Strategic Focus Area
Advanced Manufacturing

SFA Advanced Manufacturing – Expansion Program

Call for Project Proposals

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Abbreviations

IR	International Reviewer
PI	Principal Investigator
PM	Program Manager
SC	Steering Committee
SFA	Strategic Focus Area
TFA	Technical Focus Area

1 Introduction

In its Strategic Planning 2017-2020 for the ETH Domain, the ETH Board defined four Strategic Focus Areas (SFA) to be addressed with particular emphasis by the institutions of the ETH Domain in the period 2017-2020. One of these four Strategic Focus Areas is Advanced Manufacturing.

After the launch of the initial program of the SFA Advanced Manufacturing (SFA-AM) with three Technical Focus Areas in autumn 2016, the ETH Board decided in spring 2017 to expand the scope of the SFA-AM and to fund a SFA-AM Expansion Program. An important part of this Expansion Program is the funding of further research projects in two additional and complementary Technical Focus Areas.

This document describes the objectives of this strategic initiative, the definition and scope of the two new Technical Focus Areas of the SFA-AM Expansion Program, the organization and governance of the initiative as well as the project proposal submission and selection process.

2 Background and objectives

Industry is a key factor for wealth and prosperity and generates 28% of the GDP in Switzerland. It is a catalyst for progress and a driver for our future. However, the world of manufacturing is undergoing a rapid change due to the higher level of digitalization, which is in turn driving radical innovations in how products are designed, manufactured and used. Swiss industry must keep pace with these changes, often described as the so-called fourth industrial revolution and it must strive to reach a leading position at the cutting edge of these burgeoning new technologies.

The research funding of the ETH Board in the SFA Advanced Manufacturing aims to enable Switzerland's scientific and technical community to contribute at the most advanced level to these developments. It is to drive the institutions of the ETH Domain to team up, collaborate in exploratory research projects, and build the knowledge and infrastructure to position Switzerland as a leader in this domain.

3 Technical Focus Areas of the Expansion Program

In consideration of the very broad technical field of advanced manufacturing and the limited financial budget of this initiative, the initial program defined three Technical Focus Areas (TFA) which are viewed as (i) highly relevant to Switzerland's economy and (ii) in line with the involved ETH-Domain institutions' strategies for the future. The three TFAs of the initial program are Precision Free-Form Manufacturing (TFA 1), Printed Electronics (TFA 2) and Sustainable Digital Manufacturing and Design (TFA 3). Further information about the initial program and these three TFAs is available on www.sfa-am.ch.

With the two new and complementary Technical Focus Areas: "Sensing Technologies" and "Intelligent Systems and Advanced Automation", the Expansion Program aims to address the new possibilities of the digitalization as well as the high level integration along the supply and value chain. This will strengthen the program focus on digitalization and integration, and at the same time will have a positive impact on the research activities in and across the initial three TFAs.

The research projects funded by this Expansion Program should address key challenges in the two new TFAs and complement thereby the research activities in the three TFAs funded by the initial program of the SFA-AM.

3.1 Sensing Technologies (SETE) – TFA 4

Smart sensing technologies are key enablers of advanced manufacturing. Distributed sensing in machines not only allows for more reliable and customizable fabrication processes, but also enables the early detection of failures by predictive maintenance. Sensor systems are also increasingly being fitted in the workpiece itself, so that each product can provide its blueprint and report its manufacturing status.

The new TFA 4 calls for research proposals in the area of smart sensing technologies dedicated to advanced manufacturing, where sensors are either integrated into fabrication machines for monitoring and control purposes, or integrated in products for increased functionalities, efficient testing, and better traceability.

One specific challenge to be addressed is the integration of the sensor devices together with electronics, optical systems and the package of the product fabricated using novel hybrid Additive Manufacturing technologies. For some products, such as wearables, the packaging needs additionally to be flexible and/or stretchable. The scope of the TFA 4 therefore includes not only research in new sensing technologies for advanced manufacturing, but also suitable new or hybrid Additive Manufacturing processes for sensor systems and/or new materials (polymers, metals, and composites) for implementing these sensors.

3.2 Intelligent Systems and Advanced Automation (ISAA) – TFA 5

In the context of the transition to Industry 4.0, we see a strong change in the industry towards digital manufacturing technologies such as Additive Manufacturing. These have been addressed by the TFAs of the initial SFA-AM program, and are important building blocks for a fully integrated digital value and supply chain. However, it is not only the process of material transformation or the manufacturing process itself which will provide new benefits and competitive advantages: for a highly efficient supply chain, companies need in addition intelligent systems and machines with advanced automation, which are fully integrated in such digital supply chains, including design of materials and products, manufacturing, distribution and end-of-life of products.

