CLINES

SEVENTH FRAMEWORK PROGRAMME

Cluster-based Innovation through Embedded Systems technology

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Abstract:

The intermediate Joint Action Plan is a preliminary *strategy* outlining the future development of the involved regions and clusters. This strategic plan will pinpoint what it will take for the involved partners to push economic development in the four regions by enabling innovative research and technology partnerships within the collaborative area of embedded systems for smart cities (ESSC). The intermediate Joint Action Plan serves the purpose of being a platform from which relevant stakeholder can be involved in formulating the final Joint Action Plan. The Joint Action Plan will be defined among all the stakeholders to ensure that it meets with the expectations of the different stakeholders, that it is relevant to these stakeholders, founded in their strongholds, and creates commitments of the stakeholders leading to the expected economic development in the involved regions.

Keyword list: Joint action plan, strategy, smart city, embedded systems

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Abbreviations

CLINES   Cluster-based Innovation through Embedded Systems technology – project 320043
ES   Embedded Systems
ESSC   Embedded Systems for Smart Cities
JAP   Joint Action Plan
RIG   Regional Interest Group
SC   Smart City
SME   Small and Medium-Sized Enterprises
SWOT   Strengths, Weakness, Opportunities, Threats (analysis)

1   Introduction

The objective of Work Package 4 is to formulate and validate a Joint Action Plan (JAP). The general vision is to create joint action between the CLINES partners leading to the specific objectives of the project. These objectives are to be reached not only by the completion of the project, but must have a sustainable impact and relevance after the project.

This work package will have four deliverables of which this is the second. Deliverable 4.1 established the Regional Interest Groups in each of the four regions. The current deliverable (4.2) contains the intermediate Joint Action Plan. The final Joint Action Plan follows these two in 4.3, and finally there will be recommendations for political decision makers (4.4.). The core contents of all the work in this work package is the development of the Joint Action Plan.

The Joint Action Plan will be a *strategy* outlining the future development of the involved regions and clusters. This strategic plan will pinpoint what it will take for the involved partners to push economic development in the four regions by enabling innovative research and technology partnerships within the collaborative area of embedded systems for smart cities (ESSC). The Joint Action Plan will be defined among all the stakeholders to ensure that it meets with the expectations of the different stakeholders, that it is relevant to these stakeholders, founded in their strongholds, and creates commitments of the stakeholders leading to the expected economic development in the involved regions.

The Joint Action Plan will in particular be specific strategies for research, funding, innovation, smart specialization, and knowledge transfer.

The Joint Action Plan will focus on bringing together different stakeholders belonging to the quadruple helix within the domain of Smart Cities. The four regions have complementary strongholds within embedded systems for smart city applications. The strategy will be based on the strong and complementary research competences within embedded systems technology on low-power electronics, interoperability, quantitative analysis, security & safety, mobile communications, and model-driven development.

While Work Package 4 will formulate and validate the JAP it is the task of Work Package 6 to measure the effectiveness of the JAP, its goals, and its actions.

2   Background

The Intermediate Joint Action Plan is a key deliverable in the CLINES project because it directs future actions to be taken by the CLINES project and by the joint partners after the completion of the project. The status of the JAP in this deliverable is that of being stable, but intermediate. Its intermediate status is important because it gives the opportunity to use it with the Regional Interest Groups in discussion and reviews of the proposed joint actions, in forming the regional policies to be a firm corner stone of the final JAP and to inform regional policy makers, and in the other CLINES tasks that relate to the JAP.

