

# **The prospects of the ICT's in the Finnish system**

Summary of the workshop process and  
results

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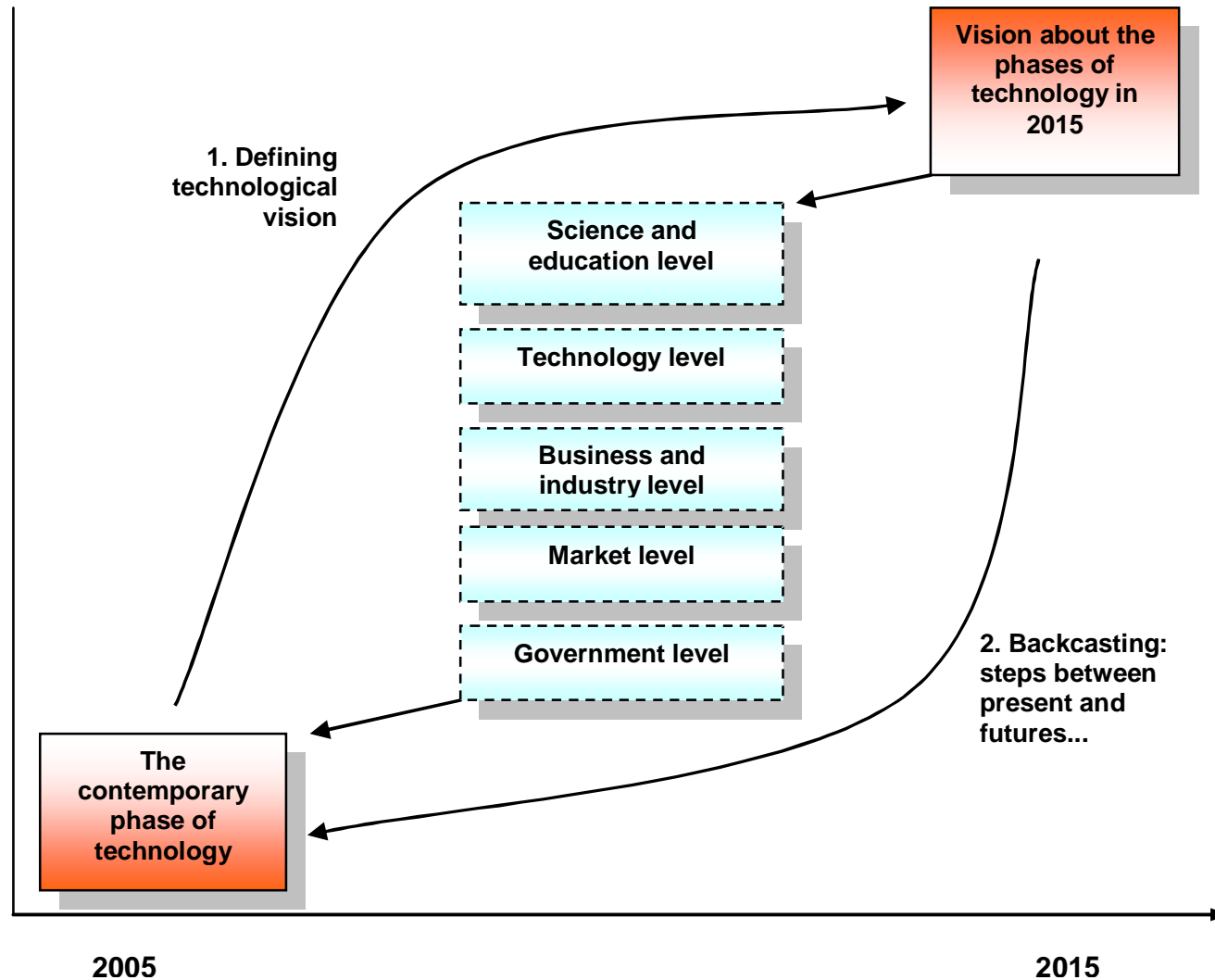
# Program

