



## **Open Innovation en PME : Cas d'applications avec BA**

**Systemes, fabricant de robots mobiles**

Journées du groupe thématique transverse AUM  
de l'Association Française de Mécanique (AFM) 2014

# Outline :

## 1 - BA SYSTEMES

French AGV manufacturer

## 2 - INNOVATION

Specific model & organisation

## 3 - BA ROBOTICS

cases of mobile robots developments

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5 cases of mobile robots

# BA SYSTEMES overview



- European leader in intralogistics automated systems
- Automated Guided Vehicles (AGV) & supervision system
- 35 years of experience
- Vertical business activity
- 150 employees (50% of engineers and PhD)
- 20 ME of Turnover
- 15% of turnover in R&D  
Special SME adapted method to spread innovation

# ROBOTIC SYSTEM



PLC



Upper Level



NETWORK

Wifi Antennas



AGV



Supervision



Operators interface

Wifi Antennas



Forklifts



# Fully manufactured AGV



## Skills involved:

- Mechanical
- Electronics
- Electricity
- Software
- Communication
- Optimisation
- Project Management

Reliability : 99,7%

Life : 50 000 Hours



# Mobile robot supervisor

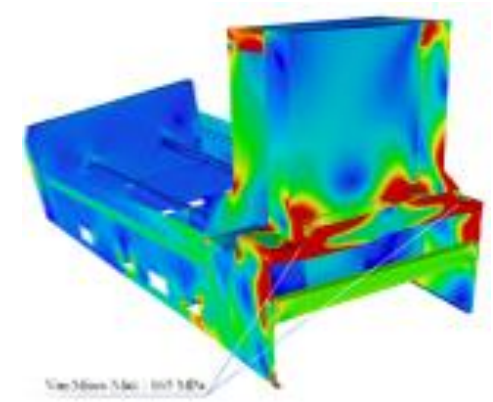
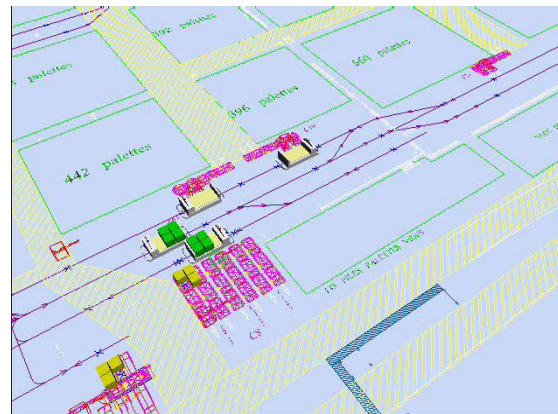
## Software AGV Manager ©

- Missions assignment
- Traffic management
- Communication
- Synoptic layout
- Analysis
  - Replay
  - Production indicator
  - Reliability indicator
  - ...



# Skills and resources

Resources	<ul style="list-style-type: none"><li>- Plan with 5 000 m<sup>2</sup> of workflow</li><li>- Organization and innovation methods (LEAN)</li><li>- Patents portfolio</li></ul>
Skills	<ul style="list-style-type: none"><li>- Mobile Robot : design and manufacturing</li><li>- Software : specification and development</li><li>- Technical and research projects management</li><li>- Maintenance and retrofit of robots</li></ul>