In the CLINES project the work on the Joint Action Plan depends on previous tasks and already produced deliverables that serve as background, it is concurrent with other tasks that it is coordinated with, and it is itself the background for other tasks and deliverables. See Figure 1.
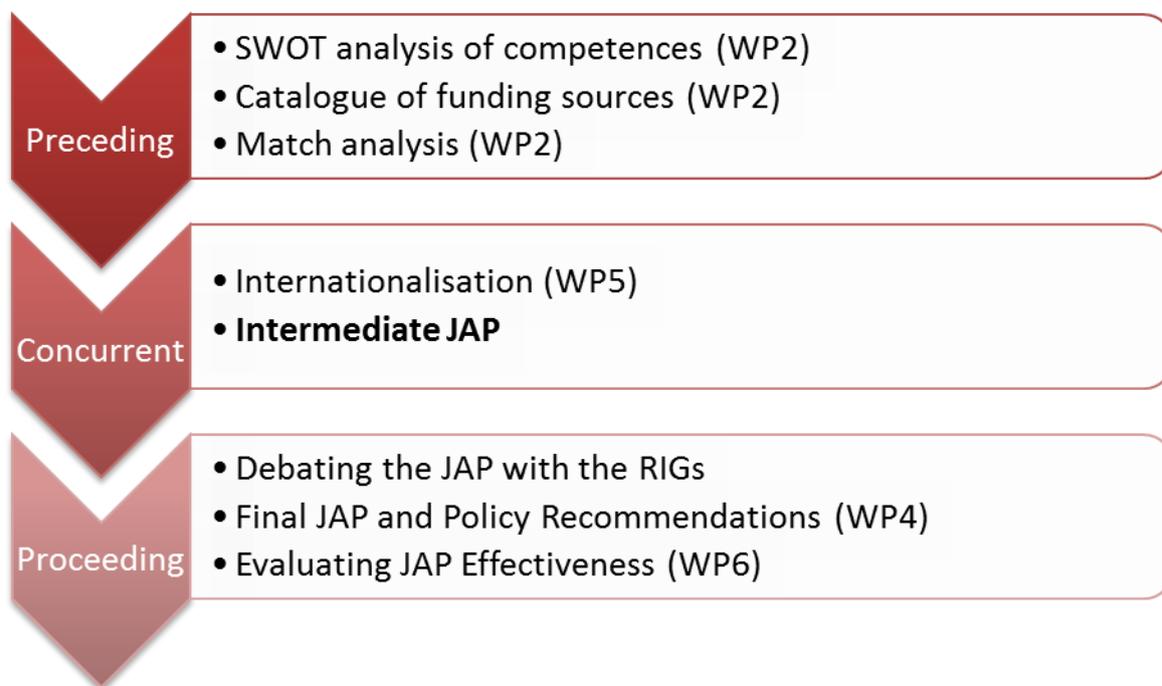

Figure 1: Task dependencies

The Intermediate Joint Action Plan was formulated and validated based on the results from Work Package 2 that produced a SWOT analysis of the regions' competences (Deliverable D2.3), a catalogue of funding sources (Deliverable 2.4), and a match analysis of the regional business strategies relative to the expected business needs and regional research topics (Deliverable 2.5). The Intermediate Joint Action Plan was developed concurrently with the internationalization strategy (Deliverable 5.1) and was coordinated with this effort. There are definite linkages between the results, but there is also deliberately no repetition between the two deliverables. The Intermediate Joint Action Plan precedes the Final Joint Action Plan (Deliverable 4.3), which again precedes the Regional Policy Recommendations (Deliverable 4.4). As part of working with the Final Joint Action Plan there will be debates with the Regional Interest Groups on the contents of the suggested strategies. The Joint Action Plan is also the foundation of the measurement of the effectiveness of the joint actions.

The Joint Action Plan leans against an intellectual base of smart specialization, of smart cities, and of embedded systems.

By smart specialization we refer to the principle of prioritization to favour certain technologies, businesses and public endeavours and to concentrate resources on the development of activities that can transform existing structures through R&D and innovation (Foray et al. 2012). The purpose is to link research and innovation with economic development and to adapt a policy-making strategy of a region. This is also referred to as a smart specialization strategy.