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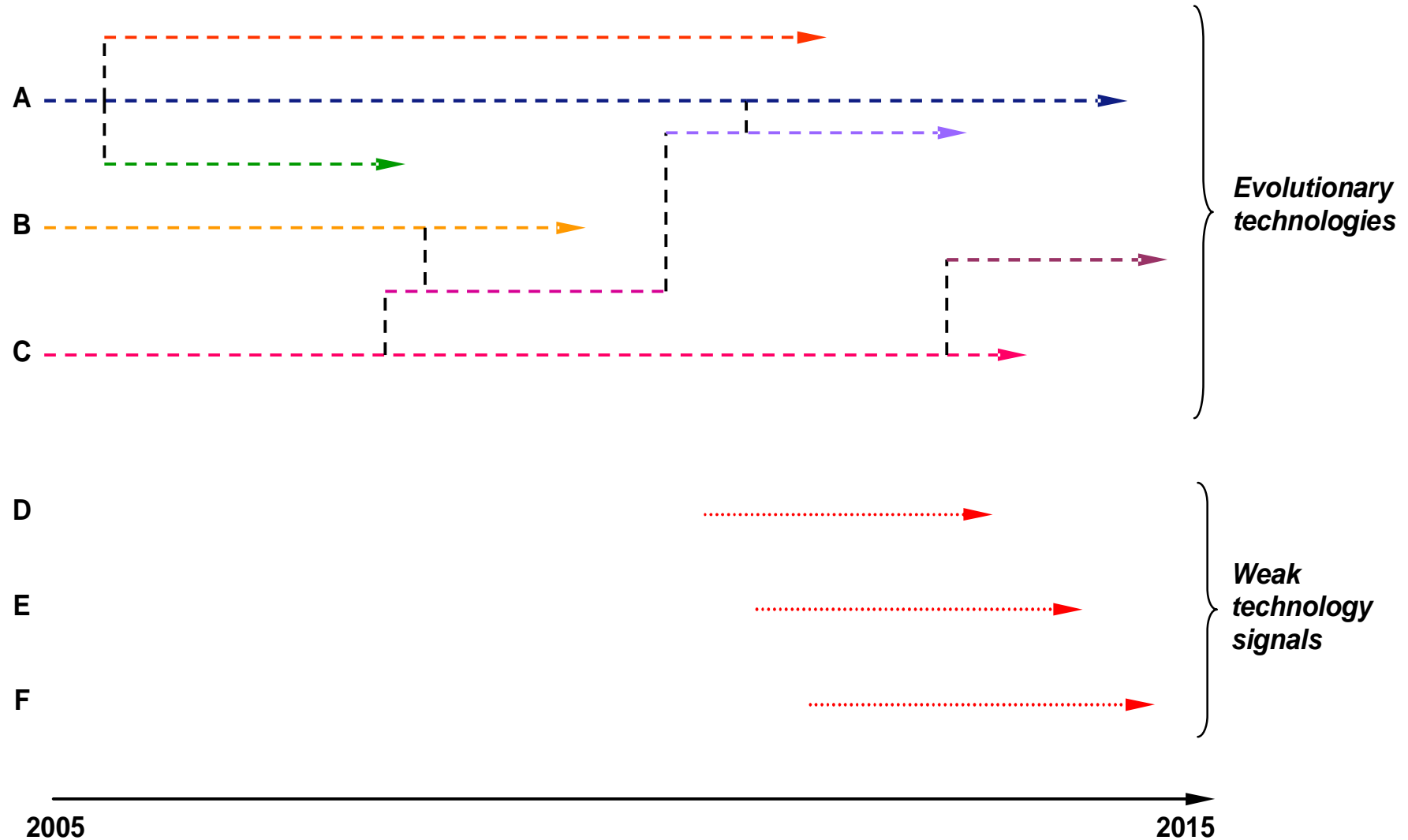
12.30–12.45	<b>Nordic ICT Foresight - presentation of the project</b> Mika Naumanen, VTT Technology Studies
12.45–13.00	<b>Technology foresight and roadmapping research</b> Annele Eerola, VTT Technology Studies
13.00–13.15	<b>The aims and working phases of the workshop</b> Toni Ahlqvist, VTT Technology Studies
13.15–13.30	<b>Splitting into separate working groups and moving into working spaces</b>
13.30–14.15	<b>Group working (phase I)</b>
14.15–14.30	Coffee break
14.30–15.00	<b>Group working (phase II)</b>
15.00–15.45	<b>Group working (phase III)</b>
15.45–16.00	<b>Conclusions, further activities and closing of the workshop</b>

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# Technology foresight application

