

# **FuturICT Knowledge Accelerator (FKA)**

## **Goal:**

The goal of this contract and the participating parties and communities is to establish an international alliance of stakeholders focused on the generation, sharing and analysis of Smart Data to create societal, scientific and economic value and to jointly and collaboratively address global 21st century challenges such as

- financial and economic crises,
- environmental degradation and global warming,
- transition to renewable energy supply,
- cybercrime and cyberwar,
- newly emerging problems.

The aim is

- to promote international confidence building and collaboration,
- to create a trustable, transparent and participatory information and communication system and
- to establish an information and innovation ecosystem
  - o empowering politics, business, science, and citizens alike to take better-informed decisions and
  - o enabling creative activities and more participation of everyone in social, economic and political matters.

## **Strategic Research and Development Goals:**

1. Create socially-oriented technologies and information exchange systems,
2. develop interactively configurable measurement and communication protocols for sensor networks and the "Internet of Things" (IoT),
3. create a participatory, trustable, secure, and privacy-respecting, decentralized Citizen Web (CW),
4. establish a Planetary Nervous System (PNS) to measure the state of the world in real-time and increase awareness of opportunities and risks,
5. organize personal data based on the Personal Data Purse (PDP) concept and enable user control over their personal data (user consent, informational self-determination),
6. establish a Global Participatory Platform (GPP) with Trusted Information Brokers (TIB) to open up data for everyone,
7. develop and deploy concepts to promote the generation of Social Capital (SC) and a responsible use and exchange of data, in particular by creating a Pluralistic Reputation System (PRS),
8. establish a novel Micro-Payment System (MPS) to reward innovators and contributors, considering aspects of reputation,
9. explore new innovation and IPR paradigms ("Innovation Accelerator" - IA),
10. support the creation of a Digital Mirror World (DMW) and of Interactive Virtual Worlds (IVW).

Further research and development goals are determined by the Governing

Board(s).

### **Ethical Principles ("FuturICT Oath"):**

All people, institutions, or autonomously acting instances (computers, algorithms, robots, etc.) with access to the data managed by the FKA (the "inside world" as defined below) commit themselves to the following principles:

1. **Respect:** Respect of the UN Charter of Human Rights; engagement in the creation, distribution and application of privacy-enhancing mechanisms and technologies<sup>1</sup>
2. **Quality** (and awareness): Commitment to high-quality information and good scientific practices and standards; support of transparency and awareness
3. **Alternatives:** Commitment to enabling self-determined user decisions and to providing adequate options (--> informational self-determination)
4. **Diversity:** Commitment to socio-economic diversity and diversity-preserving ICT uses
5. **Non-discrimination:** Engagement against discrimination or repression and against trends towards a punitive society
6. **Freedom:** Respect of the principle of academic/creative freedom (in particular of unbiased and uncensored publication without a publication approval procedure other than the academic peer review system)
7. **Self-control:** Creation of a framework supporting flexible, decentralized, self-organized adaptation, e.g. by means of suitable reputation systems
8. **Responsibility:** Commitment to timely, responsible and forward-looking actions (and non-actions)
9. **Fairness** (consideration of externalities): Orientation towards not creating individual (user/company/country) benefits that cause overall societal or socio-economic damage
10. **Balance:** Engagement in balancing political, business and individual interests
11. **Participation:** Commitment to increasing participatory opportunities for others, e.g. citizens/users/customers
12. **Protection:** Engagement into protection against harm, damage, and exploitation (including data or IPR theft); abstention from mass surveillance<sup>1</sup> and aggressive or war-like activities,<sup>2</sup> including cybercrime and cyberwar
13. **Resilience:** Commitment to the reduction of vulnerability and to the

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<sup>1</sup> Privacy is understood in terms of the use of pseudonyms or anonymization in connection with encryption, such that the related person is unlikely to be identified, if the encryption is not lifted by this person or by court rule. Mass surveillance is understood as determining behaviors of significant fractions or numbers of identifiable persons.

<sup>2</sup> Non-aggressive activities also means that data are not being used against the data-providing individuals, companies or institutions, if not required by an overarching societal interest.

increase of resilience

14. **Sustainability:** Promotion of sustainable systems and long-term societal benefits, commitment to systemic rather than particular goals
15. **Compliance:** Engagement into the protection of these ethical principles and active engagement in compliance of the FKA and its members to them

### **Organizational, Security and Quality Assurance Aspects:**

Participating data and computer centers dedicate a certain, separate share of their capacities to the FKA, ensure high-bandwidth connections with other participating data and computer centers, and commit resources as well as staff to jointly reach the above mentioned Strategic Research and Development Goals.

