

RESEARCH, DEVELOPMENT AND INNOVATION PROGRAMME ICT 2023: Programmable World and Advanced Software Techniques

Research, development and innovation programme ICT 2023

The research, development and innovation programme ICT 2023 is jointly coordinated and funded by the Academy of Finland and Business Finland (formerly Tekes, the Finnish Funding Agency for Innovation). The aim of the programme is to further improve Finland's scientific expertise in computer science and to promote the extensive application of ICT. The programme is based on the report *21 Paths to a Frictionless Finland* by the ICT 2015 Working Group. At least 10 million euros of the Academy's budget authority for 2018 will be used to implement the ICT 2023 programme. Business Finland will not open a parallel call for business-related projects, but funding is available under this theme through Business Finland's normal application process (see www.businessfinland.fi/en/for-finnish-customers/services/funding/in-brief).

Programmable World and Advanced Software Techniques

The spread of programmable devices and objects in our environment will change our world both as users and developers of these devices. The Internet of Things (IoT) is on the verge of a breakthrough in both industrial applications and numerous everyday human environments. All devices connected to the internet can be programmed both to monitor the operation of the devices themselves or the related processes and to carry out new tasks. The long-term societal and financial impacts brought about by this programmable world will be major. The remote programming of various objects requires new software technology solutions, and in addition to actual objects, the applications also utilise other IT systems in their different forms. The result is often a complex system where the idiosyncrasies of small, low-performance devices, the mobile environment and cloud computing meet.

The systems also often have application-specific requirements, such as a requirement that the system never needs to be restarted. Additionally, managing a large, heterogeneous and constantly updating fleet of devices will also require new technologies. The programming of the environment may affect the lives of end-users through constant changes in the operation of the environment and the user interfaces of the devices, while the users may also actively modify, or program, their environments to meet their wishes.

The programmable world combines several different fields of research, such as software technology, software development, information technology, telecommunications technology, hardware development, electronics, information security and human-technology interaction. The key topics of this thematic call are:

- new tools and technologies required by the management and operation of complex device fleets, changing network topologies and software upgrades; implementation of the DevOps model and continuous delivery in the IoT environment
- embedded inexpensive connectability, enabling existing infrastructures to be IoT-capable
- Edge computing and storage-time and power-optimised algorithms and devices; sensor, data transfer, computation and data analysis implementations
- new device, software and network architectures that take into account different media and senses (sight, hearing, haptic, taste, smell, balance, temperature, humidity, ...)
- methods for lean and agile software, experimental software development, scalability; continuous quality assurance
- user experience, user interfaces and protocols in the interaction between IoT systems and humans; end-user software development
- advanced software business models that take into account the special characteristics and possibilities of the Internet of Things; SaaS, IaaS, pay-per-use, ...

- information security solutions to ensure uniformity and update delivery at the level of the entire managed system and the non-repudiation of the operation of the network and the hardware, and to manage the overall system securely also as part of the internet utilising SaaS and existing infrastructures.

How applications are reviewed

In reviewing applications and making funding decisions, in addition to the Academy of Finland's general review criteria for research programmes (see [Review criteria](#) on our website), particular attention will be paid to the international element:

- number of high-level foreign researchers working on the projects, especially postdoctoral and professor-level researchers
- attracting top-level young, talented researchers from abroad to Finland or hiring researchers who have recently come to Finland to work on the project
- research visits by Finnish researchers to leading-edge foreign universities and research institutes

Other factors that will be considered:

- business collaboration
 - cooperation between universities, research institutes and business companies
 - problem-setting in research
 - application potential of results
- intersectoral mobility of leading-edge researchers
 - mobility from universities to business companies
 - mobility from business companies to universities
- use of universities' and research institutes' own resources to carry out research
 - use of resources of the site of research and the partners
 - level of commitment and funding contribution by the site of research.

The applications will be reviewed by an international panel of experts. The reviewers will use the Academy's review form for Academy Programmes.

The threshold rating for review item "Project's relevance to programme/call" is 4 on the scale from 1 to 6. If an application fails to meet this requirement, the review will be discontinued and the applicant will only receive feedback on evaluation item "Project's relevance to programme/call".

If an application does not receive at least rating 4 for review item "Scientific quality and innovativeness of research plan", the review will be discontinued and the applicant will receive feedback only on items "Project's relevance to programme/call" and "Scientific quality and innovativeness of research plan".

This call is a single-stage call. The non-negotiable deadline for applications is 1 October 2018 at 16.15 local Finnish time. Applicants may be invited for interviews during the review process.

The funding period is three years. As a rule, the funding period will start on 1 September 2019.

Consortium applications

If the applicant is a consortium, see detailed guidelines on our website under [Guidelines for consortium application](#). Please note that consortium PIs can submit the consortium application only after all consortium subprojects have completed their applications. The non-negotiable call deadline also applies to consortia. Consortium compositions cannot be changed after the call deadline has expired. If the project involves business collaboration, see the detailed guidelines below.





Business collaboration

If the project involves business collaboration, that collaboration must be clearly indicated in the research plan. In addition, your application must also include a collaboration plan as a separate appendix.

Collaboration plan (only one plan regardless of the number of companies; no more than 3 pages):

- List all project parties.
- Describe the collaboration as well as the management and research duties included in the project.
- Describe the mechanisms by which the project will integrate all participating organisations and individual researchers.
- Describe, if relevant, the implementation of intersectoral researcher exchange.
- Define each PI's required input to the project, and justify why each party's expertise is necessary to achieve the project's objectives.
- Describe the complementary roles of the parties involved, and explain which research results can be jointly utilised by the participating companies.
- Describe the application potential of the results.
- Make sure that the collaboration plan's length and details are proportional to the size of the project. The plan should be extensive enough to ensure that the project parties will work together as one whole.

In the Academy's online services, enter as consortium parties only parties that are applying for funding from the Academy.

If the project involves business collaboration, please also see section 10.1 of the Academy's general conditions and guidelines for funding.

Programme coordination

The PIs of the projects are required to

- assume responsibility for and report on the scientific progress of the project and on the use of the funds in accordance with the Academy's instructions
- ensure that the whole research team attends all events organised by the programme coordinators, and facilitate exchange and cooperation between research teams in the programme
- take part in producing reviews, syntheses and information material around the programme, and actively disseminate information about the programme's progress and results on public and scientific forums.