The new TFA 5 calls for research proposals in the area of intelligent systems and advanced automation dedicated to advanced manufacturing along complete and integrated value chains. The scope of TFA 5 includes topics such as computer-based design, machine learning, autonomous systems as well as the simulation of materials, processes and products.

A key challenge that needs to be addressed by the research projects in this TFA is the efficient integration of the different building blocks that have been targeted by the three TFAs of the initial SFA-AM program into digital manufacturing and supply chains in order to use the full potential of improved connectivity between systems and products and the higher level of digitalization.

4 Project selection process

4.1 General conditions

Proposals may be submitted by Principal Investigators (PI) or Co-PIs of the four participating ETH institutions, in particular by Professors of ETHZ or EPFL and by Laboratory Heads or Group Leaders of Empa or PSI.

Research projects conducted in the SFA-AM Expansion Program will generally run for 36 to 48 months. One call for proposals is envisaged. A two-stage submission procedure is applied: pre-proposals are submitted first, followed by full proposals upon invitation. All project proposals are to be submitted in English.

Applicants must use the Word document template that will be made available on the SFA-AM web pages (www.sfa-am.ch) to prepare the project proposals in the Expansion Program. For full proposals the applicants need to provide in addition a detailed project plan including information about the project organization, the project schedule with work packages and deliverables as well as a financial plan. Further information on how the detailed project plan needs to be prepared, will be provided in due time by the SFA-AM Program Manager (PM).

Cooperation projects involving research institutions outside the ETH Domain, e.g. universities of applied science, and/or industrial partners are welcome, if these partners can contribute to the success of the research project. However, the activities of these project partners will not be funded by the financial means of this strategic initiative of the ETH Domain.

4.2 Project selection criteria

The research activities in the SFA Advanced Manufacturing should address a key challenge (Challenge) in at least one of the two new Technical Focus Areas (TFA) described above. Such a Challenge may be a concrete and pressing technical problem in advanced manufacturing to which the solution is not known but can be tackled by one or a few consortia of Swiss research groups. The formulation of the Challenge shall be narrow enough to allow focused research, but broad enough to allow for different routes to a solution, to impact several areas of technology and to involve several groups of researchers. The formulation of the Challenge is such that the problems to be solved are quantified.

The criteria to assess and select the project proposals are as follows:

1. The project proposal is related to at least one of the two new Technical Focus Areas and addresses a Challenge (see definition above) that is of high importance for the successful industrial application of advanced manufacturing technologies.
2. The solution to the problem is subject to fundamental research in engineering sciences and allows for high impact publications. The project drives the education of engineers at the cutting edge of advanced manufacturing.
3. The objectives of the project are far-reaching and measurable. They exceed the state of the art significantly, e.g. by at least one order of magnitude if such metrics can be applied. One milestone is demonstrating significant breakthrough after 24 months.
4. The solutions are tangible and/or are demonstrated with functional demonstrators. Results can be applied in Swiss companies by start-ups and/or by direct transfer and will have a positive impact on the Swiss industry.
5. The project is carried out by a consortium of PIs from at least two different ETH institutions. Projects with a consortium that involve PIs from more than two ETH institutions are favored. The total budget is compatible with the funding available and its distribution, and:
    a. Most of the budget shall be used for hiring young talents (PhD students, Postdocs)
    b. For the purchase of key equipment, each institution can use up to one-third of its budget provided the equipment is made available to participants across the ETH Domain. Institutions can team up to purchase major equipment of mutual interest.

The Steering Committee (SC) as well as the International Reviewers (IR) will use these five selection criteria to review, assess and select the project proposals.

4.3 Project selection process and schedule

The following schedule is planned for the SFA-AM Expansion Program:

Date	**Action**	**Who**
31st May 2017 (We)	Issuing of the Call Document / Invitation to prepare pre-proposals	PM
June / July 2017	*Preparation of pre-proposals*	*PI*
24th July 2017 (Mo)	Deadline to submit pre-proposals	PI
July / August 2017	*Evaluation and selection of pre-proposals*	*SC*
4th September 2017 (Mo)	Decision about pre-proposals / Invitation to prepare full proposals	PM
Sept. / October 2017	*Preparation of full proposals*	*PI*
16th October 2017 (Mo)	Deadline to submit full proposals	PI