Embedded systems (also often referred to as cyber-physical systems) are systems based on information and communication technologies that reside in and control a device, product or system, i.e., it is embedded in a larger system. A cyber-physical system is an integration of computation with physical processes; and embedded software monitors and controls the physical process (Lee & Seshia 2011). Modern traffic control in a city could be an example of this where cars and trucks are monitored either by mobile sensors in the vehicles or on stationary locations, the sensor data communicated, analysed, and used in controlling traffic lights and information to drivers. The engineering of embedded systems is increasingly complex and involves reliably modelling the physical processes as well as utilizing very limited resources in embedded devices (Sangiovanni-Vincentelli et al. 2013).

Smart cities and the ideas of smart cities are on the rise. Many metropolitan areas and many large cities are working on the concept that should become digitalized. This digitalization is in part technology-driven and resides in the embedded systems to sense and monitor behaviour, to collect huge amounts of data (big data), to analyse these data, and then in smarter ways suggest condensed and relevant information to citizens or even intervention into the cyber-physical infrastructures of the city. The concept of 'smart city' has been defined in several yet overlapping ways. It can be seen as the investment in networked infrastructures (traditional as well as information and communication technologies) to fuel a sustainable economic growth and a high quality of life (Caragliu et al. 2011), but also that these infrastructures should be more than intelligent, they should be smarter for the benefit of citizens (Holland 2008).

3 Development of the Joint Action Plan

The Intermediate Joint Action Plan was developed through an iterative process (see Figure 2).
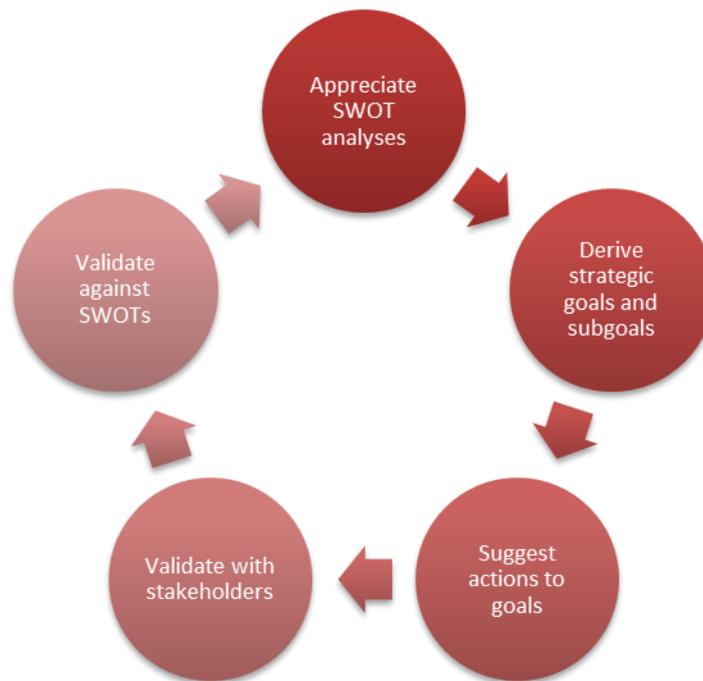
Figure 2: The approach to develop the JAP

The approach is iterative, though the starting point has been the SWOT analyses and the appreciation of these, as well as the analysis of potential funding sources. The particulars of the SWOT analyses of the four regions have played a significant role as they highlight strengths to be utilised by a region and in collaboration also with other regions; but the analyses also highlight weaknesses where it will be relevant to seek joint action. Opportunities and threats further inform the strategizing by pointing at each region's strategic options and conditions.

Based on this appreciation the strategic goals of the four regional eco-systems are developed and detailed in subgoals. Goals and subgoals are to be understood as what the four regional eco-systems will be striving for facilitated by the cluster organisations. There is an intersection between what the four regional eco-systems will be striving for and what CLINES as a project is striving for, but the regional interests are longitudinal, strategic, and policy-oriented. From the goals and subgoals it is then possible to suggest actions to meet these goals. The action must be at a strategic level.

The remaining two activities in Figure 2 will be performed based on the intermediate JAP. When the goals are in place and the actions have been developed these are then validated with stakeholders. Relevant stakeholders include the Regional Interest Group, but also the regions' and cities' administrations and policy-makers, as well as the research leadership at the related knowledge institutions. The project will then internally validate the goals and actions against the SWOT analyses.

