Technical background notes

for FP7, Strategic Objective ICT-2013.8.1

"Technologies and scientific foundations in the field of creativity"

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http://cordis.europa.eu/fp7/ict/creativity/creativity-calls_en.html

This document is intended to provide background information and technical commentary on Strategic Objective ICT-2013.8.1 of the seventh Framework Programme (FP7). The official text of the objective (including the timeline and procedures for applications) has been published as part of the 2013 FP7 work programme.

http://cordis.europa.eu/fp7/ict/docs/ict-wp2013-10-7-2013.pdf

The official text is the only legally binding source of information on the strategic objective. Should any inconsistency between the present explanatory document and the official text be detected it is always to be resolved in favour of the work programme text.

Motivation of the objective and scope of this document

Challenge 8 of the work programme 2013 is called "ICT for Creativity and Learning". Please note that the Challenge consists of two separate Objectives:

- "ICT for Creativity", which is included in Objective 8.1 and due in call 10 and

- "ICT for Learning", which is included in Objective 8.2 and due in Call 11.

The official text of the work programme under Challenge 8 relating to Objective 8.1 states that:

"The culture and creative industries are a powerful motor for jobs, growth, exports and earnings, cultural diversity and social inclusion, representing 4.5% of total European GDP and accounting for 3.8% of the workforce. European industries, in particular small and medium enterprises, are increasingly faced with the need to be more productive, innovative and dynamic in responding to the changing market needs.

This challenge calls upon research and industry to unite their forces to produce more powerful and interactive tools for creative industries, enhance the creativity of workers pursuing different professions, and anticipate future trends in research and innovation by encouraging interaction in and between different segments of the creative industries.

One goal is to create a vibrant creative technology ecosystem and increase the innovation capacity of European industries and enterprises by providing them with better tools, capabilities and foresight. A further goal is to enhance, develop and encourage creativity as an essential 21st century skill in professional contexts." (page 81)

The full name of the Objective "ICT for Creativity" is "Technologies and scientific foundations in the field of Creativity". The specific introduction to Objective 8.1 briefly reiterates the goals outlined under the introduction of the Challenge above. Please notice that already this introduction presents the Objective as articulated in four target outcomes:

"*Research under this objective will address creativity and the tools and environments in which it takes place. Research activities will contribute to equipping different industries with more effective creative tools (target outcome a), expand the potential of technology in the human creative processes (target outcome b) and advance the scientific understanding of creativity thus providing the basis for future innovative technologies (target outcome c). This will be complemented by support activities that promote ways of closer interaction and networking within and between different segments of creative industries (target outcome d).*"

Each target outcome is individually discussed in the next section of the background document ("Discussion of individual target outcomes"). It is essential to stress that target outcomes a), b), c) and d) are clearly distinct from one other, with different impacts expected from each of them. It is therefore recommended that each proposal should address exactly one target outcome and fully match its specific requirements.

In general, it is important to understand that proposals are evaluated on the basis of the work programme and their evaluation is based strictly on technical merit, management and impact potential.

Discussion of individual target outcomes

a) Creative experience tools

Outcome a) of the objective calls for:

> ***Creative experience tools*** *that make use of all our senses and allow for richer, more collaborative and interactive experiences: real time simulation and visualisation, augmented reality, 3D animation, visual computing, games engines, and immersive experiences. The tools created should be cost effective, with special attention to users like SMEs and individual creators, intuitive, and be demonstrated in real environments for the creative and cultural industries (such as advertising, architecture, arts, crafts, design, fashion, films, music, publishing, video games, TV and radio etc.).*

The underlying rationale behind this target outcome is the recognition that ICT innovations, such as digital tools, are crucial to further development of creative industries. Digital tools play an increasingly important role in improving the creative and production processes and their growing sophistication opens up new opportunities for creative professionals. Their use improves the efficiency of creative processes, impacting on time and resource investment as well as quality of output.

