Network of ICT
experienced organisations,
sharing experiences, knowledge
and supporting SMEs

Grant Agreement No.225004

Join The Network

3 Microsystems

a. Smart Microbattery

b. Microsystems Integration AIS

c. Cold Trace

d. Hydrogen storage based on hybrid nanocomposite

e. Vacuum machine for 3 layer deposition

PROPOSAL/CONTRACT N.: 225004

PROJECT ACRONYM: NET-SHARE

PROJECT FULL TITLE: NETWORK OF ICT EXPERIENCED ORGANIZATIONS, SHARING EXPERIENCES, KNOWLEDGE AND SUPPORTING SME'S.

INSTRUMENT: ICT PSP

DURATION: 36 MONTHS

DISSEMINATION LEVEL: PUBLIC

PROJECT COORDINATOR ORGANISATION NAME: Inovamais, S.A.; www.inovamais.pt

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PARTNER NAME: INOVA+

CONTACT PERSON: MIGUEL SOUSA

GOOD PRACTICE NAME: DEVELOPING ENHANCED SENSING AND COMMUNICATION CAPABILITY ON AN AUTONOMOUS SMART MICRO SYSTEM POWERED BY A NEW 3D HIGH CAPACITY INTEGRATED MICROBATTERY

SOURCE OF THE GOOD PRACTICE: E-STARS PROJECT [WWW.ESTARS-PROJECT.EU

TARGET GROUP: SMES

DATE: 12 OCTOBER 2009

http://www.estars-project.eu

NEST 2009

ICT Project E-STARS
[ICT-223927]

European Commission

E-STARS project aims at developing enhanced sensing and communication capability on an autonomous smart micro system powered by a new 3D high capacity integrated micro battery. According to the experts, the market of wireless smart sensors should generate revenues more than 5 billions euro in 2011. Faced with such future technical and economical impact, it is of strategic importance to maintain the Europe's leadership in this domain.

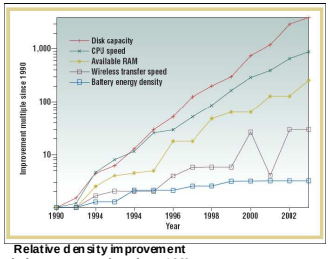
Considered as an R&D topics of high relevance in such domain (EpoSS Strategic Research Agenda), the energy-management, scavenging and storing techniques aspects will be particularly investigated in the E-STARS project. 3D architecture micro batteries will increase by 5 to 10 the battery capacity (from 100 µA/cm² to 1000 µAh/cm²) and power (from 5 mW/cm² to 50 mW/cm²) compared to traditional solutions. To do so, the consortium will investigate completely new deposition processes for micro battery layers such as Chemical Vapor Deposition (CVD), electro spraying and electro deposition in order to obtain 3D higher aspect ratios.

Outline

- Background and state of Art
- Scope
- Consortium
- Project flow chart and Work Packages
- Timing and deliverables
- Systems requirements
- Results
- Summary

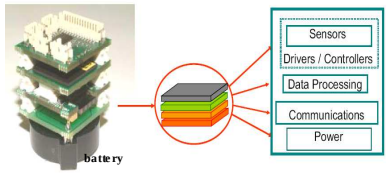
Apresentation Structure

Background

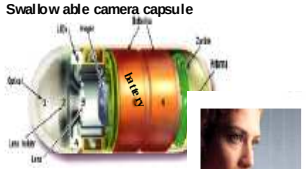


Relative density improvement in laptop computing since 1990

Wireless sensor module



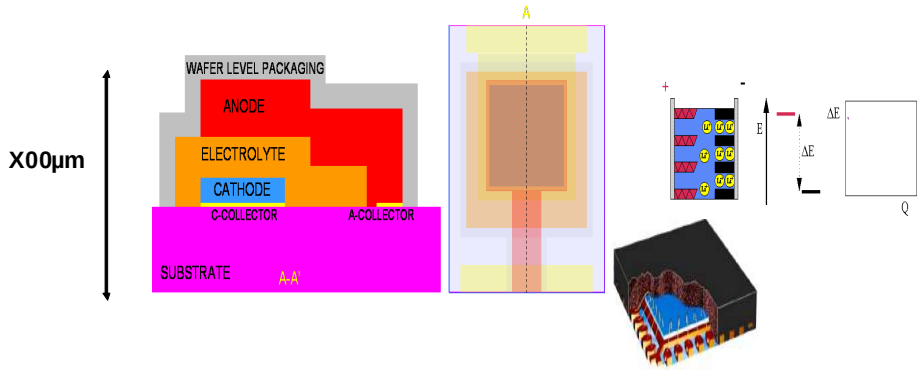
Swallowable camera capsule



European Commission

- Applications convergence ==> functions integration (passive, sensor, MEMs, transceive, microsystems);
- The size of such microsystem and micromachining shrink year over year;
- Conventional energy storage devices (Battery, super cap) do not scale down sufficiently to meet the need of micro electronics system;
- Solid state Thin Film Energy Cell built from semiconductor process offers a revolutionary way of storing energy for micro power devices;

State of Art : Solid state Thin Film Energy Cell



State of Art: Solid state thin film energy cell

- Lithium battery
  - Physics is the same to classical lithium battery
- Solid state battery
  - No liquid: Solid electrolyte with Lithium
  - High temperature capability (lead free solder reflowable)
- Thin film battery
  - Overall thickness : x00µm
  - Flexible
  - Embeddable
  - manufactured with thin film deposition equipments
- High life time and reliability

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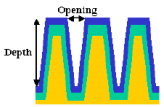
Scope: from 2D toward 3D

Scope: from 2D toward 3D

	State of Art	E-Star objective
Architecture		
Battery Capacity	100µAh/cm²	500 to 1000µAh/cm²
Battery power Capability	5mW/cm²	25 to 50mW/cm²

Breakthrough

- Increasing the capacity density by texturing the substrate (3D);
- Moderate ratio (2:1): Improve state of Art PVD process to accelerate 5x the deposition rate and to reach 50% of minimum coverage;
- High aspect ratio (10:1) represents the breakthrough of the E-stars project;
- Investigate alternative deposition techniques

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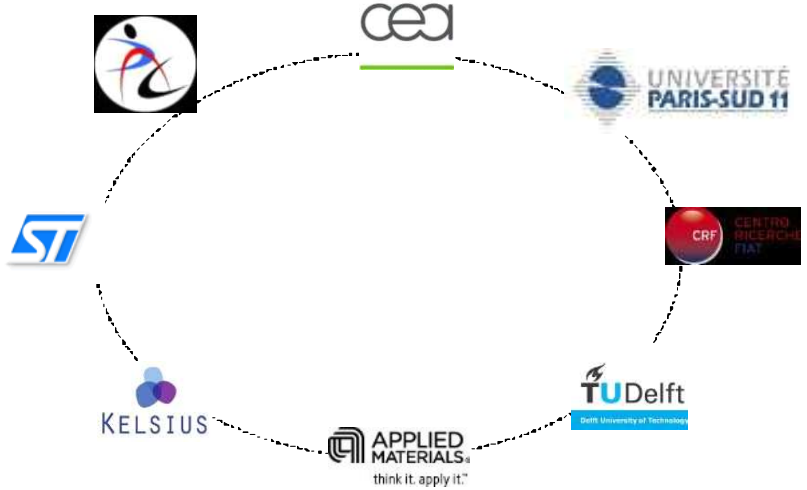
The Consortium Apresentation