4   Joint Action Plan

The Intermediate Joint Action Plan has an overall objective explained in section 4.1 and five goals elaborated in section 4.2.

4.1 The Overall Objective

The overall objective of the strategic effort and its sustained activities beyond the CLINES project has been formulated based directly on the CLINES project objective.

The overall objective of the Joint Action Plan

To define the particular actions taken by CLINES partners and regions to improve the domain of Embedded Systems for Smart Cities in Europe and in the four regions. The Joint Action Plan must drive economic development through both joint actions and regional actions within Embedded Systems for Smart Cities for the benefit of citizens.

4.2 The Goals and Subgoals

The overall objective has then been formulated into five goals with subgoals in the following sections.

4.2.1 Improve ESSC Smart Specialisation

The goal is to improve the regional smart specialization in the domain of embedded systems for smart cities (ESSC) by utilizing the regional strengths and through joint actions, thus creating a joint vision with particular foci within research, business and public agencies. It also involves relevant and significant stakeholders in each of the regions covering all strongholds and influential policy-makers both in the private and public sectors.

Subgoals
- Create a joint vision
- Appreciate and leverage regional and joint strengths
- Focus research effort
- Involve stakeholders
- Collaborate across sectors
- Create public and political awareness

The suggested actions to meet this goal and these subgoals are prioritised as follows:

1. Create a common vision for ESSC that is well founded in the SWOT analyses and in the trend roadmaps and show how the common vision links to both regional strongholds as well as other European clusters within ESSC
2. Mediate between otherwise separate business sectors and between public agencies because these need to collaborate to lift the area of ESSC and potentially facilitate through the

CLINES innovation workshops. Support public procurement agencies within ESSC to further the collaboration.

3. The Regional Interest Groups should turn from being specific to the CLINES project to becoming useful for the regional smart specialisation beyond the project by engaging a broader set of stakeholders including influential business people and public policy makers.

4. Communicate the common vision for ESSC and how it links with regional smart specialisation strategies potentially through: exemplar stories of collaboration within the ESSC vision; the CLINES show cases; and identified important ESSC problems.

5. Appreciate and influence the regional smart specialisation strategies to link with structural funds and to link ESSC initiatives to structural funds.

4.2.2 Build a Vibrant ESSC Eco-System

The goal is to build and cultivate an eco-system for ESSC that is vibrant and resonates with regional businesses, public agencies, and research institutions by strengthening the regional cluster organizations and the cross-cluster collaboration. It also involves improving both the visibility of the regional eco-systems' strongholds and their attractiveness for other ESSC eco-systems to collaborate with and leading to the creation of increased value in joint activities and to strengthen competitiveness of European ESSC.

Subgoals

- Strengthen European competitiveness on ESSC
- Create joint value
- Improve attractiveness
- Foster transnational collaboration between regional eco-systems
- Strengthen cluster organisations

The suggested actions to meet this goal and these subgoals are prioritised as follows:

1. Create joint events with common ESSC agendas and use these for frequent exchanges of information on funding opportunity, calls, projects, knowledge and research on ESSC and possibly involve the RIGs as well.

2. Establish a formal CLINES office to organise the cluster organisation for the regional clusters.

3. Create matchmaking across sectors and across regions driven by quadruple helix thinking and with an elaborate knowledge of interests and competences of businesses, public agencies, research institutions, and other relevant stakeholders. Facilitate pre-competitive public procurement to further the matchmaking.

4. Connect to similar projects within Smart Cities, Embedded Systems, and their combination, and exchange experience and information.

4.2.3 Develop Innovation Capacities

The goal is to develop as well as improve capabilities and capacities to innovate in the domain of ESSC developing competences for local and global innovativeness. It also involves the linking between and the closing of gaps between research and technology on the one hand and application and value creation on the other hand.