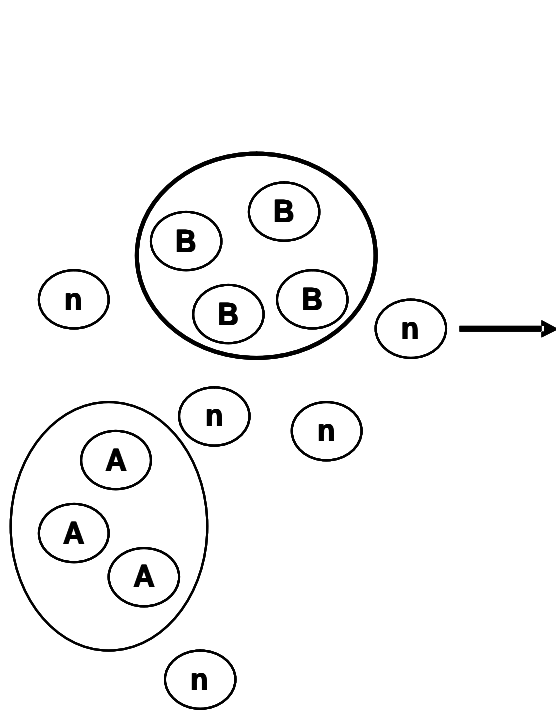


# Development of ICT's

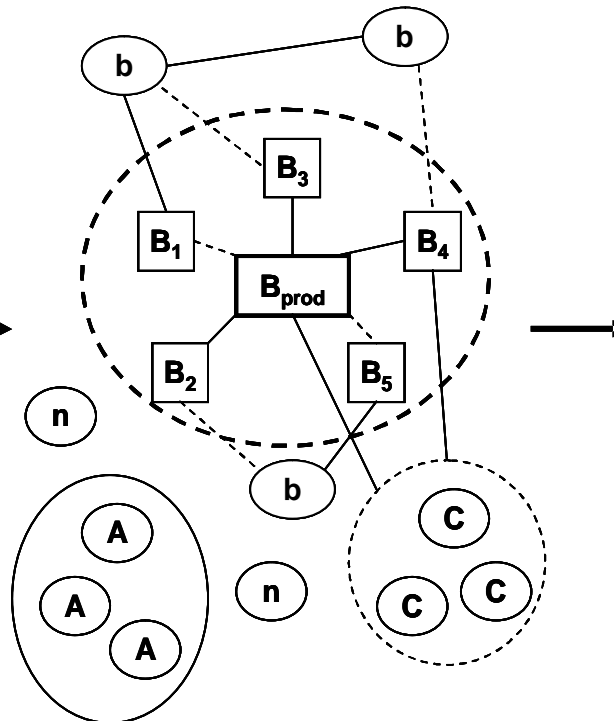


# The evolution and convergence of ICT's

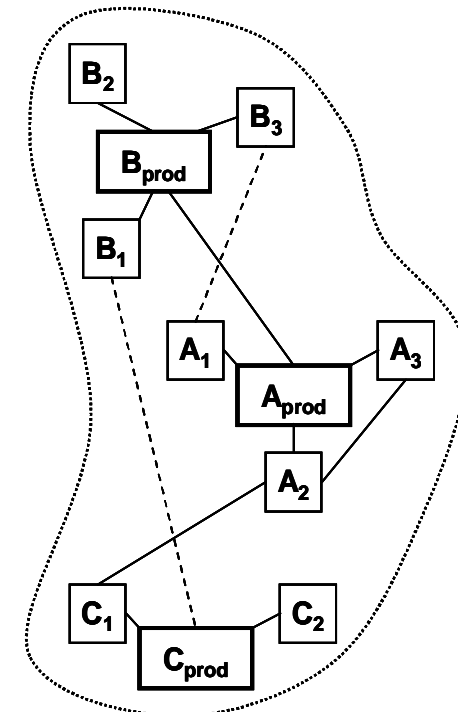
Separate technologies and product groups