Data of the FKA will be stored in a Data Safe, which is distributed over the participating data and computer centers (and potentially user devices as well).<sup>3</sup> The Data Safe ("inside world") has a service-oriented interface to the public ("outside world"), which will be called Global Participatory Platform in the following.

The participating data and computer centers establish an international visiting experts program for FKA's Data Safe (the "inside world" specified below). Institutions are allowed to send visitors to the extent they are committed financially, data- and infrastructure-wise, given they support the FKA ethical principles. Visiting capacities and conditions are determined by the Merits of the sending company or institution (see below). Applications for visits are decided by the Governing Board(s) of the FKA.

The FKA requires everyone to use its data in a trustworthy and responsible manner. Anybody with the access to the FKA Data Safe must commit to the above FuturICT Oath and to not transferring data from the "inside world" to the "outside world" with the following exceptions:

- the data provider agrees with the transfer,
- data that could have also been retrieved before by outside users,
- data from the inside world are published as aggregate table or graphics in a document coauthored by a senior expert, in which all authors and data miners are personally identifiable; all such documents must be stored on an archive of the FKA for the sake of transparency.

In such documents, companies or persons that the data relate to may only be mentioned with the agreement of the corresponding companies or persons, or if required by law. For security reasons, all operations in the FKA "inside world" will be logged for a suitable, limited amount of time.

The Global Participatory Platform allows users to run certain kinds of own

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<sup>3</sup> The aim is to keep only public data unencrypted and to establish a powerful en- and decryption approach considering digital access rights.

scripts<sup>4</sup> on the data of the FKA. For transparency, such scripts must be entered as source code. According to the usage conditions of the FKA, the FKA may use such scripts in the "inside world" for free (i.e. by submitting a script, the FKA earns the unlimited internal right of use). The FKA may deny the execution of scripts that are likely to be malicious or to violate the ethical principles of the FKA.

The user may make the scripts available to the outside world via the FKA Global Participatory Platform for free or for a fee. Publicly accessible scripts or data sets should contain safeguards against misuse, e.g. against the deanonymization of sensitive personal data. The FKA is allowed to block or remove scripts that do not meet the ethical principles of the FKA.

By uploading data, institutions, companies, or other users guarantee that they own the right to share these data. The conditions of use will imply that such data can be used internally by the FKA (in its "inside world") for free. Outside use may be for a fee, which is paid via the micropayment system.

The FKA may determine a pricing policy as determined by the FKA Governing Board(s). For example, beyond a certain computational job size, users may be charged according to computational costs. The overall principle is that the price of data should be quickly decaying with their age, and they should eventually be made publicly accessible for free.

The FKA will engage in a differential versioning system for scripts and datasets, such that data mining results are reproducible.

Outputs of scripts are transmitted to pseudonymous accounts, which are personally identifiable by decryption in case of serious violations of laws or ethical standards of the FKA, as determined by its Governing Board(s). The execution of scripts with potentially harmful uses will be temporarily logged (what account runs what script on what dataset at what time), as indicated in the conditions of use. The storage time will depend on the estimated potential size of harmful systemic impacts of a script, as determined by a special Radar and Alert System (RAS), which continuously makes a sensitivity, vulnerability and security assessment. Such a system may include crowd-based strategies.

Access to data is determined by reputation and merits (see below). In case of apparent non-compliance with laws or the FKA ethical standards, the FKA may impose temporary sanctions on users/pseudonymous accounts. The underlying principles will be determined by the FKA Governing Board(s). These decisions may not be legally challenged, according to the conditions of use.

## **Governance:**

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<sup>4</sup> We use the term "script" synonymously with "algorithm".

The FKA has a transparent multi-level meritocratic organization. In each organizational unit, there must be at least 12 members to enable an independent quality assessment of methods (e.g. scripts) and a checking of data-based conclusions by sufficiently many other parties.<sup>5</sup>

Generally, there should be  $4 \cdot n$  (institutional) representatives in each level (with  $n \geq 3$ ) such that 1/4 votes are from political representatives, 1/4 votes from science representatives (active scientists with outstanding publication track record and scientific achievements), 1/4 votes from business representatives, 1/4 from citizen representatives.

Representatives of parties/institutions should be chosen such that they are known to support the strategic goals and ethical principles of the FKA and that different geographical areas, scientific disciplines, and different interests are sufficiently well balanced.

Representatives have a 1-year-long term, which may be renewed. They are expected to take independent decisions oriented at creating a public good rather than promoting particular interests. Board members have to reveal potential conflicts of interest. The Governing Board might decide to exclude members from a vote, if a relevant conflict of interests exists. If requested by at least one third of the members of a Governing Board, its members are required to report their incomes, mandates, contracts, and agendas in writing.