As can be understood from the text of target outcome a):

- "*tools that make use of all our senses and allow for richer, more collaborative and interactive experiences*": this target outcome calls for research that would leverage advancing trends such as collaboration, interaction and involvement of different senses in order to produce more innovative and effective tools for creative industries;

- some of the technologies that could be used to develop such tools include: "*real time simulation and visualisation, augmented reality, 3D animation, visual computing, games engines and immersive experiences*". It is important to stress at this point that the enumeration of the technologies in the text of the work programme is non-exhaustive and could be expanded further to include others, for example audio-technologies; it should also be clarified that it is not obligatory for one proposal to utilise all of the mentioned technologies;

- "*the tools should be cost-effective"* means that the aspect of cost-effectiveness should be considered and the proposals are expected to address it, though the discussion of cost-effectiveness can take different forms depending on the tool;

- "*intuitive"* means easy to use (usability) and conducive to the creative process*;*

- "*with special attention to users like SMEs and individual creators and be demonstrated in real environments for the creative and cultural industries*". This part of the target outcome points out that the primary intended user group for the developed tools should be professionals in the creative industries. Consequently, their needs as targeted end users have to be taken into account and well served, and the tool adapted to the specific conditions of a particular segment of the creative industries; "*real environments*" means realistic conditions for testing and validation; the proposals should comprehensively describe the planned validation methodology;

- "*for the creative and cultural industries (such as advertising, architecture, arts, crafts, design, fashion, films, music, publishing, video games, TV and radio etc.)"*. A reference delineation of the creative industries falling into the scope of this target outcome and target outcome d) can be found in the KEA study commissioned by DG EAC: http://ec.europa.eu/culture/pdf/doc885_en.pdf

  The delineation covers the following segments:

    o books and press

    o performing arts

    o film, video, radio, television, music (including software games)

    o visual arts

    o design

- o advertising

- o heritage

- o architecture

- o cultural tourism

- o fashion

The above enumeration clearly shows that the term "cultural and creative industries" covers a wide range of segments, many of which are significantly different from one other, also in terms of workflows and creative processes involved. It would therefore be difficult to devise a tool which is both fully adapted to the specific creative processes in a given segment of the creative industries and at the same time has universal applicability in all others. The proposals are free to focus on the selected segments or even target just one.

The expected impact for target outcome a) includes:

- *Equipping different industries with more effective creative tools:* This should be seen and kept in mind as an over-arching, global context of this target outcome set in the introduction of the Objective 8.1.

- *Improved efficiency of creative processes by two fold at least as regards time and resource investment, and quality of output:* This is expected impact expressed in concrete terms as better tools should make a difference in the creative work processes.

- *Expanding the potential of technology in the human creative processes:* This impact, primarily intended for target outcome b), could also to some extent be expected for target outcome a).

To sum up, research addressing target outcome a) is likely to have a mainly technological focus and be strongly application-driven. The proposals would address an issue or issues identified in the creative and/or production processes relevant for creative professionals in a given segment(s) of creative industries and with their solutions fill a need or a gap not covered by any of the existing state-of-the-art technologies. Consequently, the developed tool(s) would help creative professionals to work better by widening the creative possibilities available to them and by providing them with new efficiencies.

Proposals responding to this target outcome can either use the Small or medium-scale focused research projects (**STREP**) instrument, which is designed for small consortia with a very

focused approach or the Integrated Project (**IP**) instrument designed for the large scale integration of various technologies. Target outcomes a) and b) share the budget of EUR 32, with a reserved minimum of 40% for IPs and a reserved minimum of 30% for STREPs. The remaining 30% are not bound to either type of instrument and will be used for the remaining highest scoring proposals addressing target outcome a) or b), irrespectively of the instrument selected the proposal.

It is important to choose the instrument that better matches a proposal's scope and objectives.

b) Intelligent computational environments stimulating and enhancing human creativity

Outcome b) calls for:

> *Intelligent computational environments stimulating and enhancing human creativity: Multi-disciplinary research (e.g. computational creativity, brain-based research, cognitive and learning sciences, HCI) should explore the potential of technology to enhancing human creative processes. Research should address individual and/or collective creative processes in professional contexts involving domain-specific skills (in e.g. creative industries, engineering, medical professions). Work should establish theories and models for hybrid (human-computer) systems to be demonstrated by fully functional prototypes of computational environments. Proposals need to address the balance between scientific insights, technological innovation and practical application to the domain. Proposals should include sound methodology for the assessment and measurement of creative performance.*

When introducing this target outcome it is important to mention that already in the past various services in the European Commission have undertaken activities relating to ICT for creativity. The activities ranged from consulting experts to consider possibilities of fostering creativity through the use of ICT to calling for research on ICT and creativity in the past calls.