Modularization of technologies and increase of relationships



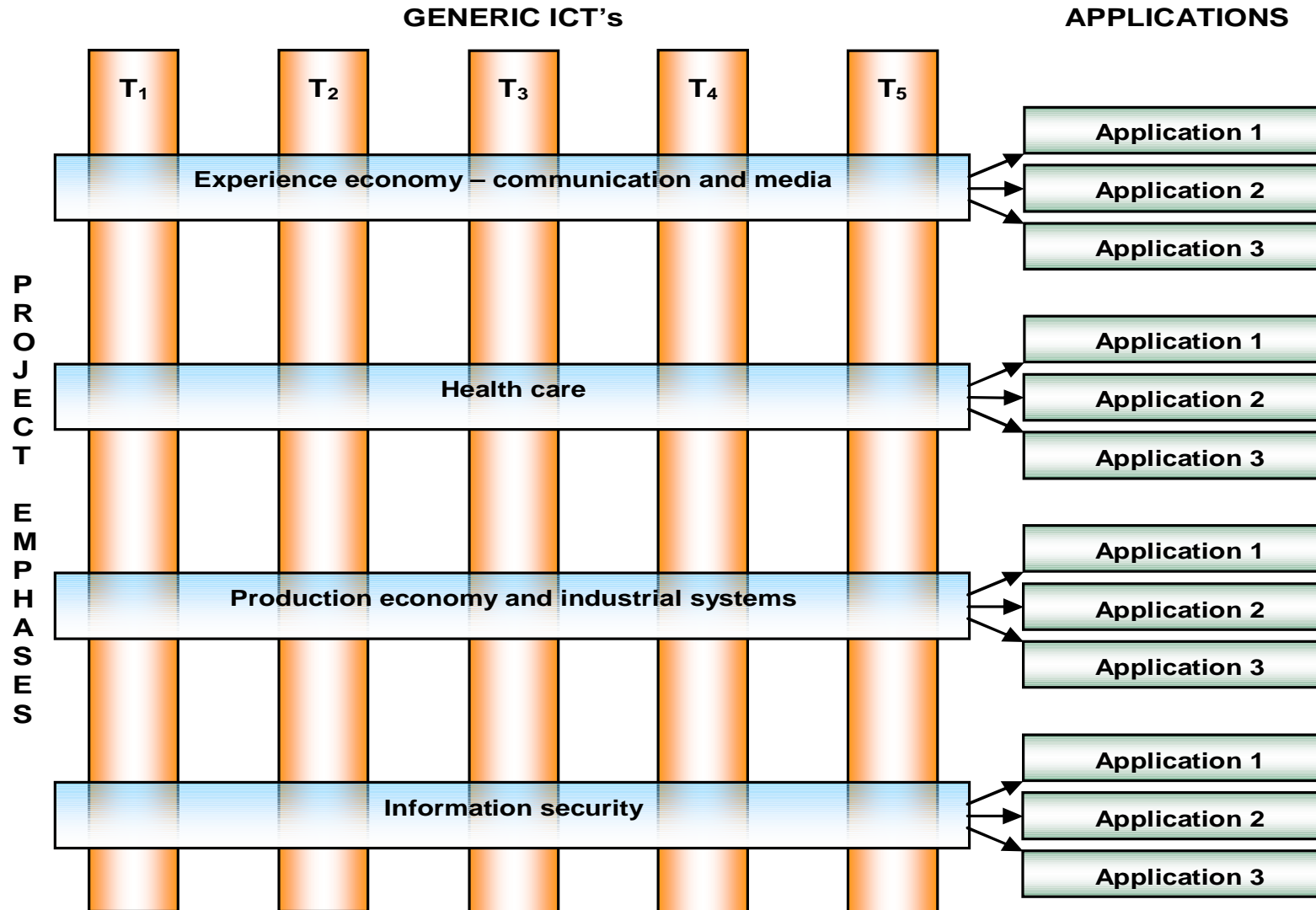
Convergence and compatibility of modular product groups – heterogeneous networks



