 2008 and they will be requested to submit their full applications. The selected projects can submit their **full applications** on 24 March 2008 at the earliest and by 25 April 2008 at the latest.

The call for international joint projects (NSFC, RFH) is carried out in one stage. The call for international joint projects opens on 24 March 2008 and expires on 25 April 2008. A panel of international experts will carry out the scientific review of the applications in autumn 2008. The programme steering group will make a proposal of the projects to be funded on the basis of the scientific review and the programme objectives indicated in the programme memorandum. The funding decisions will be made by the end of 2008. The projects can start from the beginning of 2009.

The projects will be funded for a maximum of four years. The final evaluation of the programme will be conducted during 2013.

5.3 Programme steering group

The programme steering group is consists of representatives of the funding agencies as well as permanent expert members. Also other experts may be invited to contribute to the steering group's meetings. The tasks of the steering group are:

- to submit to the responsible funding agencies a proposal on projects to be funded;
- to steer the programme and monitor its implementation;
- to plan and organise the final evaluation of the programme; and
- to promote the application of the research results.

The programme steering group is chaired by Research Director *Päivi Hovi-Wasastjerna* (Research Council for Culture and Society). The Vice Chair is Professor *Erkki Oja* (Research Council for Natural Sciences and Engineering) and members Professor *Anssi Auvinen* (Research Council for Health), Professor *Lea Rojola* (Research Council for Culture and Society), Professor *Kaisa Sere* (Research Council for Natural Sciences and Engineering). The expert members of the programme steering group are Senior Adviser, Research and Technology Ilpo Reitmaa (Tekes), Adjunct Professor, Senior Researcher *Katja Valaskivi* (University of Tampere).

5.4 Programme coordination

The programme will seek in all possible ways to support the interaction and collaboration between the projects selected to the programme. This is the responsibility of the programme coordination and Academy of Finland programme managers responsible for coordination. The researchers in charge of the projects will therefore be required to commit themselves to the objectives of the programme and, after the completion of the programme, to the final evaluation. The responsible leaders are expected:

- to report on the scientific progress of their projects and on the use of the research funds in accordance with the guidelines of the programme coordination and funding agencies;

- to make sure that they themselves and the whole research team attend all meetings, seminars and workshops organised by the programme coordination;
- to take part in producing articles, brochures, syntheses and information material around the programme and its outcome;
- to actively disseminate information on the programme's progress and its outcome on public and scientific forums.

The Academy of Finland answers for the programme coordination together with the other participating funding agencies.

5.5 Final evaluation

Upon its completion, the research programme will be evaluated by a panel of international experts. During the course of the programme, methods of impact assessment will be further developed. A special aim is to consider with which indicators and in which time span the scientific and societal impact of the programme could be assessed most rationally and more reliably.

Aspects to be considered in the evaluation include:

- attainment of the programme objectives
- implementation of the programme (coordination, role of programme steering group, seminar etc.)
- scientific quality of the programme outputs
- scientific, societal and economic impacts of the programme
- researcher training and advancement of research careers
- national and international cooperation
- information activity around the programme

The research teams receiving funding are required to submit a final report to the Academy of Finland upon the completion of their project. The reports shall include information on, for example, scientific publications produced and theses and dissertations completed within the project. More information on reporting with timetable will be given to the researchers in the course of the programme. An international evaluation panel will present the results of the evaluation for publication after the evaluation is completed.

6 APPLICATION GUIDELINES AND EVALUATION CRITERIA

The call for the Research Programme on Ubiquitous Computing and Diversity of Communication is open for researchers at universities and research institutes. Three kinds of applications can be submitted to the programme: individual projects (from Finland), consortium projects (from Finland), and international joint projects between Finnish and Chinese or Finnish and Russian researchers.

Applications shall be submitted via the Academy of Finland's online services (ww.aka.fi/eng > For researchers > Log in to online services). Applications with all appendices shall be made in English. All submitted applications will be reviewed by an international expert panel. The evaluation is based on the scientific quality and the programme objectives. The key evaluation criteria are:

- scientific quality and innovativeness of the research plan
- project compatibility with the research programme
- feasibility of the research plan
- scientific competence and expertise of the applicant/research team
- international cooperation network of the applicant/research team
- added value to be expected from possible cooperation

6.1 Call for letters of intent: deadline 31 January 2008

Individual research teams: Applications are drafted in accordance with the Academy's general application guidelines (NB. for guidelines for drafting plans of intent go to http://www.aka.fi/en-gb/For-researcher/How-to-apply/Appendices/Plan-of-intent-for-research-programmes-and-FiDiPro-call/). Select the call 'MOTIVE'.