Subgoals

- Develop innovation competences and capabilities
- Close research & technology gaps
- Stimulate SMEs as international innovators

The suggested actions to meet this goal and these subgoals are prioritised as follows:

1. Create access to research groups, research labs, testbeds, and technical infrastructure for ESSC companies and utilise collaboration and alliances with researchers to close research and technology gaps.
2. Support comprehension and communication of innovation specifically for ESSC through innovation workshops in particular, but also expositions, show cases, demonstrators, and knowledge sharing demonstrating both existing and future innovation and innovativeness
3. Support understanding of users and consumers through use cases, business cases, and by exchanging user analyses as background for creating value for customers and citizens.
4. Support business' and public agencies' access to innovation competence, mentors, coaches, and training for relevant stakeholders.
5. Transfer knowledge and experience to involved regions through CLINES innovation workshops.

4.2.4 Create More Business

The goal is to increase the volume and quality of business within the ESSC eco-systems supported by new and improved business models and entrepreneurial capabilities. It also involves a particular focus on start-ups and SMEs and well as linking with international partners and unleashing new opportunities through alliances and networks as well as close collaboration.

Subgoals

- Develop entrepreneurship
- Develop business models
- Unlock new opportunities
- Improve access to international partners
- Focus on SMEs and start-ups

The suggested actions to meet this goal and these subgoals are prioritised as follows:

1. Facilitate exchange of ESSC knowledge, its problems, consumers and citizens, solutions, and technologies.
2. Match making both regionally and between regions supported by scouting for new business, utilisation of open development models, consortia creation, SME bundling, and SME and large enterprise linking.
3. Facilitate an international outreach for regional businesses.
4. Develop and diffuse knowledge of business models and value creation based on quadruple helix, alliances, and networks, and train SMEs in developing business models.
5. Exchange knowledge and experience between universities to address both entrepreneurial skills and technical skills.
6. Public procurement as a lever for private-public-partnering in particular within ESSC.

4.2.5 Mobilize Funding Sources for ESSC

The goal is to identify, understand, apply, gain, spend and report on all funding sources relevant to promote ESSC both joint and regionally. This involves both public funding, e.g., for research, cluster organisations, SMEs, and commercial investment, e.g., venture capital. This may also involve informing policy-makers and funding agencies of the attractiveness of funding ESSC activities.

Subgoals

- Facilitate public-private-partnering
- Provide knowledge of commercial investment, entrepreneurial funding, and venture capital
- Provide knowledge of public funding opportunities

The suggested actions to meet this goal and these subgoals are prioritised as follows:

1. Facilitate the exchange of knowledge of funding by EU as well as national and regional funding through regional lobby and funding offices whether these are for research, business, public agencies, or for partnerships.
2. Facilitate the exchange of knowledge of commercial investment in entrepreneurial business, of venture capital, and of crowd funding.

5 Future Work

The Joint Action Plan is currently in a stable, but intermediate state. The purpose with the intermediate plan has been to bring it in a stable state where it can be debated, discussed and reviewed by the Regional Interest Groups and be brought to a larger audience such as regional policy makers. Work continues towards a Final Joint Action Plan in Deliverable 4.3. This section describes the future work leading to the final plan and topics to be covered in the final plan that are not part of the intermediate plan.