2000

2015

# Generic ICT's and applications



# Applications - group 1

Experience economy – comm. and media	Health care	Production economy and industrial systems	Information security
<p><b><u>Tailored service applications</u></b></p> <ul style="list-style-type: none"> <li>• <b>Personal information control:</b> communication and identity independent of the device</li> <li>• <b>Digital identity</b></li> <li>• <b>Personal media production:</b> personal value chain, real time production</li> <li>• <b>Community based information solutions</b></li> <li>• <b>Bi-directional mediaservices:</b> informing, teaching, "users as innovators"</li> </ul> <p><b><u>Network applications</u></b></p> <ul style="list-style-type: none"> <li>• <b>Content delivery through networks:</b> peer to peer</li> <li>• <b>Compatibility of networks</b></li> <li>• <b>Intelligent information search and organization techniques:</b> e.g. based on neural networks</li> </ul> <p><b><u>Voice and language oriented applications</u></b></p> <ul style="list-style-type: none"> <li>• <b>Applications of language technologies</b></li> <li>• <b>Multilingual solutions</b> (traveling, informing, speech recognition)</li> </ul> <p><b><u>Ubiquitous technologies</u></b></p> <ul style="list-style-type: none"> <li>• <b>Ubi-intelligence:</b> techniques of virtual presence</li> <li>• <b>Ambient Design:</b> multiple senses, marketing</li> </ul>	<p><b><u>Personal healthcare, "home medicine" (8)</u></b></p> <ul style="list-style-type: none"> <li>• <b>Gathering and analysis of information:</b> diaries, training calendar, prevention (6)</li> <li>• <b>Systems that monitor and assist elderly people living in homes:</b> controlling the changes in health, monitoring day-to-day activities (2)</li> <li>• <b>Technology assisted training:</b> modular technologies</li> <li>• <b>Vital sign data capture / collection</b></li> </ul> <p><b><u>Diagnostic and treatment applications</u></b></p> <ul style="list-style-type: none"> <li>• <b>General ICT applications in health:</b> pattern recognition, ubicomputing, mobility, hybrid media, dosing...</li> <li>• <b>Nano / picosensors</b></li> <li>• <b>ICT based diet and nutrition systems</b></li> <li>• <b>Chip laboratories</b></li> <li>• <b>Virtual diagnostics, distance diagnostics (2)</b></li> </ul> <p><b><u>Medical information processing</u></b></p> <ul style="list-style-type: none"> <li>• <b>eHealth &amp; ePrevention:</b> knowledge based, data warehouses, data mining / drilling</li> <li>• <b>National health databases</b></li> </ul>	<p><b><u>Industrial production applications</u></b></p> <ul style="list-style-type: none"> <li>• <b>Sensor technologies</b></li> <li>• <b>Applications of RFID</b> (radio frequency identification)</li> <li>• <b>IP- based (Internet Protocol) systems</b></li> <li>• <b>Learning devices:</b> self-monitoring of machines</li> <li>• <b>Fully automatic factories</b></li> <li>• <b>Minimization of production related environmental hazards</b></li> </ul> <p><b><u>Industrial information processing</u></b></p> <ul style="list-style-type: none"> <li>• <b>Information and data transfer in production systems:</b> man2 man, man2machine, machine2man</li> <li>• <b>General information gathering:</b> technology, markets, financing...</li> </ul> <p><b><u>Control of the logistic chain</u></b></p> <ul style="list-style-type: none"> <li>• <b>Gathering and analyzing the process data in real time</b></li> <li>• <b>Quality control</b></li> <li>• <b>Mobile and automatic maintenance and repair</b></li> </ul>	<p><b><u>Confidentiality in general</u></b></p> <ul style="list-style-type: none"> <li>• <b>Identity management</b></li> <li>• <b>Dynamic privilege management</b></li> <li>• <b>Integrity</b></li> <li>• <b>Long term preservation</b></li> <li>• <b>Non-reproducing technologies</b></li> </ul> <p><b><u>Security in environments and networks</u></b></p> <ul style="list-style-type: none"> <li>• <b>Automatic control in open spaces:</b> e.g. figure identification for cameras</li> <li>• <b>Invisible information security:</b> ad hoc, availability, PMAC + PMF, mobility...</li> </ul> <p><b><u>Biometrics</u></b></p> <ul style="list-style-type: none"> <li>• <b>Biometric tags</b></li> <li>• <b>Security of biometric information:</b> prevention of malpractices (2)</li> </ul>