In decision-making processes, each member of a Governing Board can submit a proposal to address a certain problem. In favor of diversity and greater consensus, it is recommended that proposals offer several alternative implementation options. The proposal to take no action is always a default proposal. The members of the Governing Board decide about all proposals as follows: Each member indicates on a scale from  $-n$  to  $n$  (with  $n=5$ , for example) how much it is in favor of each proposal ( $-5$ =strongly opposed,  $5$ =strongly supportive). The votes of each member are rescaled such that his/her average resulting score is 0. The proposal with the smallest overall score will be implemented. The decision will be valid only for a certain maximum time, which is chosen shorter for lower and longer for higher overall scores. At the end of the respective time period, the success of the respective decision will be reviewed, and the decision will either be extended, replaced, or dropped.

The ethical principles of the FKA are unlimited in duration and may only be changed if a majority of two thirds of all members of the General Assembly agree.

On each organizational level, the corresponding Governing Boards can establish Advisory, Ethical, Management and Outreach Boards as needed, to prepare or support (or take) certain kinds of decisions, but the respective

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<sup>5</sup> The value of transparency is to ensure and improve quality standards and trust.

Governing Board has a co-responsibility for the quality of such delegated decisions. Governing Boards hold between 2 and 12 meetings per year, of which at least one (the General Assembly) is an in-person meeting and the others can be video meetings. One annual in-person meeting is associated with an international workshop dedicated to advancing the FKA Research and Development Goals, and it will be organized and financed by one of the FKA partners.

The FKA has a representative, who stands for the vision and mission of the FKA, but does not have any legal responsibility for the activities of the FKA. This representative has no vote, but has a guiding role and can freely voice his/her opinion on any subject matter. The office of the representative is indeterminate in duration, but can be terminated by disagreement of half of the members of the General Assembly.

In cases of conflict, the following procedure is applied:

1. the corresponding Governing Board tries to settle the dispute by deliberation and negotiation, considering the FKA ethical principles,
2. if the sentence of the Governing Board is rejected by the conflict parties, they explain their positions in 10 page documents that are forwarded to the same number of randomly selected representatives from other levels of the FKA, whose decisions are anonymous ("wisdom of crowds" kind of decision-making) and based on the FKA ethical principles,
3. if the sentence of this anonymous, randomly selected board is not accepted, the final decision is taken by the General Assembly, which takes a secret vote after previous opportunities for everyone to speak, considering the FKA ethical principles; this procedure can be video-streamed for information of the general public.

The conflicting parties will have to compensate the committee members for their time.

### **Merits:**

All data uploaded to the FKA Data Safe are made accessible after a predetermined delay time  $T$ , which depends on the merit  $M$  of the respective user who wants to access them. This delay time is given by

$$T = T_0 * (2 - M/100)$$

where  $T_0$  is the minimum non-availability time set by the data provider. Until the time  $T_0$  has passed, the corresponding data set will not be decrypted. One may also set a maximum time period, after which the data will not be decrypted anymore (which would simulate their deletion).

Merit depends on:

1. Investments  $I$ , including infrastructure, software, commercial data, money for staff and visiting experts

2. Quality  $Q$  of data provided as determined by a rating and reputation system
3. Usage levels ("usefulness")  $U$  of the data provided by the participating stakeholders
4. Contributions  $C$  to the Research and Development Goals
5. Generation of Public Goods  $P$ , e.g. opening up data through the GPP
6. Reputation  $R$ , which depends on scientific standards, responsible data use and compliance with the FKA ethical principles ("FuturICT Oath"); a downgrading in the reputation value applies for at least one year.

All criteria are measured on scales from 0 (low value) to 10 (high value). The overall merit  $M$  is a number between 0 and 100 and determined by means of the following formula:

$$M = R * (Q + I + P + U + C) / 5$$

Users with a higher merit have earlier access to data, and high merit requires a responsible use of data. The Governing Board(s) may decide to restrict the access to particularly sensitive data to users with a minimum level of merit, but for the sake of transparency, each dataset must be accessible to at least 12 parties (1/4 political, 1/4 business, 1/4 science, 1/4 citizen representatives).

#### **Possible Initial Partners:**

ETH incl. CSCS  
 TU Delft and other IDEA League Partners  
 TU Munich  
 Juelich Supercomputing Center  
 Karlsruhe Smart Data Innovation Lab  
 Barcelona Supercomputer Center  
 Humboldt University  
 UCL  
 Imperial College  
 Oxford University  
 Cambridge University  
 CNR  
 CNRS  
 Warsaw Universities  
 International Centre for Earth Simulations  
 Japan K Computer, Earth Simulator  
 National digital libraries, national Open Data Institutes  
 Many more data and computer centers worldwide