**AGV fleet supervision**

→ Software development



# A LARGE CLIENTS PORTOFOLIO

**Paper / Press / Printers**

**Packaging**

**Textile**

**Bottling**

**Pharmacy / Cosmetics**

**Agri-food**

**Industries**

From Classic  
Industrial  
Activities



By using  
management model

To New  
Robotics  
Application



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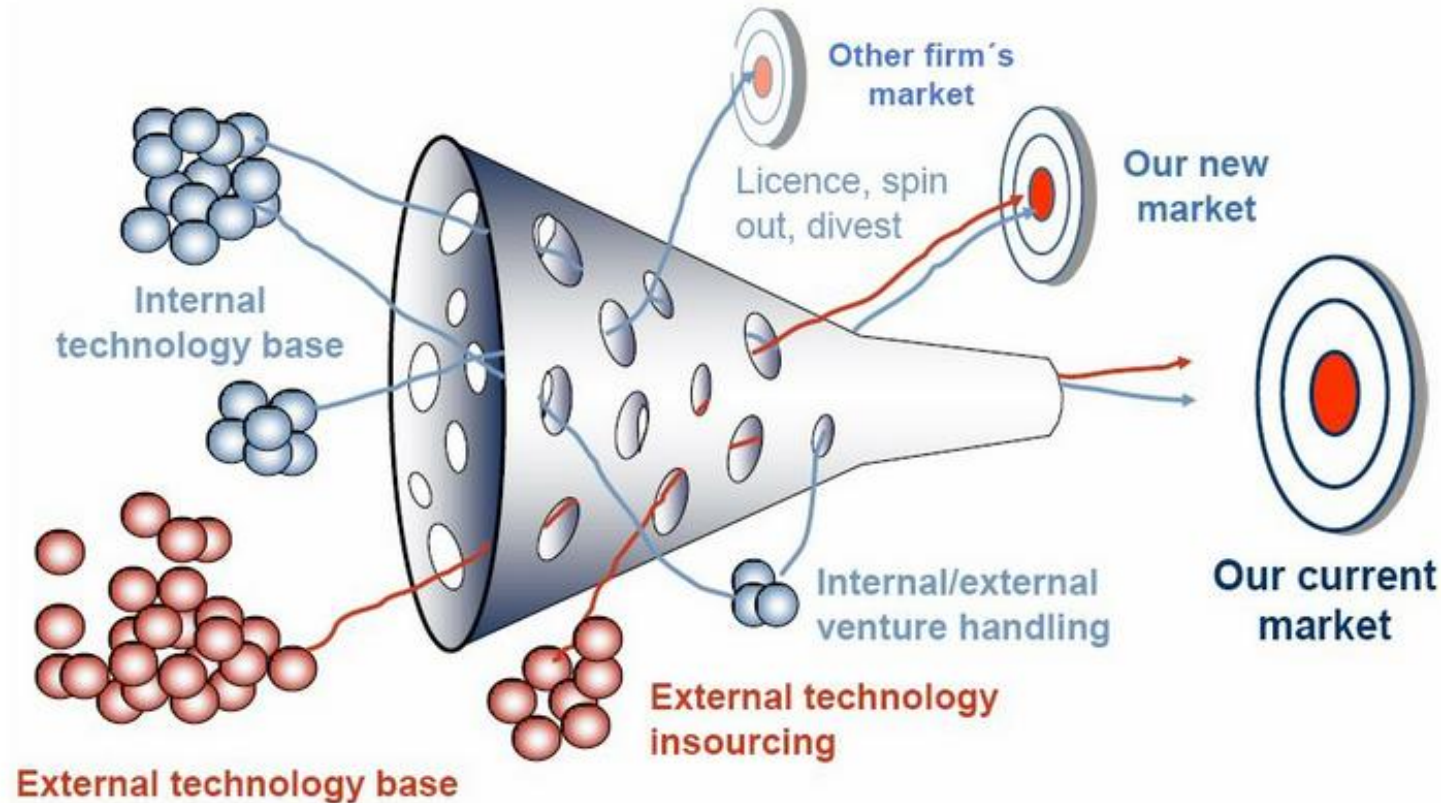
Specific model & organisation