# Applications - group 2

Experience economy – comm. and media	Health care	Production economy and industrial systems	Information security
<p style="text-align: center;"><u>Hybrid media (1)</u></p> <ul style="list-style-type: none"> <li>• <b>Combinations of printed and electronic media:</b> e.g. 2D code that is readable via camera mobile phone which connects the mobile phone to database</li> <li>• <b>Intelligent paper and intelligent package</b></li> <li>• <b>“Talking paper”:</b> sound + still image</li> <li>• <b>Tailored news:</b> printed either to communication device or local printing service (communal printing) (2)</li> </ul> <p style="text-align: center;"><u>Communication services</u></p> <ul style="list-style-type: none"> <li>• <b>Global media network:</b> you can see your favourite show anywhere</li> <li>• <b>Digital me</b></li> <li>• <b>Mobile ID-TV</b></li> <li>• <b>Group phone calls</b></li> <li>• <b>Free services with different devices (2)</b></li> <li>• <b>Expression and performance of civil rights via networks:</b> voting, taxes (2)</li> </ul> <p style="text-align: center;"><u>Voice and language oriented applications</u></p> <ul style="list-style-type: none"> <li>• <b>Simultaneous translation services (4)</b></li> </ul> <p style="text-align: center;"><u>Technical solutions</u></p> <ul style="list-style-type: none"> <li>• <b>Printable electronics</b></li> <li>• <b>Silent computer and digital technology:</b> without background noise or humming</li> <li>• <b>Home robots</b></li> <li>• <b>RFID tags</b></li> </ul> <p style="text-align: center;"><u>Virtual environments</u></p> <ul style="list-style-type: none"> <li>• <b>Home virtual environments</b></li> <li>• <b>Enhanced reality (1)</b></li> <li>• <b>Multisensory environments and virtual learning platforms</b></li> </ul> <p style="text-align: center;"><u>Entertainment (2)</u></p> <ul style="list-style-type: none"> <li>• <b>Games</b></li> <li>• <b>“Edutainment”</b></li> <li>• <b>Games based on mobile positioning</b></li> </ul>	<p style="text-align: center;"><u>“Home medicine”</u></p> <ul style="list-style-type: none"> <li>• <b>ICT home treatment:</b> free self service systems, health centre and pharmacy systems, additional services, “mobile service and competition” automata (5)</li> <li>• <b>Adaptive, intelligent home:</b> conditions adapt to inhabitants’ health conditions</li> <li>• <b>“Every home” service robots</b></li> <li>• <b>Systems that monitor patient’s condition in real time:</b> especially in the case of emergency (elderly people etc.), real time diagnostics</li> </ul> <p style="text-align: center;"><u>Assisting and socially activating applications (5)</u></p> <ul style="list-style-type: none"> <li>• <b>Brain interface:</b> for the seriously disabled</li> <li>• <b>Basic technology, tailored interfaces</b></li> <li>• <b>Intelligent user centred services for the senior housing:</b> technologies that activate everyday social contacts</li> </ul> <p style="text-align: center;"><u>Applications for the control of allergies (4)</u></p> <ul style="list-style-type: none"> <li>• <b>Prevention</b></li> <li>• <b>Diagnosis</b></li> <li>• <b>Self treatment</b></li> </ul> <p style="text-align: center;"><u>Documentation applications</u></p> <ul style="list-style-type: none"> <li>• <b>Documentation in the doctor’s reception:</b> records of the doctor’s instructions in the net, crisp instructions in the net and as a print (1)</li> </ul>	<p style="text-align: center;"><u>Industrial production applications</u></p> <ul style="list-style-type: none"> <li>• <b>Mass tailored production lines:</b> on demand systems, no storages (2)</li> <li>• <b>New interfaces:</b> tangible, wearable, embedded (4)</li> <li>• <b>Multi-sensory process control and robotics:</b> input / output (1)</li> <li>• <b>Applications enabling telework and mobile work (1)</b></li> <li>• <b>Mobile maintenance systems (1)</b></li> <li>• <b>Automatic reasoning systems:</b> error seeking, production optimization</li> <li>• <b>Environmental measuring systems and services:</b> security, “emission trading” and emission control (2)</li> </ul> <p style="text-align: center;"><u>Convergence of information systems</u></p> <ul style="list-style-type: none"> <li>• <b>Convergence of information:</b> the performing, controlling and packing of information is combined via sensors, then combined information moves to be compared with planned information (1)</li> <li>• <b>Convergence of all of the life cycle systems (3)</b></li> </ul> <p style="text-align: center;"><u>Simulation applications</u></p> <ul style="list-style-type: none"> <li>• <b>Simulation of micro level phenomena in different fields :</b> electronics, nanotechnology, fabrication of medicines, material technologies (2)</li> <li>• <b>Combination of 3D visualization and simulation</b></li> </ul>	<p style="text-align: center;"><u>Confidentiality in general</u></p> <ul style="list-style-type: none"> <li>• <b>IPR in the industrial information processes:</b> rights to use, billing, software licences like in the entertainment (2)</li> <li>• <b>Animated agents that endorse the trust of the users</b></li> <li>• <b>Virus-free “internet” (4)</b></li> </ul> <p style="text-align: center;"><u>Security in environments and networks</u></p> <ul style="list-style-type: none"> <li>• <b>Distributed networks:</b> important information is directed to different network</li> </ul> <p style="text-align: center;"><u>Biometrics</u></p> <ul style="list-style-type: none"> <li>• <b>Bioidentifiers:</b> reliable electronic system, bioidentity (7)</li> </ul>