Consortium



European Commission

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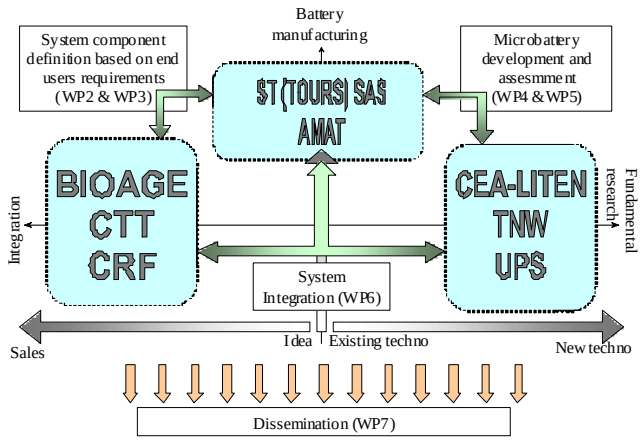
Work packages and program structure



Work packages and program structure:

- WP1: Program mgt;
- WP2:Requirements definition;
- WP3:System architecture design;
- WP4:Micro battery layers technology development;
- WP5: Assessment of the battery
- WP6: System integration
- WP7 : Dissemination and exploitation

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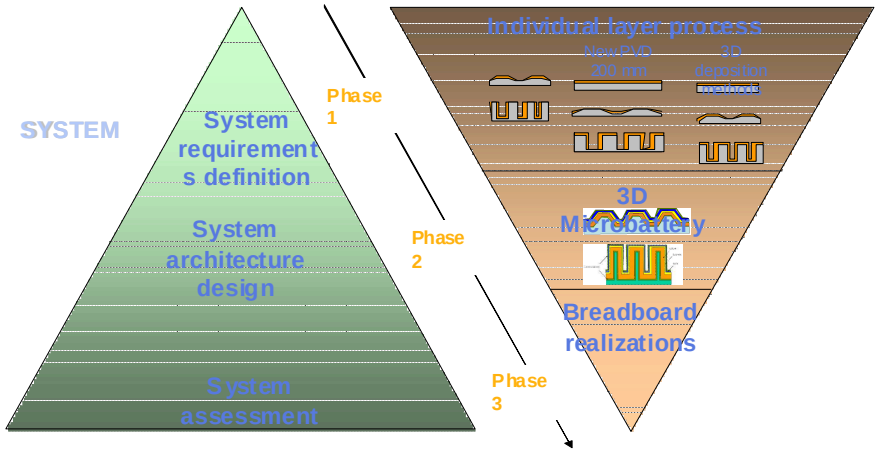
Phasing



Phasing description

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WP2: System requirements CRF

Centro Ricerche FIAT S.C.p.A.

E_STARS Demonstrators

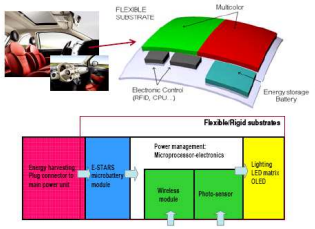
Autonomous Lighting systems

•LED matrix

Autonomous LED module composed by several LED (i.e. red, yellow, green) is proposed.

•OLED

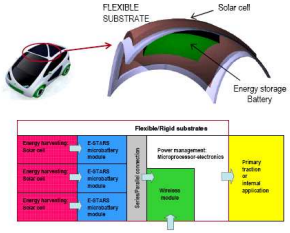
OLED display composed by icons on suitable substrate.



Solar cell

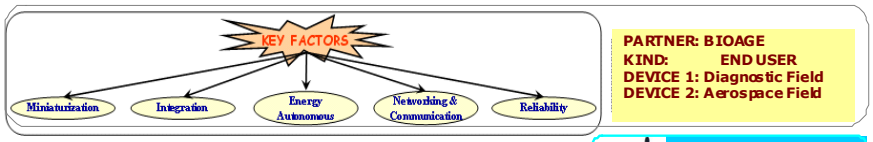
The proposed PV module is based on Polycrystalline Silicon with average efficiency of around 13%. Nevertheless Monocrystalline Silicon based solar cells will take in consideration due to higher average efficiency (up to 15%).

Assembling single solar cells a semi-rigid system is proposed in order to develop PV energy roof's car.



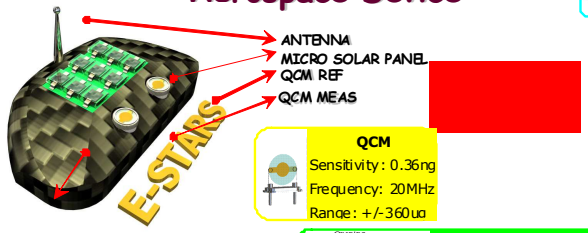
Systems requirements Bioage

WP2: system requirements Bioage



PARTNER: BIOAGE
KIND: END USER
DEVICE 1: Diagnostic Field
DEVICE 2: Aerospace Field

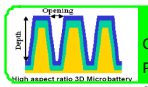
Aerospace Device



EXAMPLE OF APPLICATIONS

Characterization of Dust Flux of Atmosphere
Characterization of Comet Tail
Characterization of Spacecraft "Outgas"
Characterization of Spacecraft Contamination
Characterization of Interstellar Material

QCM
Sensitivity: 0.36ng
Frequency: 20MHz
Range: +/-360ua



3D BATTERY
Capacity: 1000 ua/cm2
Power: 50 mW/cm2

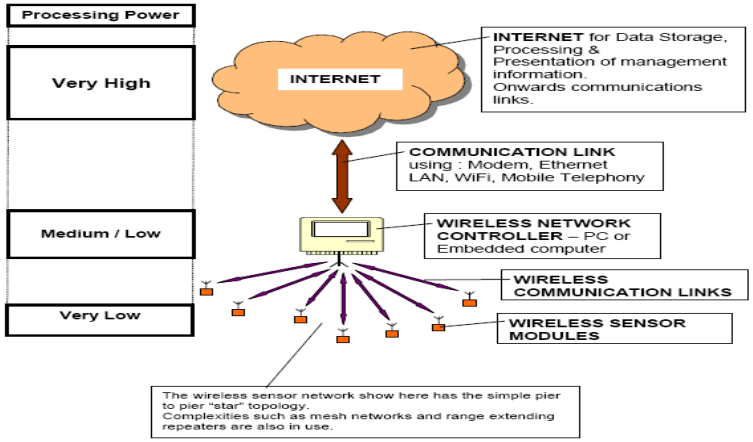
N.B.: E-STARS final goal

RF RADIO-NETWORK
Frequency ISM 2.4GHz
RF Data Rate: 250.000 bps
Standard: IEEE 802.15.4(ZigBee)

MICRO SOLAR CELL
Dimensions: 3mm x 3mm
Weight: 0.1 gr
Max Power: 0.82 mW

European Commission

WP2: System requirements CTT/Kelsius



Time/temperature/localization monitoring – bulk goods in transit

Solutions based on mobile telephone are costly for all but the largest loads. Tariff free wireless sensors offer an appropriate solution.

- Module travels with bulk goods package.
- Data loggin is continuous.
- Wireless sensor periodically polls for data connection.
- Typically data is transferred at depot.
- Vibrational energy harvesting + E-STARS battery provides power source.