5.1 Plan for the Final Joint Action Plan

The final JAP will be developed through a series of activities where the dependencies to other tasks are stipulated in Figure 1 and the iterative approach in Figure 2 will be followed; but these also need to be supplemented to develop a complete and final JAP, see Figure 3.
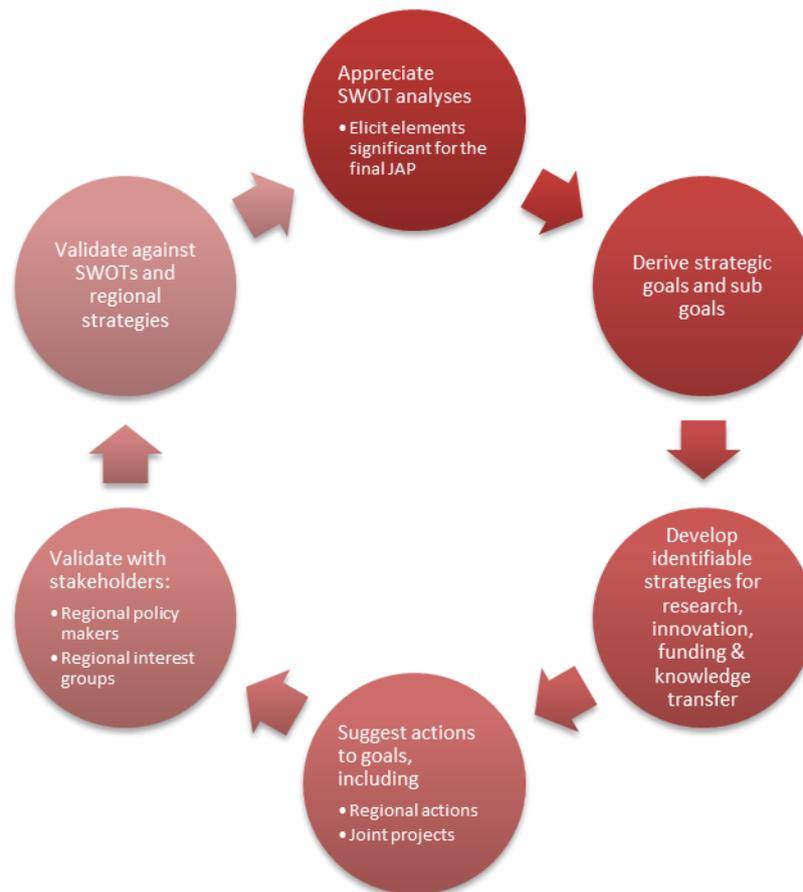
Figure 3: Activities to develop the final JAP (amended from Figure 2)

The activities in Figure 3 are amended from Figure 2. These activities will be performed after the first round of validation based on the intermediate JAP. This will further inform the appreciation of the SWOT analysis and will make it possible to elicit the most significant elements of the SWOT analyses, that is, which are the most important strengths, weaknesses, opportunities, and threats for the final JAP. This will involve modelling of the linkages between SWOT elements and the strategic goals and subgoals in the final JAP. This may then give rise to a revision of the goals and subgoals. The following activity has been added, as it is necessary to link the goals and subgoals to separate strategies for research, innovation, funding, and knowledge transfer. This will again involve modelling the linkages back to the goals and subgoals.

The final JAP is due 10 months after the intermediate JAP; months 30 and 20 respectively. The intermediate milestones are outlined in Table 1.

	Milestone month 25	Milestone month 29
Validate	First feedback and discrepancies documented	Validation documented and explained
Appreciate	SWOT elements mapped to goals and subgoals	Mapping final and explained
Develop strategies	Goals and subgoals finalised; Goals and subgoals mapped to separate strategies	Goals and subgoals explained Mapping final and explained
Develop actions	Regional actions and joint projects added	All actions and projects explained

Table 1: Intermediate milestones before the final JAP

5.2 Topics in the Final Joint Action Plan

The intermediate Joint Action Plan reflects the focus on achieving the goals and subgoals, cf. Section 4. There are several implications that will be drawn from this in the final plan. The final plan will also encompass the following (and these are in addition to the topics covered in intermediate plan):

- Explicit linkage with the smart specialisation strategies of each of the four regions. What are the smart specialisation strategies? In which ways are they aligned with the joint action goals of CLINES? In which ways are the joint actions of CLINES supporting the regions' smart specialisation strategies?

- So far the Intermediate Joint Action Plan has a particular focus on the *joint* actions to be taken by the partners. In the Final Joint Action Plan this should be supplemented with actions taken by each of the partners as long as these actions can be explained as supporting the joint goals in the JAP.

- Within the realm of the Joint Action Plan there must be joint projects to drive some of the strategic actions as some of these are potentially massive and requiring separate funding and effort.

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