## 3 - BA ROBOTICS

5 cases of mobile robots

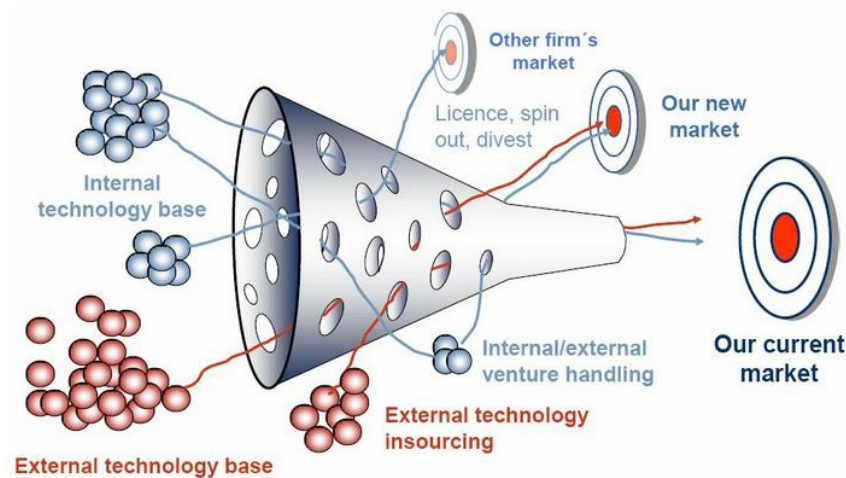


# Open innovation model



“Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.”

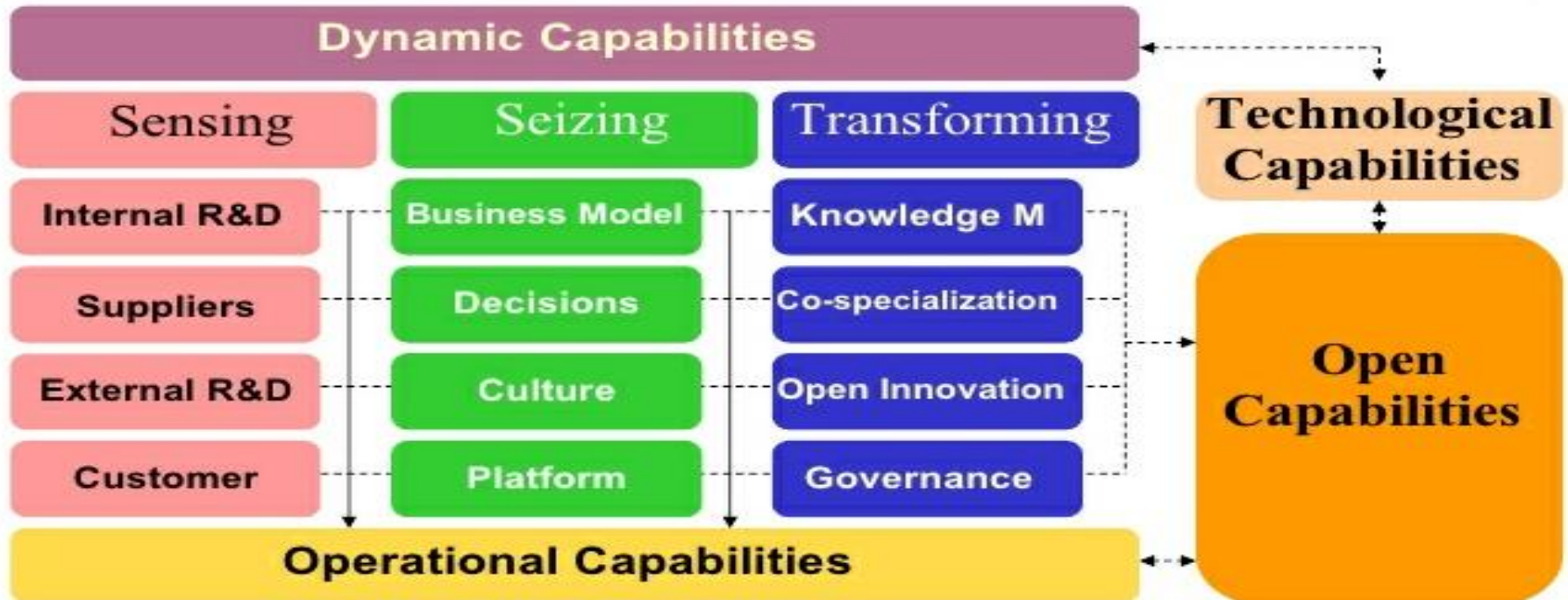
# OI model Implementation



Projets industriels	B to B (triangle) Appuis techniques et scientifiques Adressage de nouveaux usages
Projets collaboratifs	FP7, ANR, FUI, RAPID, ADEME, IRT Financement partiel Absorption interne de connaissances
Projets pédagogiques	Etudes sur projets internes, Projets collaboratifs de recherche, Machines spéciales