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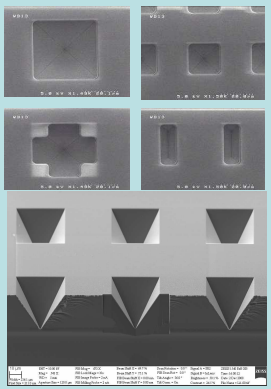
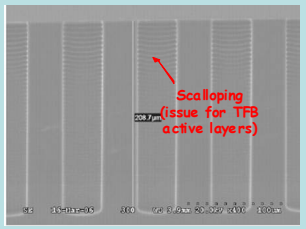
Substrate Texture

Substrate texturation

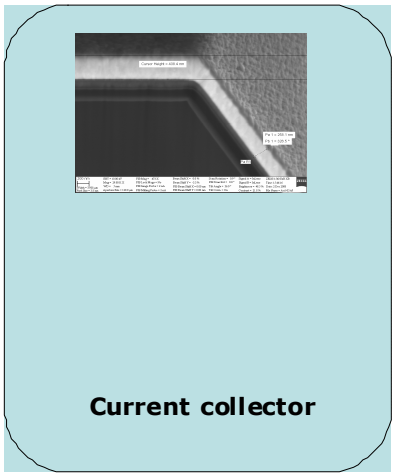


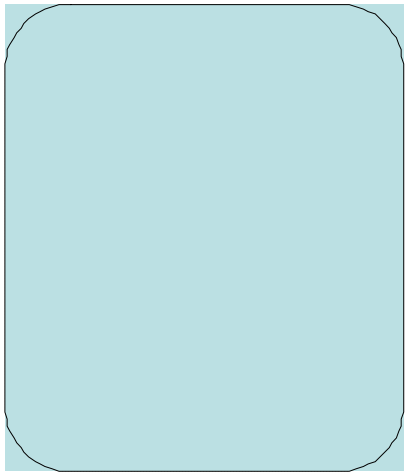
Low Aspect ratio substrates



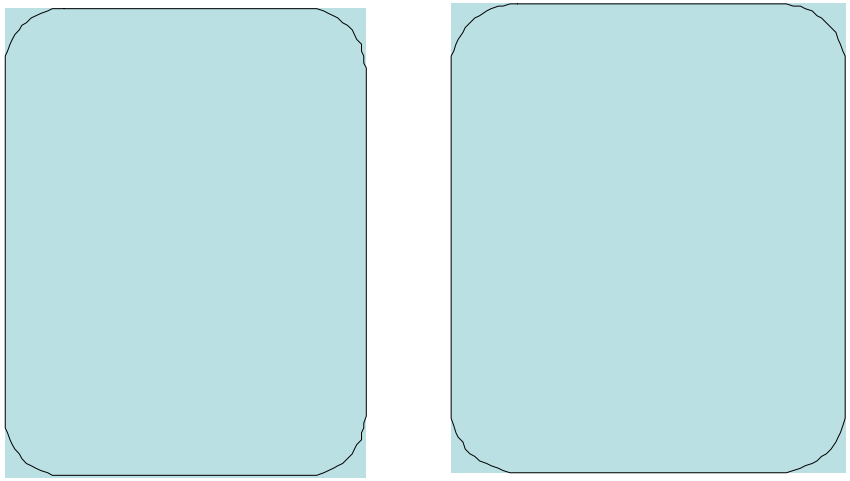
High Aspect ratio substrates

PVD deposition on textured substrates





Alternative deposition method



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Alternative deposition method

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Summary

- E-STARS project develops next generation of solid state microbattery through 3D architecture
- Complementary consortium from end users to technology providers

- Do not hesitate to contact us!

Summary: E-stars project develops the next generation of solid state micro battery 3D architecture.

PROPOSAL/CONTRACT N.: 225004

PROJECT ACRONYM: NET-SHARE

PROJECT FULL TITLE: NETWORK OF ICT EXPERIENCED ORGANIZATIONS, SHARING EXPERIENCES, KNOWLEDGE AND SUPPORTING SME'S.

INSTRUMENT: ICT PSP

DURATION: 36 MONTHS

DISSEMINATION LEVEL: PUBLIC

PROJECT COORDINATOR ORGANISATION NAME: Inovamais, S.A.; www.inovamais.pt

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PARTNER NAME: INOVA+

CONTACT PERSON: MIGUEL SOUSA

GOOD PRACTICE NAME: AIS & SYSTEMS INTEGRATION

SOURCE OF THE GOOD PRACTICE: [HTTP://WWW.AIS-CO.COM/)

TARGET GROUP: SMES

DATE: 11 JUNE 2009

AIS
&
Systems Integration

Systems Integration

☞The activity of designing, planning, procuring, and constructing a fully operational computer based system. The system may be a network, single-user workstation, auto ID based, financial or operations oriented, or

whatever is required to attain the objectives.

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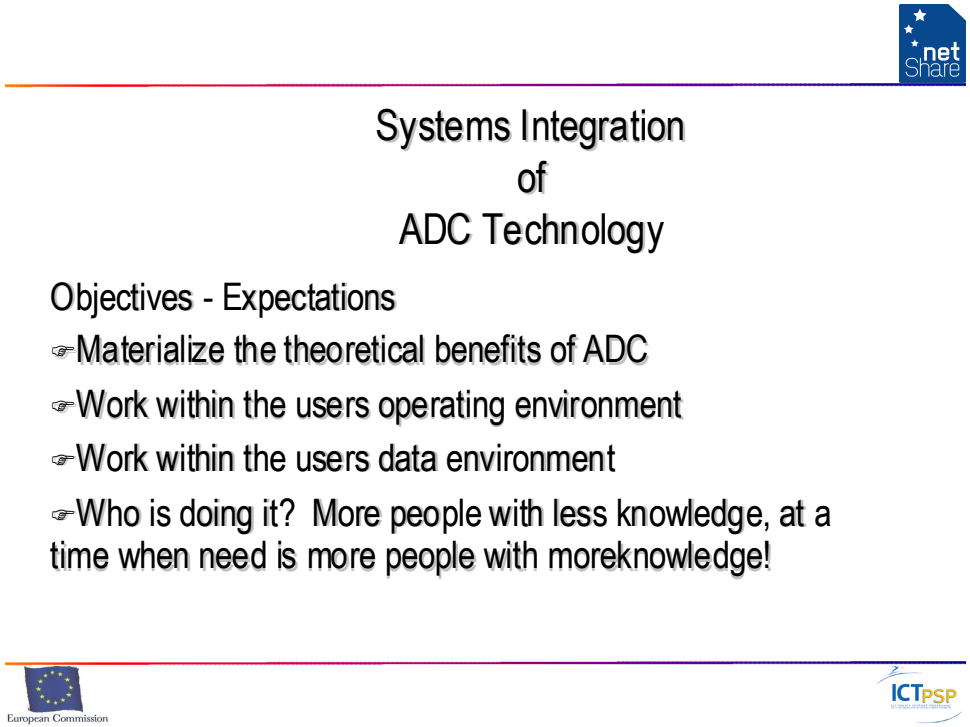

The objectives are to materialize the theoretical benefits of ADC, to work within the users date environment, to work within the users operating environment.

ADC Systems Integration Toolset

- ADC Technical Knowledge
  - Cross-technology
  - Scanalyst Bar Code Quality Systems
  - Depth – especially Bar Code Printing - Scanning
- ADC Standards Knowledge
  - Industry specific
  - Depth- i.e. RF and 2D
- Systems Design Expertise
  - Functional Specification
  - Operator Interface Design – Human Factors
  - Other similar cases
- Access to assistance from experts

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ADC Systems Integration Toolset (nuts and bolts)

- Development Language Expertise
- WEB Development - i.e. ASP, .NET
- Computer Platform Knowledge
- Data and inter-process Communications Knowledge
  - RS232 Breakout box for comm. analysis
  - Terminal Program
  - Third party interface tools for legacy systems
  - Terminal clients i.e. Citrix, MS Terminal Server, Browsers to access mainframe systems

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ADC Systems Integration Toolset (vision)

- Wireless strategy for mobile portable users reflecting
  - –Convergence of data and voice
  - –'Smart' packaging and products
  - –Coming new symbologies and media – cell phones reading barcode
- WEB strategy
- And now – PPC, RIM, Java, etc. for the cell phone, PDA and Blackberry equipped masses

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- And now – PPC, RIM, Java, for the cell phone, PDA and Blackberry equipped masses.

