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User Centred Innovation in Manufacturing

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Authors: Philine Warnke, Philine.warnke@ec.europa.eu

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Purpose

'User Centered Innovation in Manufacturing' (UCIM) was investigating possible pathways towards user centred innovation approaches in European manufacturing industry with the following two main purposes:

- Support the European Commission and the Manufuture technology platform to set priorities for the funding of research on industrial technologies that will underpin sustainable and competitive manufacturing in Europe.
- Stimulate a wide stakeholder debate on the implications of user centred innovation for European manufacturing industries in order to raise awareness.

Integration of Users – a Challenge for Manufacturing Industry

Since a number of years the European Commission has used Foresight to define research-funding priorities in interaction with European stakeholders in the realm of industrial technologies. Two large-scale exercises have been looking into the future of European manufacturing industries. The Manufuture technology platform has been set up and developed a long-term strategic research agenda. Within this framework the UCIM project addressed a challenge for European manufacturing industry that was identified as of particular relevance within the previous work: The Integration of users as active partners in product and service innovation. This challenge, which is driven by changes in economy and society on the one hand and by emerging enabling technologies on the other is demanding substantial transitions in manufacturing industry that are not yet well understood.

Envisioning User Centred Innovation - The UCIM Approach

The UCIM project was pursuing the following objectives:

- Develop visions of user centred innovation approaches within European manufacturing industry that underpin sustainable and competitive manufacturing located in Europe.
- Identify elements that need to be developed in order to realise these visions - enablers & roadmaps.
- Recommend research funding and other policy measures needed to foster the roadmaps.
- Foster stakeholder debate and creative thinking on the matter through thought provoking input.

UCIM used a road mapping approach to set up the structured stakeholder dialogue characterising Foresight. Special emphasis was placed on visualising ideas and concepts to initiate out-of the box thinking and creative debate. In a first step two pilot roadmaps on furniture and machine tool industry were

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developed. In the second phase the results were translated into a more general picture of manufacturing industry. The whole process was carried out in close interaction with stakeholders and experts involving the following steps:

- Literature review and analysis to identify emerging types of user centred innovation approaches.
- Pilot roadmap furniture industry:
    - Stakeholder interviews using imaginary future situations of user innovation (see figure 1).
    - Interactive stakeholder workshop to condense visions into scenarios and identify barriers and enablers.
- Pilot roadmap machine tool industry - same approach.
- Generalisation of sector specific results for manufacturing industry in interactive workshop.
- Validation of results and Identification of policy measures in support to enablers within interactive workshop.

All workshops were fed with illustrative material following from internal analysis and documented in detail often using imaginative visualisations (cf. figure 1&4). An interactive web platform was used to moderate stakeholder debate throughout the project.

Figure 1: Fictive situation used to stimulate future oriented thinking in the UCIM stakeholder interviews

Involving Stakeholders

UCIM involved experts and stakeholders within three interactive workshops - each around 15 participants, around twenty face-to-face interviews and within an online web dialogue. For the two pilot roadmaps stakeholders from the two industries - furniture and machine tool - were involved together with researchers working on the various enablers. In the validation phase, policy makers and researchers dealing with innovation and consumer behaviour were involved. Currently the results are disseminated and discussed with a wider audience.

UCIM Management

A consortium of six European research institutes carried out UCIM with complementary competencies in innovation studies, Foresight methodology and manufacturing concepts:

- Centre for Knowledge Exchange - CKE, Ireland
- European Commission Joint Research Centre - Institute for Prospective Technological Studies - JRC-IPTS, Spain
- VTT Technical Research Centre of Finland - VTT
- Austrian Research Centre Systems Research - ARC
- Netherlands Organisation for Applied Scientific Research - TNO
- Strategic Design Scenarios - SDS, Belgium

DG Research, Industrial Technologies as a Specific Support Action – SSA - within the sixth Framework Programme, financed UCIM.

UCIM Results

The UCIM project was focussing on developing desirable visions and on stimulating debate and out of the box thinking. It placed less emphasis on identifying ongoing trends or likely futures in an exploratory manner. The core findings are incorporated in the typology of user innovation, the scenarios, roadmaps and policy recommendations.

Types of User Centered Innovation

As a base for the vision building a conceptual framework was developed distinguishing different types of user centred innovation. The differentiation was done in two respects.

A first distinction was made according to nature of activity required from both user and manufacturer. Involvement of users can focus either on the product creation of on the production (cf. figure 2).

Secondly, we classified the approaches as to the nature of the innovation coming out of the joint effort which can be either incremental or radical innovation directed towards either a specific product or a whole product type (cf. figure 3).