Consortia composed of research teams: The consortium has one responsible leader and, in addition, each team within the consortium has its own responsible leader. The consortium leader submits the letter of intent for the whole consortium. The consortium application with the sub-projects is **reviewed as one entity.**

Applications shall be drafted in accordance with the Academy's general application guidelines (see the Academy's website at www.aka.fi/eng). The only appendices to the consortium application are (submitted only by the consortium leader):

- plan of intent of the consortium, no more than six pages (Times New Roman 12 pt or corresponding); see the guidelines at http://www.aka.fi/en-gb/For-researcher/How-to-apply/Appendices/Plan-of-intent-for-research-programmes-and-FiDiPro-call/.
- curricula vitae for the consortium leader and the responsible leaders of the sub-projects, combined as one document, no more than four pages/researcher
- lists of publications of the consortium leader and the responsible leaders of the sub-projects, combined as one document.

The plan of intent is appended to the application in the online services.

On the basis of the submitted plans of intent, the programme steering group will decide on the projects to be invited to submit their full applications. Full applications are requested from projects that best meet the programme objectives and the programmatic criteria.

6.2 Call for full applications: deadline 25 April 2008

The call for the invited projects for submitting their full applications opens on 24 March 2008 and expires on 25 April 2008. Select the call 'MOTIVE'.

Individual research teams: Applications shall be drafted in accordance with the Academy's general application guidelines (see the Academy's website at www.aka.fi/eng).

Consortia composed of research teams:

Application by consortium leader

The completed application form that includes the funding specification only for the consortium leader's own research team. Appendices to the application:

- abstract drafted in accordance with the consortium guidelines, no more than one page
- research plan drafted in accordance with the consortium guidelines, no more than 15 pages
- curricula vitae for the consortium leader and the responsible leaders of the sub-projects, combined as one document, no more than four pages/researcher
- lists of publications of the consortium leader and the responsible leaders of the sub-projects, combined as one document

- statement by an ethics committee or the Committee on Animal Experimentation, if relevant
- progress report by the consortium leader and the responsible leaders of the sub-projects on their Academy-funded research projects for which no final reports have been submitted, combined as one document
- invitation by a foreign university or research institute, if the research is conducted abroad.

Application by responsible leader of a sub-project of the consortium

The completed application form that includes the funding specification only for the research team of the responsible leader of a sub-project. No appendices must be appended to the application of the sub-project. The consortium leader collects and combines all appendices of the consortium as part of his/her application.

Consortium abstract

The abstract, i.e. the summary of the research plan, is the most important appendix to an application. The abstract shall be no more than one page in length and it shall include the key aspects of the project in the following order:

- responsible leader of the consortium and site of research
- leaders of the sub-projects of the consortium and sites of research
- name of the consortium and abbreviation used, names of the sub-projects, if needed
- objective and short description of the research of the consortium (summary of research plan)
- funding period, the total amount of funding to be applied for from the Academy (sub-projects specified) and amount of person-years within the project.

The abstract is appended to the application in the online services. Name the attachment file as follows: yoursurname_abstract.

Consortium research plan

The research plan of a consortium is different from the research plans in other applications. The maximum length of a consortium research plan is 15 pages (Times New Roman 12 pts or corresponding). The plan shall include the following information:

1. Responsible leader and leaders of the sub-projects including sites of research

Name of the consortium, abbreviation to be used and names of the sub-projects, if needed.

2. Background

- background and significance of the research nationally and internationally as well as previous research pertaining to the topic
- how the consortium project ties in with other research of the leaders of the sub-projects or their research teams

3. Objectives

- justification for how the proposed research ties in with the call and its objectives, in case the call has a specific objective (e.g. research programme calls)
- research objectives
- hypotheses

4. Implementation

- research methods and research material
- timetable for research
- ethical issues

(justification for funding to be applied for from the Academy on the online application form)

- funding to be applied for from the Academy by the whole consortium, indicated by type of expenditure and by year, specified by sub-projects (in table form)

5. Researchers and research environment

- members of the research teams of the sub-projects, their merits and tasks
- research environment, including equipment
- national and international cooperation and distribution of work relevant to the project: partners, form of cooperation, description of how the project benefits from cooperation
- plan for the salary of the leader of a sub-project during the funding period, in case he/she does not have a permanent employment relationship
- concrete description of research to be possibly carried out abroad, e.g. how the visit ties in with the research plan; objectives of visit and if the visit is already agreed.