Systems Integration
Elements of Success

- Good Relationships
- Clear Objectives
- Dogged Determination
- Flexibility
- Technical Expertise
- Broad Experience
- Enough vision to know what is important
- Good Relationships (you can't have too much of a good thing)

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Classic vs. Rapid Development

	Classic	*Rapid*
Specification	Detailed – lots of input from all parties	Reflects management objectives
Comprehensive		ting the basic job – 90% or so
Time to visible progress	Long – months to years	Short – days to weeks
Iterations		sumes there will be 'additions' later
Initial cost	Supposed to be Less	Supposed to be More
Long term cost	Supposed to be Less	Supposed to be More
Return on investment	Probably best for stable core corporate functions	Probably best for dynamic business elements

Fast and cheap

or great ROI!

Comparing classic and rapid development we can see thar the last reflecth management objectives, being more specific than the classic that is more detail with a lots of inputs from all the partes; the rapid is more comprehensive becase assumes getting the basic job done only – 90% or so, the time visibility is short (days or weeks), there are more iterations (assumes that will be addictions later), the initial cust is supposed to be more than in the classic development, as the long term cost that supposed to be more than in the other; the retorn of the investiment is probably best for dynamic business elements, and in the classis development this retorn probably is best for stable core corporate functions.

Systems Integration
More Elements of Future Success

- ☞Real strong understanding of real needs
- ☞Use all the tools simultaneously – it not an AIDC system, it is a system that uses all the tools including AIDC
- ☞Get to the right guy/gal – higher is good, but too high is not help – there are a lot of shoppers but less buyers

European Commission

More elements for success of Systems Integration:

· real strong understanding of real needs

· use all the tools simultaneously – it not an AIDC system, it is a system that uses all the tools including AIDS

· get to the right guy/gal – higher is good, but too high is not help – there are a lot of shoppers but less buyers.

Example Projects - AIS

- •Printing system for healthcare
- •2D Print, Certify and Apply System for Automotive
- •2D Verification System
- •Large Corporate Barcode Certification System
- •Six Sigma Analysis of Barcode based shipping system
- •Returnable Container Tracking System – RF Tag
- •Supply Chain Conformance Audit System
- •2D Barcode on Aluminum
- •sCanEasy
- •Electronic Survey System – The Box
- •Electronic commerce – Shipping Conformance System
- •Electronic commerce - Vendor Conformance System
- • 2 Dimensional bar code - Manufacturing Communications
- • Plant Calibration Maintenance System - ISO9000, QS9000
- • Ohio Asset Control System
- • Production Reporting System - non-ADC and ADC
- • Bar Code Print Quality Verification Systems - SCANALYST
- • Group Conference System - CATALYST
- • Fast Food Inventory Control System
- • Warehouse Control System - MRP
- • AIAG Shipping Systems - EDI

European Commission

Some examples projects – AID:

Printing systems for healthcare

- Client – large healthcare manufacturer
- Description – FDA validated label printing system for medical devices
- Elements – printing. ANSI verification, communications, - CFR21 part 11, large rollout at multiple locations
- Current status - early

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2D Print, Certify and Apply System for Automotive

- Client – Automotive Parts Mfg.
- Description – fully automatic parts marking system with 2D -
- Elements – printing digital imaging, SCANALYST, electromechanical controller, communications
- Current – Scheduled for 9 production lines related to 2006 and 2006 ½ models – Installed one +2 – found another 6 for a total of 15 + another 19 +?

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2D Verification System

- Client – Multinational Automotive Airbag Mfg.
- Description – easy to use 2D verification with extensive HELP system
- Elements – digital imaging, SCANALYST, WEB based printing
- Current – Announced as product 30 days ago, reasonable sales just from word of mouth

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Description – easy to use 2D verification with extensive HEPL system

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Large Corporate Barcode Certification System

- Client – large forest products company – $20 bill.
- Description – 100+ plants, 500+ presses equipped with barcode verification automatically feeding a central database for certification and analysis
- Elements – SCANALYST, ODBC, LAN, WAN, 2D, RFID
- Current – 1% completed – 1 plant and 8 presses, many more waiting for us – may take 3-4 years

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Six Sigma Analysis of Shipping System

- Client – large chemical manufacturer
- Description – Determine the impact of applying barcode technology to an existing shipping system as it related to companies Six Sigma objectives
- Elements – Mathematical modeling, Barcode statistics, focus group, Monte Carlo method
- Current – Six Sigma was attainable using barcode

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Elements – Mathematical modelling Barcode statistics, focus group, Monte Carlo method

Current – Six Sigma was attainable using barcode

Returnable Container Tracking System – RF Tag

- Client – large greenhouse operator
- Description – Develop a fully automated system to track plant carts
- Elements – HF RF, antenna design, business system integration, patience
- Current – 5 greenhouses installed and many more to go – adding variations and expanding to vehicles – returnable/expendable networks

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Supply Chain Conformance Audit System

- Client – large health care products company
- Description – Develop a portable audit tool to test all product marking (6000 different items from 7 different locations) for accuracy and against industry labeling standards
- Elements – Verification, Windows CE, UCC stds., Corp. database
- Current – All warehouses checked – found and fixed problems - system is now being used to analyze process capability for further automation.

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Elements – Verification, Windows CE, UCC stds, Corp. database

Current – All warehouses checked – found and fixed problems - system is now being used to analyze process capability for further automation.

2D Barcode on Aluminum - Ink Jet

- Client – large automotive company
- Description – Develop low cost, reliable method of marking aluminum parts for the purpose of tracking through manufacturing useful life (Had not been done successfully!)
- Elements – Ink Jet, imaging and Data Matrix
- Current – It worked! Now planning to take the next steps – maybe a product? (2005 Not Yet!)

European Commission

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Elements – Ink Jet, imaging and Data Matrix

Current – It worked! Now planning to take the next steps – maybe a product? (2005 Not Yet!)

sCanEasy

- Client – internally defined
- Description – Windows CE utility to get barcode data into any Widows CE application without programming – even browsers!
- Elements – Windows CE, cabling, power management
- Current – Active for first few years of CE – now given away free by scanner companies to aid in marketing
- http://www.ais-co.com/ceweb/wedge.htm

sCanEasy

Client – internally defined

Description – Windows CE utility to get barcode data into any Widows CE application without programming – even browsers!