As an example of a consultation exercise, the Future Emerging Technologies (FET) unit organised a consultation workshop to gather ideas on "ICT for Creativity" bringing together experts with focus on creativity in their research. The document summarising the conclusions of the workshop can be found under: FET Consultation Workshop (Brussels, 28 November 2011) http://cordis.europa.eu/fp7/ict/fet-proactive/docs/shapefetip-wp2013-01_en.pdf

The Cultural Heritage and Technology-Enhanced Learning Unit called for research on Computational tools fostering creativity in learning processes under "Objective ICT-2011.8.1 Technology-enhanced learning" in work programme 2011-1012 (target outcome d) of Call 8). Three projects on creativity in learning processes were selected as a result of Call 8 (C2Learn, Collage and IdeaGarden) and have been launched as of 1st of October 2012.

Should you refer to the mentioned projects of the Technology Enhanced Learning call, please note that Call 10 is a different call, with its own distinctive context and focus.

In the current Call 10, the underlying rationale of the target outcome b) Intelligent computational environments is based on the hypothesis that technology (intelligent computational environments) has the potential to stimulate and enhance human creativity. The challenge of research in this area is to further discover and investigate this potential, to understand it better and to find out ways how technology can be best used, with computers serving as enablers or co-creators, to augment and strengthen human creative efforts.

<u>As can be understood from the text of target outcome b):</u>

- "*Multi-disciplinary research (e.g. computational creativity, brain-based research, cognitive and learning sciences, HCI)…"* The first sentence reflects the recognition that various research areas study creativity from different angles. Research on creativity involving ICT will necessarily call for a blend of disciplines. The mentioned disciplines are examples of areas which could be involved and they do not constitute an exhaustive list. Nor is it expected that one single proposal will set out to involve all of them.

- *"Research should address individual and/or collective creative processes".* It is up to the proposers to define whether they will address individual and/or collective creative processes. They should however target creative processes "*in professional contexts involving domain-specific skills".* Domain-specificity calls for the consideration of the view that creativity shows itself in different forms in various domains: for example creativity in composing music manifests itself very differently than creativity in designing architectural works as those two exemplary domains require very different skillsets and requisite domain knowledge.

- *"(in e.g. creative industries, engineering, medical professions)".* The enumeration of the professions mentioned here is non-exhaustive, however, one might venture say that some professional contexts might lend themselves more easily to being test-beds for research on creativity (such as those of creative industries) because the creative processes might be more easily discerned or identified in some types of work.

- "*Proposals need to address the balance between scientific insights, technological innovation and practical application to the domain.*" It is up to the proposers to decide how they will approach the three components mentioned and which one will constitute the main selling point of the proposal, however, the remaining text of the target outcome indicates that there should be a scientific basis for the research so some scientific insights should emerge.

- *"Proposals should include sound methodology for the assessment and measurement of creative performance"*. The difficulty of measuring and evaluating creativity undoubtedly raises methodological challenges and this could be considered as one of the most important questions to be tackled under this target outcome. Measurement implies the need to define what will be measured and to provide metrics. Designing well thought-through and well-defined indicators which clearly articulate how the baseline will be specified and how the changes will be measured will need careful consideration from the proposers.

To sum up, the multi-disciplinary nature of the research at question enables proposals to start from different research perspectives or from different paradigms. Proposals can address a broad range of research questions based on different working hypotheses. However, irrespectively of what the starting point is, a proposal addressing b) should provide an operational definition of creativity for the purposes of the research to be carried out and should commit to this definition. Committing to the definition entails specifying how the insights gained in the course of the work will feed back into the work.

The nature of this target outcome implicates that it is strongly recommended to include expertise on creativity in the consortium.