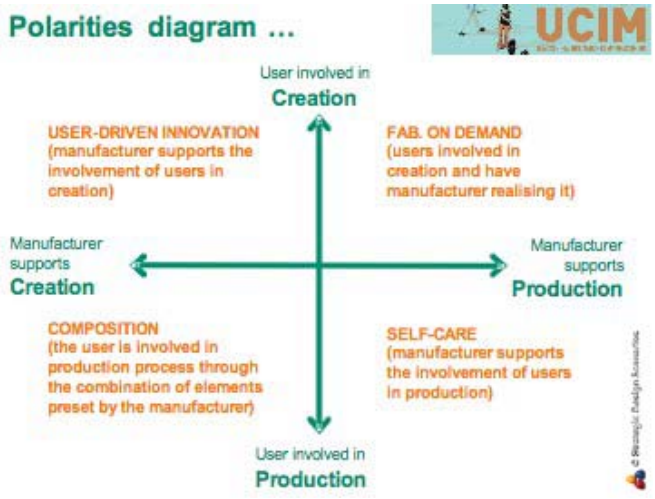

Figure 2: UCIM typology - nature of interaction

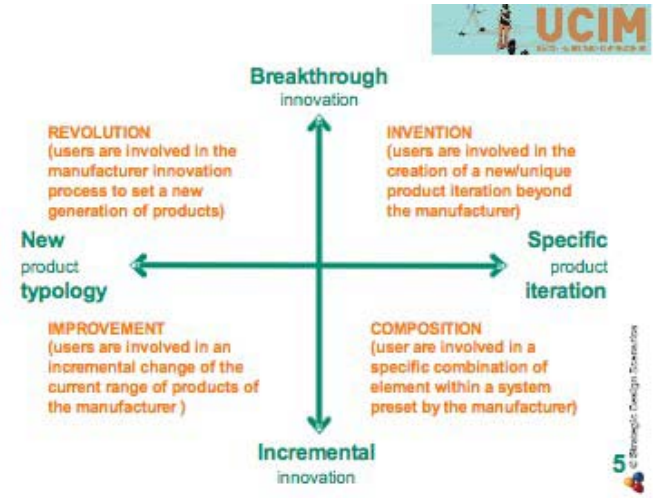

Figure 3: UCIM typology – outcome of interaction

Scenarios for User Centred Innovation

Departing from insights that were generated from the two pilot roadmaps, four general desirable UCIM scenarios were identified (figure 5). These scenarios do not only describe a high degree of user integration into innovation processes but are also incorporating a prospect for a sustainable and competitive production located in Europe.

Scenario 1 – My Product Valley: This scenario comprises individualised production in local production clusters with a joint space for interaction with the customer such as a semi-virtual furniture showroom in the case of the furniture sector. For less complex products the scenario envisages networks of shops where individual data is captured and personal products are produced within nearby factories.

Scenario 2 - Create and Carry: This scenario envisages shops where some product components are produced on the spot in a back-office workshop and assembled together with standard parts into personal products according to users demand. Some of the individual components can be generated through modification of existing components others completely freely.

The scenario also embraces manufacturing centres where personal products are produced on the spot on demand through 'fabbing' on the base of 3D design information either for individual consumers or for business applications - e.g. spare part production within a technology centre.

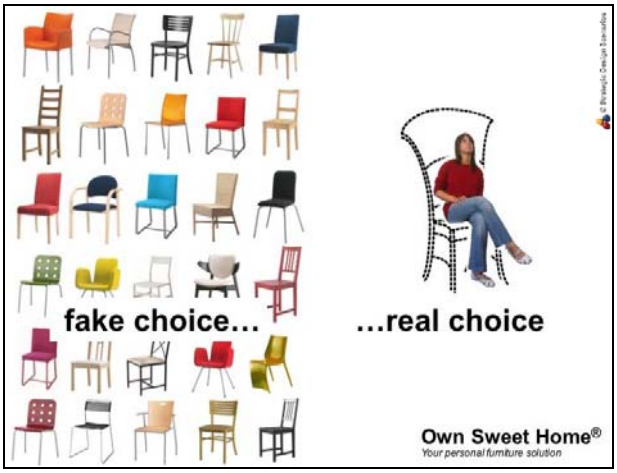

Figure 4: Fictive advertising campaign for scenario My Product Valley in furniture industry

Scenario 3 - Leasing My Long-term Needs: This scenario features provision of individual product service systems that are adapted to customer needs over the whole lifetime either through exchange of product or through continuous adaptation of one long lasting product.