Elements – Windows CE, cabling, power management

Current – Active for first few years of CE – now given away free by scanner companies to aid in marketing

AIAG Shipping Systems - EDI

- Client - IBM CORP for resale
- Description - Use AIAG standards to mark and collect data for IBM Business Systems EDI Module
- Elements - Bar code terminals and software
- PC Communications Module
- Download cradle/recharger
- Standards
- Current – Was one of EDI solutions for IBM - Automotive division closed – application on longer in use

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Warehouse Control System - MRP

- Client - Health Care Products Mfg.
- Description - Record transactions of raw materials in mfg and warehouse movement to insure availability and quality.
- Elements - Bar code terminals and software
  - Bar code printers and software
  - PC Communications Module
  - Transaction Processor
  - Standards.
- Current - 4 installs in Far East and Mgmt change. – as of 2005, there have been at least 4 MRP system changes

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Fast Food Inventory Control System

- ☞Client - Large Fast Food Company
- ☞Description - Replace paper based inventory / reorder system - improved productivity and quality
- ☞Elements - Bar code terminals and software
- PC Communications Module
- Data Base software
- Download cradle/recharger - custom
- Standards
- ☞Current - 2 alpha and 25 beta sites sold – system never fully implemented - note the infamous fastfood 'finger'

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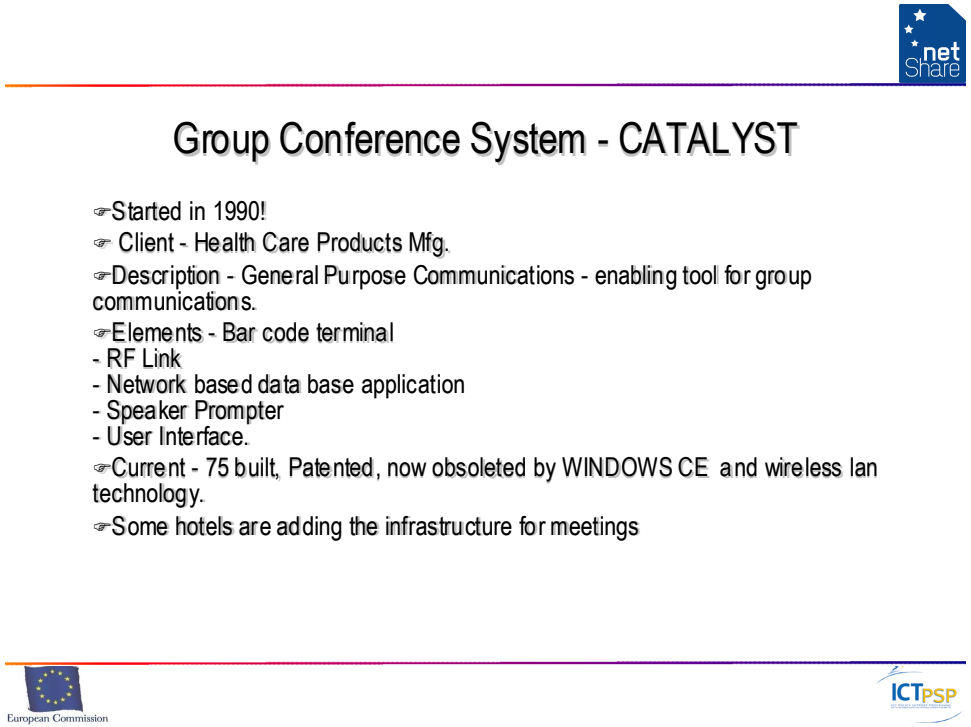

Group Conference System - CATALYST

Started in 1990!

Client - Health Care Products Mfg.

Description - General Purpose Communications - enabling tool for group communications.

Elements - Bar code terminal

- RF Link
- Network based data base application
- Speaker Prompter
- User Interface.

Current - 75 built, Patented, now obsolete by WINDOWS CE and wireless lan technology.

Some hotels are adding the infrastructure for

meetings

Bar Code Print Quality Verification Systems - SCANALYST

- Client - Health Care Products Mfg.
- Description - System to help improve bar code quality and train company personnel
- Elements - Verifier
  - PC Windows Software
  - Standards
  - User Interface
  - SPC, Networks, Futures
  - Languages
- Current – well over 1000 users around the world, has helped industry get proactive toward bar code problems – 10 versions
- http://www.scanalyst.com

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- Languages

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Ohio Asset Control System

- Client - State of Ohio
- Description - basic bar code based asset control
- Elements - Bar code terminals and software
  - bar code printers
  - large data base application
- Current standard - other installs expected

Ohio Asset Control System

Current standard - other installs

expected

Plant Calibration Maintenance System - ISO9000, QS9000

- Client - large paint and glass manufacturer
- Description - Use bar code to help CMMS - QC instrumentation calibration functions
- Elements - Bar code terminals and data base software
  - bar code printers
  - networked data base application
  - portable scanning terminals
- Current - 20 plants completed, QS9000 certification attained, version II completed, project taken internally
- http://www.ais-co.com/calib.htm

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2 Dimensional Bar Code - Manufacturing Communications

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- Description - send manufacturing transactions to mainframe legacy system
- Elements - 2 dimension bar code printers and scanners
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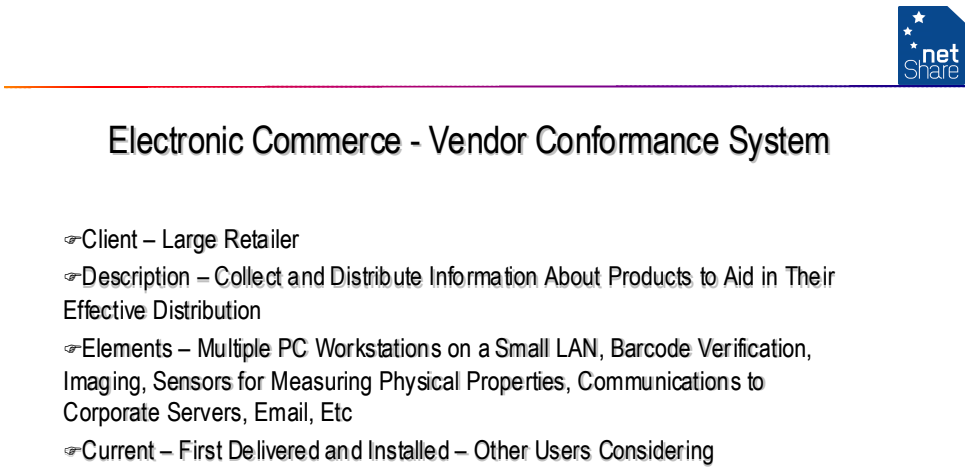

Electronic Commerce - Vendor Conformance System

Client – Large Retailer

Description – Collect and Distribute Information About Products to Aid in Their Effective Distribution

Elements – Multiple PC Workstations on a Small LAN, Barcode Verification, Imaging, Sensors

for Measuring Physical Properties, Communications to Corporate Servers, Email, Etc

Current – First Delivered and Installed – Other Users Considering

Electronic Commerce - Shipping Conformance System

- Client – Large Retail Manufacturer
- Description – Scan as items are packed to insure shipping accuracy
- Elements – Windows CE, scanning, large CE database, uploads
- Current – Developed and not delivered yet – client testing employee incentive programs

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Electronic Survey System – The Box

- Client – Ad agency for cigarette industry
- Description – Event marketing tool that captures consumer data and allows users to distribute sample products legally
- Elements – Windows CE, imaging, barcode scanning, power consumption, signature capture, OCR, simple operator interface
- Current – Developed and 3 delivered – need faster communications to go further

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PROPOSAL/CONTRACT N.: 225004

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INSTRUMENT: ICT PSP

DURATION: 36 MONTHS

DISSEMINATION LEVEL: PUBLIC

PROJECT COORDINATOR ORGANISATION NAME: Inovamais, S.A.; www.inovamais.pt

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PARTNER NAME: INMARK

CONTACT PERSON: YOLANDA URSA

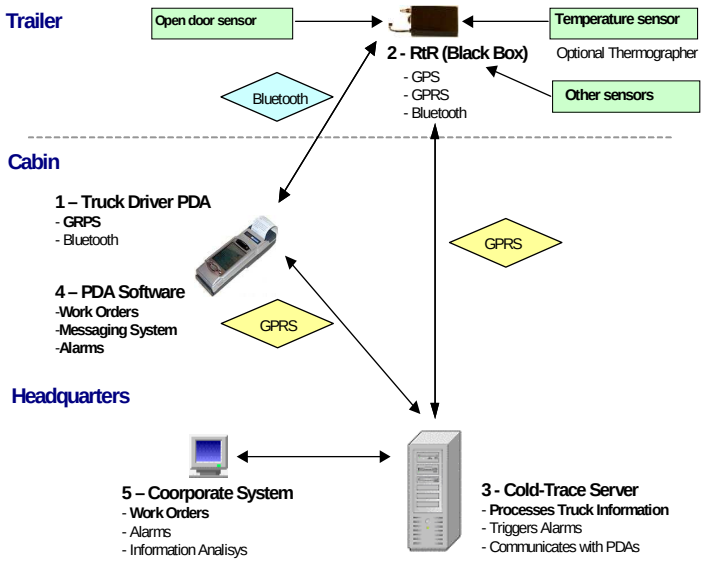
GOOD PRACTICE NAME: COLD-TRACE: A MOBILE-BASED TRACEABILITY SOLUTION FOR FLEET MANAGEMENT

SOURCE OF THE GOOD PRACTICE: COLD-TRACE ETEN PROJECT

TARGET GROUP: ROAD TRANSPORTATION COMPANIES

DATE: 7 NOVEMBER 2008

What is Cold-Trace?