The expected impact for target outcome b) is:

- *Better understanding of the potential of technology in human creative processes leading to enhanced domain-specific human creative performance;*

Proposals responding to this target outcome should use the Small or medium-scale focused research projects (**STREP**) instrument, which is designed for small consortia with a very focused approach. Target outcomes a) and b) share the budget of EUR 32 million, with a reserved minimum of 40% for IPs and a reserved minimum of 30% for STREPs. The remaining 30% of the allocated budget are not bound to either type of instrument and will be used for the highest scoring proposals addressing target outcome a) or b), irrespectively of the instrument selected by the proposal.

c) Progress towards formal understanding of creativity

Target outcome c) of the objective calls for

> ***Progress towards formal understanding of creativity*** *with a view to advancing the measurable capability of computers to produce results assessed by humans as useful, original and surprising. Proposals should contribute to technological and theoretical insights on creativity, incorporating progress in relevant areas such as AI, psychology, sociology, neuroscience and cognitive science. Proposals should demonstrate how the theoretical insights gained in the project will contribute to the understanding of human creativity.*

> *Technological advances should be validated as proofs of concept in innovative autonomous creative systems aiming to rise above the level of pastiche (mimicry).*

To repeat what has already been stated above, there is no consolidated and consistent 'Science of Creativity' (various disciplines study it from different angles). Computational creativity (CC) is one of the areas of research of creativity which offers interesting possibilities for studying it and understanding it better. One of the research endeavours of CC is the development of autonomously creative systems which produce creative outcomes and at the same time work with little or no human input.

The underlying rationale of this target outcome is therefore two-fold: on the one hand, this outcome should result in the advancement of technologies for autonomous creative systems. On the other hand, on the basis of a relationship between computational algorithms and human cognitive processes (which for example makes computational modeling of human creative processes possible), work on autonomous creative systems is expected to contribute to a better formal understanding of creativity, or, in other words, to informing scientific theories on creativity, including human creativity.

As can be understood from the text of target outcome c):

- *"Progress towards formal understanding of creativity"* as already explained above, the scientific insights on creativity per se are a crucial part of this outcome;

- *"measurable capability of computers"* stresses the need for systematic research and providing metrics specifying how this capability will be evaluated;

- *"to produce results assessed by humans as useful, original and surprising":* Producing by computers results which are assessed by humans as creative as useful, original and surprising (that is: as creative) means reaching by computers human-level creativity with important implications for the research under this target outcome;

- *"Proposals should contribute to technological and theoretical insights on creativity, incorporating progress in relevant areas such as AI, psychology, sociology, neuroscience and cognitive science"* This sentence stresses the importance of involving different disciplines and drawing on their body of research;

- *"Proposals should demonstrate how the theoretical insights gained in the project will contribute to the understanding of human creativity".* Technological development in itself is not sufficient; the proposals need to demonstrate that there will be a possibility to learn something about human creativity;

- *"innovative autonomous creative systems aiming to rise above the level of pastiche (mimicry)."* It is important for the proposals to argue that the developed innovative systems will aim to rise above the level of pastiche (mimicry). The term "Pastiche" (mimicry) describes a situation where the software has been programmed in such a way that it for example produces music in the style of Bach or Mozart. Such outputs however do not rise to the level of human creativity – they are not original and surprising and just mimic and re-produce by exploiting a rule embedded in them. Autonomous creative systems called for in this target outcome should go beyond this level and be themselves able to innovate and surprise;

- "*aiming to rise*" leaves the door open for some areas where "just" reaching the level of pastiche for a system would constitute a major scientific breakthrough.

The expected impact for target outcome c) is:

- *Deeper scientific understanding of creativity, fostering the synergy between understanding and enhancing human creativity, and new technologies for autonomous creative systems.*

Proposals responding to this target outcome should use the Small or medium-scale focused research projects (**STREP**) instrument, which is designed for small consortia with a very focused approach. Target outcome c) has a separate budget of EUR 10 million.

d) Roadmaps for future research and innovation

Target outcome d) of the objective calls for:

Roadmaps for future research and innovation in the creative industries; proposals should target cross- and inter-cluster support activities to boost creative competitiveness in sectors such as advertising, architecture, arts, crafts, design, fashion, films, music, publishing, video games, TV and radio

The objective of the Coordination or Support Action expected for this outcome is **not** to carry out actual research, but rather to

- map the landscape of opportunities that may present themselves over the next years

- propose a strategic European roadmap within this landscape

The proposers should make clear that they are aware of the relevant reports and initiatives in the field and clearly outline what their added value will be.

The expected impact for target outcome d) is:

- *Better coordination of European and national efforts, closer dialogue between research and industry, better understanding of user requirements, more innovation and technology uptake.*

Proposals responding to this target outcome should use the Support or Coordination Action instrument. It is important to choose the instrument that better matches a proposal's scope and objectives.

Target outcome d) has a separate budget of EUR 1 million.