Date	Action	Who
Oct. / November 2017	*Evaluation and selection of full proposals*	*SC/IR*
4th December 2017 (Mo)	Announcement of decision about full proposals	PM
December 2017	*Start of project preparation*	*PI*
1st January 2018 (Mo)	Earliest start of research projects (latest 1st April 2018)	PI

5 Budget, allocation of funds and funding regulations

The budget to fund research projects in the SFA-AM Expansion Program in period from 2018 to 2020 is in total CHF 4 million. It will be a competitive and open call for project proposals with no pre-defined budgets of the participating institutions. The SFA-AM Steering Committee will nevertheless make sure that the funds are reasonably shared among the four institutions. The project selection will take until end of 2017. Therefore, the split of the funds for research projects by institution and the exact budgets of each institution will only be known at the end of 2017. Only project consortia of labs from at least two different ETH institutions will be funded. Project consortia that involve PIs from more than two ETH institutions will be favored. In these collaborative projects, the researchers and other needs are funded by the budget of their home institution.

Costs will be funded in accordance to the Funding Regulations of the SNSF. The personnel costs as total annual gross salary that are funded by the SFA-AM Expansion Program are as follows:

- Doctoral Students: CHF 50'000
- Postdocs: CHF 95'000

Also in line with the Funding Regulations of the SNSF, the social security contributions will be paid as blanket amounts. The flat rates for the employer's social security contributions are as follows (as a percentage of the relevant total gross salary): 16% for ETHZ, EPFL, PSI and Empa.

The personnel costs mentioned above must be used to prepare the financial plan of a project proposal. The SFA-AM funds are operated and controlled by the respective internal processes of the home institution of the concerned PI or co-PI, as stipulated in the respective guidelines for research projects.

6 Organization and governance

The governance of the initiative shall enable focused research and capacity build-up by consortia with a minimum of overhead. As a governing body of the SFA-AM, a Steering Committee (SC) has been formed.

6.1 Steering Committee

The SC is composed by two representatives per ETH institution: ETHZ, EPFL, Empa, PSI, and six experts from industry. The SC will organize itself.

The representatives from the ETH institutions are:

- Prof. Dr. Detlef Günther, ETHZ
- Prof. Dr. Christofer Hierold, ETHZ
- Prof. Dr. Christian Enz, EPFL
- Prof. Dr. Andreas Mortensen, EPFL
- Prof. Dr. Gabriel Aeppli, PSI
- Prof. Dr. Frithjof Nolting, PSI
- Dr. Pierangelo Gröning, Empa
- Dr. Lars Sommerhäuser, Empa

The industry representatives are:

- Dr. Jacques Baur, Director, Rolex SA
- Evert Dijkstra, Managing Director, Phonak Communications AG
- Siegfried Gerlach, CEO, Siemens Schweiz AG
- Calvin Grieder, Chairman, Bühler AG
- Dr. Andreas Hafner, Senior Innovation Manager & Academic Partnership Developer, BASF Schweiz AG
- Dr. Nobert Münzel, CEO, Rolic Technologies Ltd.

The tasks of the SC are:

- The SC evaluates the pre-proposals for compliance with the selection criteria (see section 4.2) and the budget allocation and invites for full proposals.
- The SC organizes the evaluation and takes decisions on the full project proposals and allocation of funds. The members of the SC themselves cannot receive funds from this initiative as PI or Co-PI.
- The SC meets at least once a year to discuss progress in the projects, corrective actions and to define next steps towards a larger national initiative led by the ETH Domain on manufacturing starting in 2021.
- The SC reports annually and after the end of the initiative to the ETH Board by short reports addressing scientific progress and financial aspects.

6.2 Outreach

Public and internal outreach activities are coordinated by the SC, conducted by all and supported by coordination staff at Empa. Additionally, each institution shall promote the activities and results.

6.3 Reporting

The projects deliver yearly scientific progress reports and one final report to the SC, referring to the achievement of the milestones and deliverables. Yearly financial reports and a final financial report after conclusion of the projects are submitted to the SC.

The SC prepares and submits annual reports (aggregated project reports) to ETH Board at the end of each calendar year. At the end of the complete planning period in Spring 2021, the SC prepares and submits a final scientific and financial report (aggregated project reports) to the ETH Board.

6.4 Co-ordination and Program Manager

Administrative tasks to co-ordinate this strategic initiative are run at the Empa by the Program Manager (PM) of the SFA-AM: Dr. Lars Sommerhäuser: +41 (58) 765 4787 or lars.sommerhaeuser@empa.ch.

All pre-proposals and full proposals must be submitted to the Program Manager by email using the provided Word template for SFA-AM project proposals and respecting the deadlines mentioned in section 4.3.