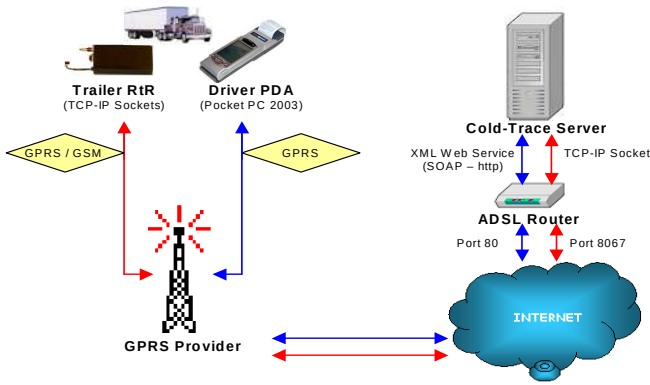
Cold-Trace is a complete and modular traceability solution for fleet management based on mobile communications. The Cold-Trace solution consists of a management tool on board trucks that collects and processes information from a set of sensors distributed throughout the trailer.
Cold-Trace provides:

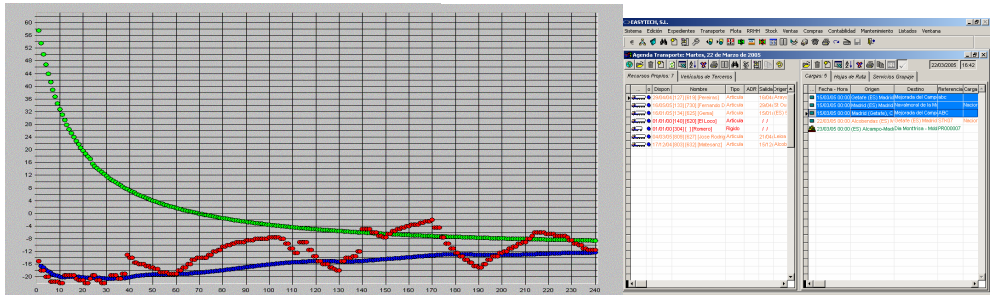
- *Temperature control*
- *GPS tracking system*
- *Work order management system (navigation system, trip expenditures, messaging system…)*

Cold-Trace is the result of a eTEN Market validation project (2005-06)

- Performed by 7 Partners from 3 EU countries (Spain, Ireland and Germany):
  - *INMARK (Co-ordinator), EasyTech, Fraunhofer-IPSI and HFRG*
  - *3 Pilot sites for validation: Disfrimur, Montfrisa and ODT*
  - Validated with 3 target groups: truck drivers, Fleet managers and supervisors/IT managers
- *Result: a cost-effective traceability solution ready to the market*

Rich Functionality Offering





Cold-Trace provides fleet managers with real-time information necessary to ensure the safe, prompt and efficient delivery of goods in the most cost-effective way possible

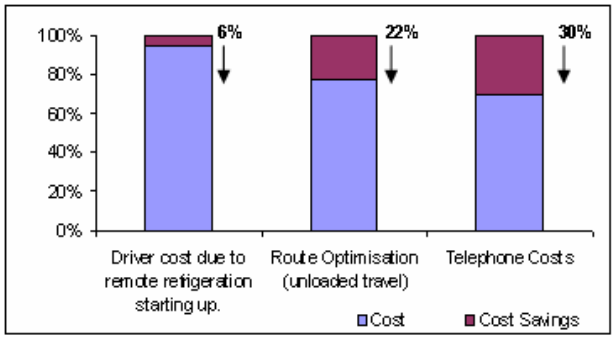
Cold-Trace offers the truck transportation industry and the logistics operator a set of services:

- Temperature monitoring
- Work order management
- Fleet location information (GPS tracking system)
- Expenses management
- Pallet Registry
- Navigational information
- Real time fleet monitoring
- Remote control of refrigerated equipment
- Efficient communication
- System Agenda (system core)
- Alarms system
- Security of trucks loads

How Cold-Trace can benefit business?

"Cold-Trace helps companies to fulfil the requirements of monitoring temperature, driving, food safety and traceability regulations"

- **More efficient Fleet Management**
- **Better Quality Service**
  - **Increased consumer protection**
  - **Increased customer satisfaction**
  - **Improved merchandise security**
- **Route optimisation**
- **Driver performance**
- **Significant cost savings**



Cold-Trace benefits

The Cold-Trace meets real market needs for traceability and cold chain monitoring and offers numerous advantages to road transportation companies, to their customers and to consumers in general:

Traceability: the system offers merchandise traceability and a strict control of the cold chain.
Cost Reduction: tasks requiring much time and effort focus on daily communication between the customer, the fleet manager, and the truck driver. Cold-Trace eliminates many hours of unnecessary work.

Reduction in Phone Calls: many phone calls arise from the driver calling the fleet manager. A frequent case is the truck driver needing instructions on how to get to a certain place. The navigation system provided on the PDA eliminates these phone calls, as it guides the driver to the Work Order collection and delivery points with ease.

Resource Optimization: knowing the exact position of all available trucks, fleet managers can assign new orders to the ideal truck, optimizing resources accordingly.
Increase professionalism: the system has a significant impact on the professionalism and level of quality of the services offered by the transportation company, especially in SMEs, that in the transportation industry often lack an advanced management, control system or ERP.

Cold-Trace best practice

Cold-Trace is being commercialised as modular solutions, designed to suit practically any scenario in the road haulage sector

- **Complete Cold-Trace Functionality**
- **RtR + Fleet Management Software**
- **PDA + Fleet Management Software**
- **With or without the "Cold" part**
- **Connection with Internet Ordering System**

Request Product Information
Please Contact : www.coldroad.es

Selling flexible products and services

A focused sales organisation is commercialising the Cold-Trace solution in Spain, Germany and other European countries:

- A sales organisation with a clear understanding of the road haulage industry and how the technology increase business efficiency.
- To promote and sell Cold-Trace through direct sales and promotions.
- To install and roll out Cold-Trace successfully.
- Strong focus on local partners supported by committed manufacturers.

The key to success of Cold-Trace deployment is primarily found in the selection of the local partners, who will sell and roll-out Cold-Trace products and services in a specific geographical area/market. This requires closeness to end users, good understanding of the road haulage sector and how technology can improve business efficiency.