# Identified generic technologies

Group 1 - generic technologies	Group 2 - generic technologies
<p style="text-align: center;"><u>Evolving network concepts</u></p> <ul style="list-style-type: none"> <li>•Personal Area Network</li> <li>•Ad Hoc -networks</li> <li>•Ambient Intelligence: urban environment as a experiment environment, security, entertainment, informing</li> </ul> <p style="text-align: center;"><u>Network technologies</u></p> <ul style="list-style-type: none"> <li>•Wireless applications: last mile, terminals, gadgets</li> <li>•Semantic networks: distribution of contents</li> </ul> <p style="text-align: center;"><u>New media solutions</u></p> <ul style="list-style-type: none"> <li>•Cross media: multiple channels, interoperability</li> <li>•Printed codes: intelligent paper, matrix codes</li> </ul> <p style="text-align: center;"><u>New technological solutions</u></p> <ul style="list-style-type: none"> <li>•3D avatars</li> <li>•Wearable computing</li> </ul>	<p style="text-align: center;"><u>Mobility</u></p> <ul style="list-style-type: none"> <li>•Systems</li> <li>•Terminals</li> <li>•Services</li> <li>•WIFI</li> <li>•3G</li> <li>•Network technologies</li> <li>•Wireless wideband</li> <li>•Positioning technologies</li> </ul> <p style="text-align: center;"><u>Intelligent systems</u></p> <ul style="list-style-type: none"> <li>•Sensors technologies and networks</li> <li>•RFID</li> <li>•Systems that measure the reliability and value of information</li> <li>•Flexible, distributed architectures</li> <li>•Visualisation techniques of information semantics</li> <li>•Semantic web</li> <li>•Multitechnical modelling design</li> </ul> <p style="text-align: center;"><u>Interfaces</u></p> <ul style="list-style-type: none"> <li>•Flat</li> <li>•Flexible</li> <li>•3D</li> <li>•Systems that endorse communality and social interactions</li> <li>•User modelling in real time</li> <li>•Voice controlled systems &gt; producing, understanding and interpretation</li> </ul>