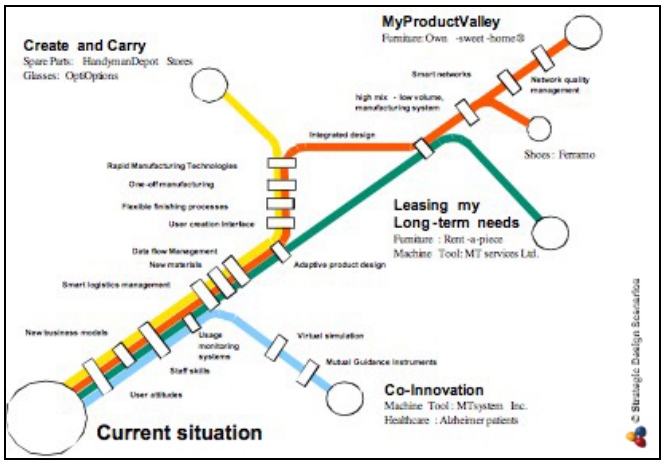

Figure 5: UCIM scenarios and roadmaps

Scenario 4 - Co-Innovation: Co-Innovation involves close long-term collaboration between manufacturer and (lead) users to innovate according to users needs. The scenario will often involve joint workshops where specific methods and supportive technical equipment are used for joint generation of new products. Another important element of this scenario is

proactive observation of the customer to identify user innovation and user needs and continuous uptake of the monitoring results and transfer into innovation activities.

Roadmaps towards User Centred Innovation

To realise the UCIM scenarios a number of elements from diverse realms such as technologies organisational concepts and skills need to be aligned. The UCIM roadmaps show the most important "stops" on the road towards some desirable UCIM destinations (cf. figure 5).

A Customer View - The UCIM Street

The UCIM Street (figure 6) gives an idea how a future world might look like where UCIM scenarios are realised in a number of sectors. It is populated by a number of places such as shops, ateliers and offices providing spaces for manufacturers and users to innovate together in different ways.

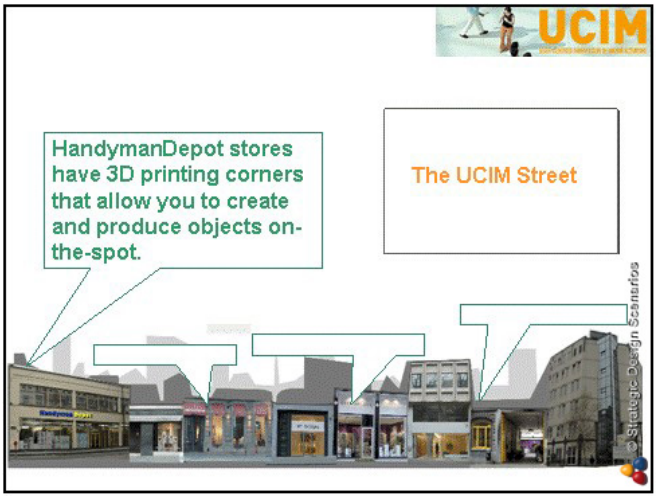

Figure 6: The UCIM Street

How to Foster the Roadmaps

For each of the enablers of the UCIM roadmap research and support measures needed to speed up its development were suggested. Five areas were proposed where measures could be aligned in order to foster a transition towards beneficial UCIM scenarios in European manufacturing industry.

- Manufacturing system for UCIM
- User interface for UCIM
- Adaptive product and service design
- Smart and open networked production
- User attitudes

Across these areas the following actions were recommended:

- **Real life learning for UCIM:** Establishment of attractive UCIM pilots to raise awareness among users and create learning spaces for companies and other actors.
- **Orienting research towards UCIM:** Integration of users and user research into publicly funded R&D projects.
- **Make the case for UCIM:** Collection and documentation of experience with UCIM applications establishment and promotion of success stories best practice and transfer of concepts between sectors.
- **Open up knowledge for UCIM:** Fostering of debate on IPR revisions in favour of user innovation.
- **Align actors for UCIM:** Targeted set up of user-producer-dialogues in dedicated innovation areas through local clustering and in particular Foresight initiatives. This could be aligned to Lead market initiatives.
- **Purchasing for UCIM:** Launching of public procurement with a view to promoting user involvement.
- **Experiment with UCIM:** Develop tailored UCIM strategies for companies with the aid of innovation researchers taking the Danish experience as a model.
- **Find out more about UCIM:** Launching of additional socio-economic research to explore in more detail the nature of change towards user centred innovation for various sectors, products cultural contexts as well as its social and economic impacts and the emerging requirements for innovation policy.

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