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INSTRUMENT: ICT PSP

DURATION: 36 MONTHS

DISSEMINATION LEVEL: PUBLIC

PROJECT COORDINATOR ORGANISATION NAME: Inovamais, S.A.; www.inovamais.pt

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PARTNER NAME: INNOVA SPA

CONTACT PERSON: FRANCESCO NIGLIA

GOOD PRACTICE NAME: NANO-TECH INNOVATIVE HYDROGEN STORAGE (NIHS)

SOURCE OF THE GOOD PRACTICE: NANO-SHARE

TARGET GROUP: DOMESTIC AND AUTOMOTIVE FUELL CELLS

DATE: 18/09/2009

Grant Agreement: 225004

Development of a innovative Hydrogen storage based on hybrid nanocomposite materials for Domestic and Automotive sectors

We will describe in detail the process that brought an innovative development technology to an SME belonging to an high-tech cluster, thus to provide more tools and possibilities to improve their business and their market share.

Context: the players

- **Field Associations**: H2IT (Italian Association for Hydrogen and Fuel Cells), EHA (European Hydrogen Association)
- **SMEs**: Domestic and Automotive Fuel Cells sector
  - more than 3870 organizations are involved in this sector and spent an estimated $8.4 billion in 2008. This market is estimated at $8.8 billion in 2009 and expected to increase to $14 billion by 2014, with a compound average growth rate of 9.6%. [source : iRAP report "EN-103: Fuel Cells, Hydrogen Energy and Related Nanotechnology-A Global Industry and Market Analysis."]
- **Technologies owners**: well established corporations, start-up companies, universities, governments at the federal, state and municipal level, cooperative public/private demonstrations, as well as non-profit organizations and laboratories.

The analysed SME cluster belongs to the Domestic and Automotive field and Hydrogen Fuel Cells.

The process has been also supported by field producers (EHA) and local associations H2IT (Italian Association for Hydrogen and Fuel Cells).

The presence of R&D and financing partners has been sought for achieve an effective innovation.

Context: NanoShare S.r.l.

Main Interest:

- Realisation of a reservoir for applications in which the **high volumetric efficiency** and security features are priority.
- Possibility of issuing construction licenses to **third parties** in countries outside Europe, as a result of adequate coverage of **intellectual property** generated.
- According to **European Hydrogen and Fuel Cell Technology Platform** (HFP):
  - **reduce the cost** of fuel cells to a factor of anywhere from 10 to 100;
  - develop technologies for **mass production** of the stack and fuel cell systems;
  - **reduce** the hydrogen **production** and **distribution costs** to a level comparable to fossil fuels.

NanoShare S.r.l. belongs to the most representative cluster identified in the NIHS technology transfer project, its main interest are close to the request of the project.

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Grant Agreement: 225004

Context: NanoShare needs analysis

- **Enforce** its presence in the market for storage systems for hydrogen mainly related to the innovative market for fuel cells.
- **Benefit** from the results of any research conducted during the project about **hybrid nanocomposite material.**
- **Enlarge** its interest in research fields like :
  - **Nanomaterials**, to obtain the optimal solution with regard to the pair matrix polymer nanomaterials;
  - **Mechanical design**, complemented by simulation tools designed to optimize the final layout of the system in terms of weight, strength and stability over time.
- **Expand** its market share.

How we started: survey of NanoShare needs through a technological audit and an explanation of the develop process.

As the develop is one of the most important surveyed issues, we also carried out a SWOT analysis of the applicability and effects of the Innovative Hydrogen Fuel Cell within the business of the SME.

Context: partner search

- **Technology offer scouting:**
  - **Sector:** Automotive and Domestic.
  - **Field:** Hydrogen Fuel Cells.
- **Selection of support company:**
  - Co-funded by public administrations, private companies (Labor, Invent S.A.S., University of Tor Vergata).
- **Why NanoShare?**
  - The NanoShare will therefore be a high-technology company based on years of experience and cutting-edge expertise in nanotechnology, applied to the processes of accumulation of hydrogen.

Step Two: associate all partner as support company to increase know-how of the project itself. It's worth to mentioning the relevant work of NanoShare, thanks to its expertise on main topics and direct transfer of knowledge and technologies.

Context: the NIHS T.T. project

- **Objective:** The project aims to develop, prototype, validate through an actual sized tank, an innovative technology for storing hydrogen reversibly under conditions of temperature and pressure close to real environment, based on hybrid nanocomposite materials consisting of carbon nanostructures in a matrix consisting of a polymer conductor.
- **Application Areas**: As the fuel that makes the reaction easier in fuel cells, can be used in a wide range of applications (Automotive, Local Production, Portable Devices).
- **funding:** Public and private financing through venture capitalism companies

Follow the description of NIHS project and its main features to improve the development of a innovative and nano-materials based tank as Hydrogen storing system.

The process has been extended to three main Application Areas: Automotive, Local Production and Portable Devices.

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Context: the objectives of the project

- Introduction of an innovative storage system in the so-called "**hydrogen economy**".
- **Accumulation** of hydrogen in tanks, made complex by its very low density and high degree of flammability.
- **According to the European Commission**, increase of **functional market** and a subsequent reduction in production costs.

Just to fix the context and the meanings of this activity.

The mean target of this Project is to support SMEs growth through NIHS prototypes.

It gather information about the business modelling framework to analyze the business sustainability; other sub-targets have been:

- To introduce an innovative storage system
- To study accumulation of hydrogen
- To answer to a market request

Context: beneficiary SMEs cluster

- **SMEs target group:**
  - **Sector:** Automotive, Local Production and Portable Devices.
  - **Geographical area:** WorldWide.
  - **Cluster:** Hydrogen Fuel Cells.
- **Typical profile:**
  - Automotive, Storage and Fuel Cells manufacturers;
  - Chemical and Nanotechnologies manufacturers.

A description of the mean class representative of the cluster. The action has been tailored on a SME having this profile but it's extendible and adoptable by other profiles and other SMEs.

Technology Develop: definition

- Currently the most widely **used technology** is based on conventional **steel cylinders** but are limiting in terms of density of the energy that you can store, because of their **excessive weight**.
- **Definitions :** The core of the new storage technology is represented by an **innovative type of nanomaterials** for hydrogen storage and the procedure for their preparation. These materials are able to **interact with the gas**, which retains its own in a working temperature range which includes room temperature, with **storage times** of extremely rapid in the range of values of pressure that includes the ambient pressure.

The whole support action moves from actual technology used to store Hydrogen. It's time to change because of its excessive weight.

This new technology has been chosen for a list of criteria that highlight the potentialities of implementation of this experience on other clusters and, very important, the one with highest benefits impact.

Technology Develop: overview

The particular characteristics that make **this device unique** on the international scene are:

- **The volumetric storage capacity** (about 5%, considerably higher than that of the current system performance such as chemical hydrides, which remain around 1%);
- **Safety of the device**, which works to pressure and temperature;
- **Reversibility of the process** in a temperature range between 0 and 100 ° C, which allows a quick release of hydrogen from the nanomaterial;
- The characteristics of size and weight, making it ideal **for automotive applications;**
- Effordability and scalability of the production process, making this system easily exportable to a logic to a **prototype industrial scale**.

There are listed the main features of the innovative tank; they depends on size and weight, pressure, temperature range and storage capacity.

Technology Develop: final idea

- **Search** for innovative materials and criteria for the storage of hydrogen in order to obtain sufficient quantities for the range of vehicles and the assembly requirements. The criteria for development are the packing density and costs, plus the efficiency of the energy path.
- The goal is to create a **sustainable energy system** to meet the strong growth in world demand for energy with a limited and controlled environmental impact. The need to produce hydrogen using for this purpose an external energy source remains one of the main problems that arise with its widespread use.
- **Apply** this technology to Automotive sector.