# SWOT - results of the group 1

Strengths	Weaknesses
<p style="text-align: center;"><b><u>State functions</u></b></p> <ul style="list-style-type: none"> <li>•State subsidies: economic and political</li> <li>•State is an advanced regulator</li> <li>•ICT infrastructure</li> </ul> <p style="text-align: center;"><b><u>Corporations and market functions</u></b></p> <ul style="list-style-type: none"> <li>•Advanced markets: new products are easy to pilot in the consumer markets</li> <li>•Advanced corporations in many sectors</li> <li>•IPR/patent base</li> </ul> <p style="text-align: center;"><b><u>Universities, competencies and research functions</u></b></p> <ul style="list-style-type: none"> <li>•Cooperation between corporations and universities</li> <li>•Competencies in mobile technologies and industries</li> <li>•Competencies in RF and communication technologies</li> <li>•High standards of applied research</li> <li>•Strong R&amp;D system</li> <li>•Education system can be integrated with the competencies needed in information technologies &gt; navigation competencies, control of health information</li> </ul> <p style="text-align: center;"><b><u>Cultural and regional functions</u></b></p> <ul style="list-style-type: none"> <li>•Municipal communes are advanced and ready to reform</li> <li>•People are willing to try new things</li> <li>•People obey authorities</li> <li>•People are educated and all-around education is high</li> <li>•Positive attitudes towards technologies</li> </ul>	<p style="text-align: center;"><b><u>State functions</u></b></p> <ul style="list-style-type: none"> <li>•Orientation towards regional development: one should not endorse national solutions</li> <li>•Lack of capital and finances</li> <li>•Tax incentives</li> </ul> <p style="text-align: center;"><b><u>Corporations and market functions</u></b></p> <ul style="list-style-type: none"> <li>•The chain between ideas and commercial solutions is leaking (2)</li> <li>•Small country, small resources, small markets: should one have pilot customers abroad?</li> <li>•Too little venture capital funding to improve new businesses, lack of risk funding</li> <li>•One should master the ways to standardize things</li> </ul> <p style="text-align: center;"><b><u>Universities, competencies and research functions</u></b></p> <ul style="list-style-type: none"> <li>•Abilities to utilize new technologies</li> <li>•The level of basic research in technical universities</li> <li>•Convergence of the information systems is slow</li> </ul> <p style="text-align: center;"><b><u>Cultural and regional functions</u></b></p> <ul style="list-style-type: none"> <li>•Technological orientation &gt; the social dimension is often forgotten</li> </ul>
Opportunities	Threats
<p style="text-align: center;"><b><u>State functions</u></b></p> <ul style="list-style-type: none"> <li>•Attractiveness: the marketing of Finland as internationally interesting research and development field</li> <li>•Developing new ways of acting: from the regional development orientation towards "open innovation processes"</li> </ul> <p style="text-align: center;"><b><u>Corporations and market functions</u></b></p> <ul style="list-style-type: none"> <li>•Strong investments to certain competence areas</li> <li>•Proliferation of business orientation in ICT's</li> <li>•New products and new markets</li> <li>•New mobile services as support system for health care</li> <li>•Direct orientation towards international markets</li> <li>•Combinations of sciences</li> </ul> <p style="text-align: center;"><b><u>Universities, competencies and research functions</u></b></p> <ul style="list-style-type: none"> <li>•Coming revolutions in industrial automation</li> </ul>	<p style="text-align: center;"><b><u>State functions</u></b></p> <ul style="list-style-type: none"> <li>•Weakening of the sovereignty</li> <li>•Lessening of the resources and finances</li> </ul> <p style="text-align: center;"><b><u>Corporations and market functions</u></b></p> <ul style="list-style-type: none"> <li>•International competition is tightening: Finland moves slowly, language differences, remote location, image</li> <li>•Rigidities in the cooperation of different sectors and branches</li> <li>•Multinational sectors dictate the directions</li> </ul> <p style="text-align: center;"><b><u>Universities, competencies and research functions</u></b></p> <ul style="list-style-type: none"> <li>•Not just production, but also research and development moves to Asia</li> </ul> <p style="text-align: center;"><b><u>Cultural and regional functions</u></b></p> <ul style="list-style-type: none"> <li>•Difficulties in giving up the old</li> <li>•Distribution of competencies to regions</li> <li>•Diminishing of the autonomous thinking</li> <li>•Parochialism: things should be seen in global perspective</li> </ul>

# SWOT - results of the group 2

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>•Strong competencies in the mobile sector &gt; strong spearhead sectors</li> <li>•Commitment to the development of the ICT applications in the well being sector("one must do something") &gt; the point was criticized in the discussion</li> <li>•Application oriented culture (R&amp;D)</li> </ul>	<ul style="list-style-type: none"> <li>•Gaps in the competencies &gt; technical competencies, for example new screen technologies</li> <li>•Small population &gt; the need to focus research and education, the need to select the aims</li> <li>•Finnish can handle technology and design, but others take the business</li> <li>•Undeveloped risk financing</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>•Potential new export products and services &gt; e.g. applications of the well being sector</li> <li>•Cost effective data transmission solutions in the sparsely populated areas</li> <li>•Mobile application markets in the Third World &gt; e.g. connected to energy systems</li> </ul>	<ul style="list-style-type: none"> <li>•China &amp; India</li> <li>•"New illiteracy"</li> <li>•One cannot find risk financing for the development of added value applications</li> <li>•Consumers do not feel that the value of applications are worth paying</li> <li>•ICT applications demand stable development, the benefits of the ICT applications fade in global risk situations</li> </ul>

# Conclusions

- Challenges:
  - How to compare and combine the results of the national SWOT's? (metareport)
  - How to connect the results of the SWOT's and scenario workshop to the roadmapping workshop process?