6. Researcher training and research career

- researcher training, including arrangements for instruction and supervision
- doctoral studies within the research teams of the consortium
- promotion of research careers and plans for researcher mobility
- promotion of gender equality within the project

7. Expected research results

- expected scientific and societal impact
- possibility for scientific breakthroughs and for increasing the renewal of science and research

- applicability and feasibility of research results
- publishing of research results and increasing awareness among possible end-users, the scientific community and the general public

The research plan is appended to the application in the online services. Name the attachment file as follows: yoursurname_research plan.

Drafting a consortium application

You start submitting a consortium application to the Academy by registering the consortium into the online services. After registration, the sub-projects can start drafting their own applications. All appendices of a consortium application are appended to the application of the consortium leader. Other sub-projects submit only an online application without any appendices.

All applications of the consortium shall be submitted online before the submission deadline. The application deadline is strict. If the application of any sub-project is submitted late, the application of the whole consortium is considered submitted late and will not be processed.

Consortium registration into the online services

The leader of a consortium (or the responsible Finnish partner of an international consortium) registers the whole consortium into the online services. This is done via the link in the list that opens after logging in. The consortium leader gives the name of the consortium, the abbreviation that describes it (e.g. acronym) as well as the responsible leaders and sites of the research of the sub-projects. After the consortium registration is submitted, the system immediately provides the consortium code number to be used in online applications (not the same as the application number). The consortium leader gives this code to the other consortium partners. The consortium code number links the different parts of the consortium to each other. The code shall be indicated in the applications (*General description* page) of all sub-projects within the consortium.

Funding can be applied for researchers at the postgraduate and postdoctoral level, for research costs, travel costs and for costs for arranging scientific meetings as well as for supporting researcher mobility.

6.3 International joint projects with China or Russia

The call for international joint projects is carried out in one stage without a call for letters of intent. **The call opens on 24 March 2008** and **expires on 25 April 2008**. Applications shall be drafted in accordance with the Academy's general application guidelines (see the Academy's website at www.aka.fi/eng). If the project involves several Finnish partners and funding is applied independently for different sites of research, the Finnish partners draft a consortium application. All sub-projects of a consortium application shall indicate the consortium number code on their applications so that the projects within the same consortium can be identified. Applicants are advised to contact the funding agency of their own country before submitting their application.

For international joint projects, the research plan of an application must not exceed 15 pages. The research plan shall clearly indicate the contact information of the foreign partner. In addition, the applications shall also clearly indicate how the cooperation with the foreign partner will be implemented and for what kind of research the foreign partner is applying for funding. The research plan shall include a clear description of the planned research collaboration (distribution of work and methods of implementation) as well as the added value to be expected for the collaboration. The name of the project shall be the same in the applications of both the Finnish and the foreign partner. Applicants are advised to together check the final research plan before submitting their application.

China

The Finnish research team within the Finnish-Chinese joint projects applies for funding from the Academy of Finland by selecting 'MOTIVE, joint projects with the Chinese NSFC'. Correspondingly, the Chinese research team applies for funding from the NSFC. The Chinese partner within the research projects can ask for application guidelines from the NSFC (www.nsfc.cn).

Russia

The Finnish research team within the Finnish-Russian joint projects applies for funding from the Academy of Finland by selecting 'MOTIVE, joint projects with the Russian RFH'. Correspondingly, the Russian research team applies for funding from the RFH. The Russian partner within the research projects can ask for application guidelines from the RFH (www.rfh.ru).

7 MORE INFORMATION

The programme memorandum and the general application guidelines are available on the Academy of Finland website at www.aka.fi or from the Registrar's Office. More information is also provided by the Programme Managers.

Academy of Finland postal address:

Academy of Finland
POB 99
FI-00501 Helsinki
Street address:
Vilhonvuorenkatu 6
tel.: + 358 9 7748 8377
fax: + 358 9 7748 8299
email: kirjaamo@aka.fi

Programme Manager:
Mikko Ylikangas
mikko.ylikangas@aka.fi
tel. +358 9 7748 8481
mobile +358 40 586 4729

Project Secretary:
tel.: +358 9 7748 8334
fax: +358 9 7748 8393