Description of the final idea: search an innovative set of nanomaterials that could positively interact with Hydrogen into storage fuel cells. In this way they create a sustainable energy system to meet the growth world demand for energy source.

Hydrogen Fuel Cells allow to proceed on research way to obtain less sized cells with a more efficiency security system.

From the NanoShare side, this system gives a very-high added value on the whole develop phase.

Grant Agreement: 225004

NanoShare in NIHS

Features to be achieved

- The reservoir for the storage of pure hydrogen is mainly characterized by **extreme lightness**, with **gravimetric storage capacity**> 6%, the tank will be capable of operating cycles of accumulation and discharge of hydrogen under conditions of **low temperature and pressure**, within a few bars, so in terms of substantive safety.
- Thanks to the development of a new adsorbent material hydrogen is expected to be able to build a device capable of meeting the requirements specified for applications like **automotive**, concerning especially the **lightness of the device**, but also the cost and duration in terms of sustainable cycle.

The description lists of the two main sector with which NanoShare works in NIHS:

- Technology and features design;
- Meet the requirements of Automotive.

NanoShare has been selected for its best knowledge about nanomaterials-Hydrogen interactions.

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Technology Develop: the benefits

- It must be clarified that in addition to an obvious **savings** in terms of volume, the **NIHS** system achieves significant **performance gains** with regard to the overall system efficiency, weight, and in some cases, the cost of the equipment .
- Possibility to **create** a new collaborative network.
- **Improve** the know-how.
- **Enhance** the experience and expertise of involved subjects.
- **Expected sales growth**, made possible thanks to trade agreements with potential customers using the technology offered in the production of innovative systems for hydrogen storage.

The list of perceived benefits by the two main actors: NIHS and NanoShare.

NanoShare has a more harmonised view of the working parameters and NIHS has more insurances about the technology origin and the whole value chain.

NanoShare: the business

- **The commercial success** of the proposed technology will mark a turning point for the company. The adoption of the system by a customer, which will mainly consist of car manufacturers and producers of industrial gases, will pose **strategic choices** are not trivial given the high volume of income likely to be generated from the commercialization of the patent and the sale of knowledge company.
- In the short to medium term period (3 / 5 years) the company will focus its resources and efforts to **develop prototypes** that demonstrate the validity of the proposed technology and thus set an action that is appropriate business for publicizing technology to **potential customers**.

The core business of NanoShare is completely determined by strategic choices, as realization hydrogen fuel cells realization. With prototypes it can demonstrates the validity of the project and publicizing technology to potential customers.

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PARTNER NAME: DATA MEDIA GROUP

CONTACT PERSON: MIGUEL SOUSA

GOOD PRACTICE NAME: VACCUM MACHINE FOR 3 LAYER DEPOSITION

SOURCE OF THE GOOD PRACTICE: SIDRABE INC

TARGET GROUP: SMES

DATE: 12 DECEMBER 2009

Vacuum machine for 3 layer deposition

P600MR

SIDRABE Inc

History of the organisation

Year of foundation: **1962**

Major milestones

1966 – Work coordinator in the area of vacuum coating for the former Soviet Union;

1971-1990 – this period was marked with processes development for the defence industry and space programs in USSR;

1990-1992 – Sidrabe become a Joint Stock Company in independent Latvia;

1997- since 1997 *Sidrabe* have promoted business of building and selling commercial thin film deposition equipment, including in-line systems and batch operation coaters. Sidrabe now serves clients all over the world with major customers in the USA, the Netherlands, Taiwan, Japan, Germany, Korea and Canada.

As a highly innovative SME, TILDE participates in European research projects financed by European Commission.

These activities cover the areas of terminology, language technologies, machine translation, information retrieval, e-learning, cultural heritage, internet and multimedia.

TILDE has established successful international cooperation with research institutes and educational organizations around Europe:

- Institute for Information Management in Germany;
- University of Tartu in Estonia;
- University of Sheffield and University of Glasgow in UK;
- University of Zurich in Switzerland, and many others

Vision

To Become a leader in design of vacuum roll-to-roll machines in the world

Mission

Development of new cost-effective vacuum machines with different technological processes. To provide full circle starting with samples produced in R&D department and finishing with industrial vacuum machine with technological process

Research targets / plans

- Research new coating for PV application (contact layers, active layers)
- Multifunctional cluster type vacuum coater
- Research processes of cleaning and activation before surface coating

TILDE Ltd. – established in 1991. TILDE is the Baltic leading-edge IT company specializing in language technologies, multilingual and Internet software, and localization.

Language technologies: TILDE provides intelligent language technologies for the languages of the Baltic countries that are equivalent to the support available for major world's languages, using a combination of statistical and knowledge driven approaches. TILDE's experience resulted in excellence covering three main areas:

- Translation tools
- Speech technologies
- Information search and retrieval

Digital content: TILDE creates new possibilities for the cultural riches and terminology content in the digital world.

TILDE has a working relationship with over 400 public libraries in Latvia that are subscribers to TILDE's content resources and its search system.

Experienece in research

Development of Vacuum Technological Processes for application in various directions for example: computer displays, touch screens, batteries, protection coating etc.

Research directions - Nanoelectronics Technology, Flexible, Organic and Large Area Electronics and Photonics

R&D department with 15 qualified researchers and all necessary equipment for
research and development of related technologies.

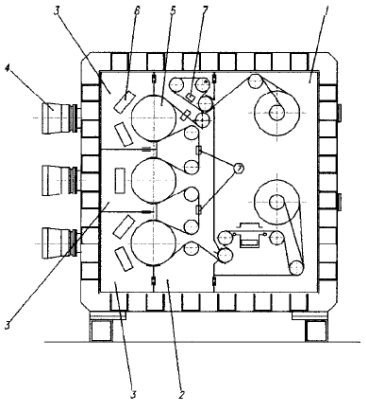
The company has successfully participated in FP5 and other EU projects.

Enterprise content management: Tildes Biroja Serveris (TBS) developed by TILDE, provides possibility to organize and manage the most important business components for enterprises and organizations.

Terminology services: As a member of the EuroTermBank Consortium, TILDE develops and hosts the multilingual terminology portal www.eurotermbank.com, providing a consolidated interface to over 1.5 million terms in various European languages.

Audiovisual content processing: TILDE offers multimedia content preparation, processing, storage and delivery, multimedia content search solutions, unique content data base management.

Localization services: TILDE covers localization needs of customers for all three languages of the Baltic countries



Layout of 3-drum's web coater:

- unwinding/rewinding compartment (1);
- intermediate compartment (2); deposition compartment (3); vacuum pumps (4);
- process drums (5);
- magnetron sputtering devices (6);
- optical and electric sensors for coating layers (7).

The design feature of P600MR is a vertical arrangement of all sputter magnetrons and deposition surfaces, a separated and sufficiently insulated zone with individual drums for each deposition process; and application of a highly effective plasma treatment device for film prior to the deposition.

This design allows control of sheet resistance and optical characteristics (transmission, reflection) after each deposition run. Provision of precise winding, eliminated film slippage ensures a high quality product. Provision is made for inter-leaf unwinding and rewinding within the deposition cycle.

Symmetrical, uniform pumping is accomplished for each deposition zone. Versions with turbomolecular and cryogenic pumping of the magnetron Compartments are available. Version of the machine with 6 drums with 5 insulated compartments, developed especially for films with AR layers. The availability of a system for a winding device, rolling away on one side of the chamber and drawing out sputter magnetrons on the other side facilitates maintenance of the chamber and all devices between cycles. The vacuum coater P600MR module has proven reliable and convenient to run.

Address: Krustpils iela 17, Riga, LV1073
Country: Latvia
Contact person: Mr. Viktors Kozlovs
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