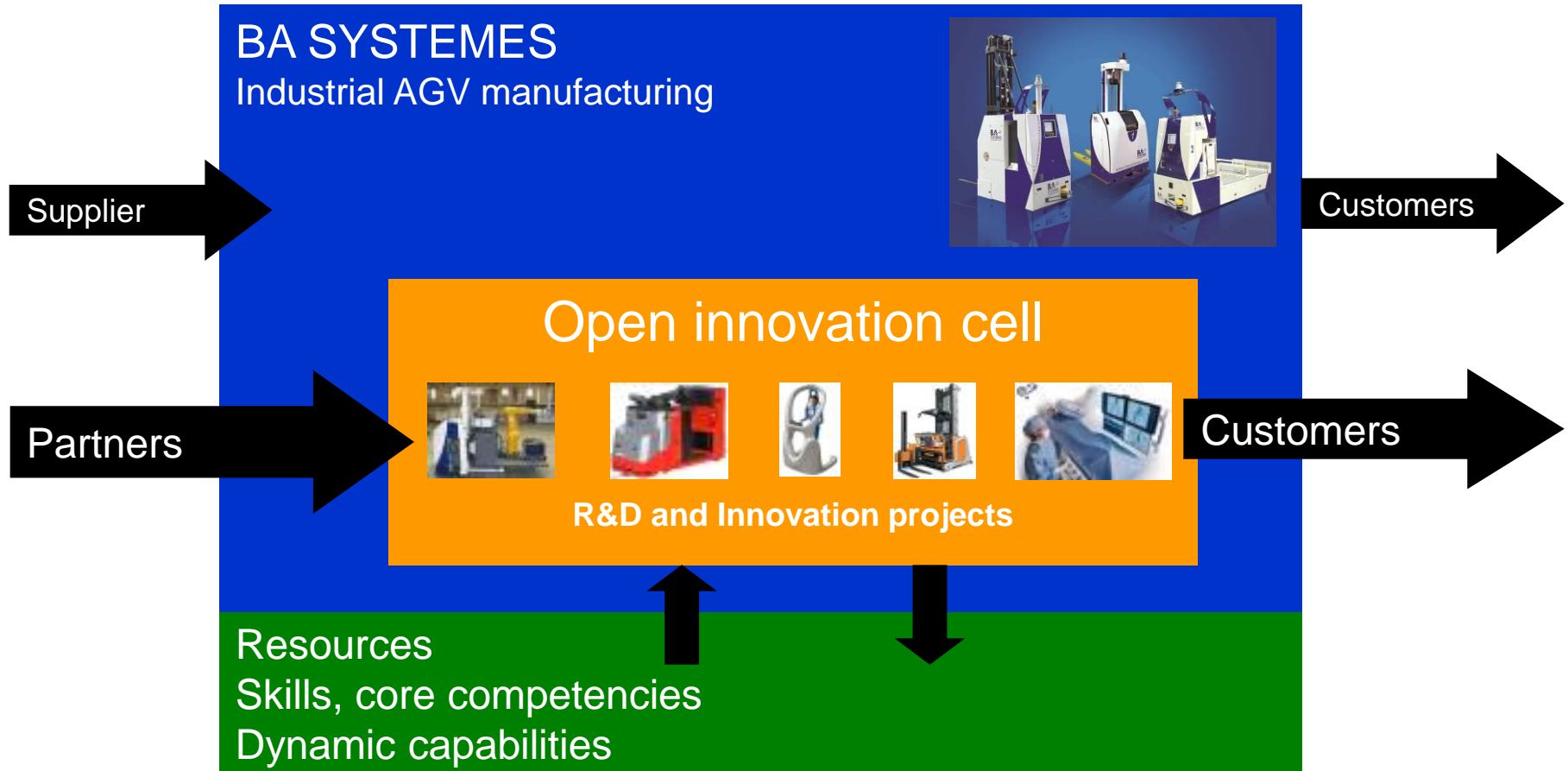


# Dynamic capabilities



**Teece David J. 2007** - Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance

# Internal specific organization to boost open innovation



## Purposes:

- Enrichment of skills and knowledge
- Creation of new added-values
- Openness in R&D

# Dedicated process for *Open Innovation*

## Professional Networks

- Facilitators
- Companies
- Education
- BA Systèmes
- Research

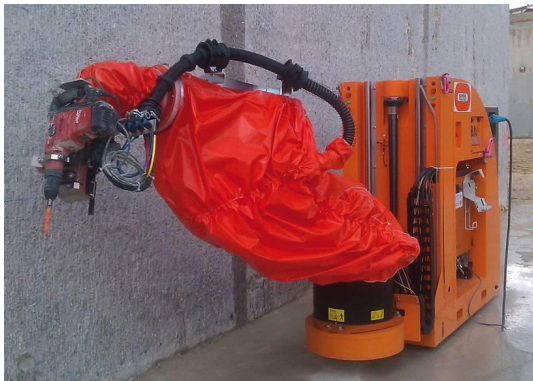


Innovation BA Syst.





# New mobile robots



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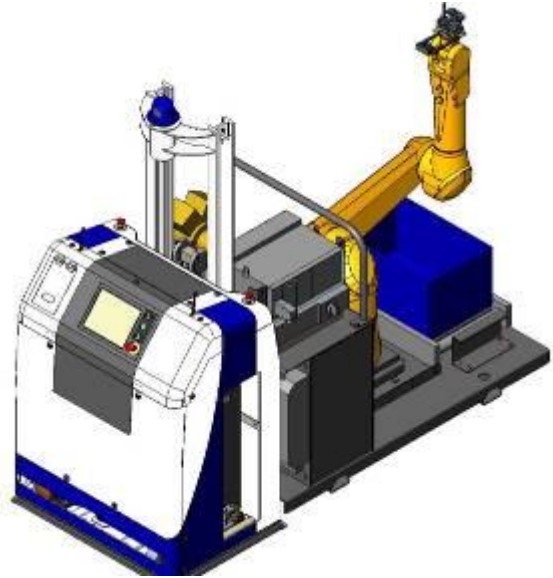
# 1 – AGV + robot 6 axes

Recherche > marché

Open innovation

Histoire

# ROBM@RKET: 1<sup>st</sup> open innovation project



- **Mobile robot to automate picking**
- **3-year project**  
Project budget: €1.7M
- **4 partners**  
BA Systèmes, CEA List, IRISA-INRIA, University of Caen
- The Robm@rket project obtained **the 2009 « Innovation Supply Chain » award.**
- **Robm@rket generated several spinoffs such as:**  
Discovery, ROBY, Artémis AGV...

# ROBY: the automated building system



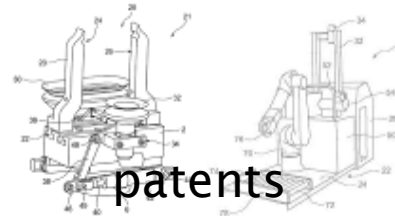
- **Mobile robot to automate drilling, sanding or bushing hammering walls**  
RSI\* suppression, better efficiency, insures the repeatability & quality
- **Co-developed with BOUYGUES Travaux Publics**  
Direct spin-off from Robm@rket:  
AGV base + robotic arm

\*Repetitive Strain Injury

# Model implementation



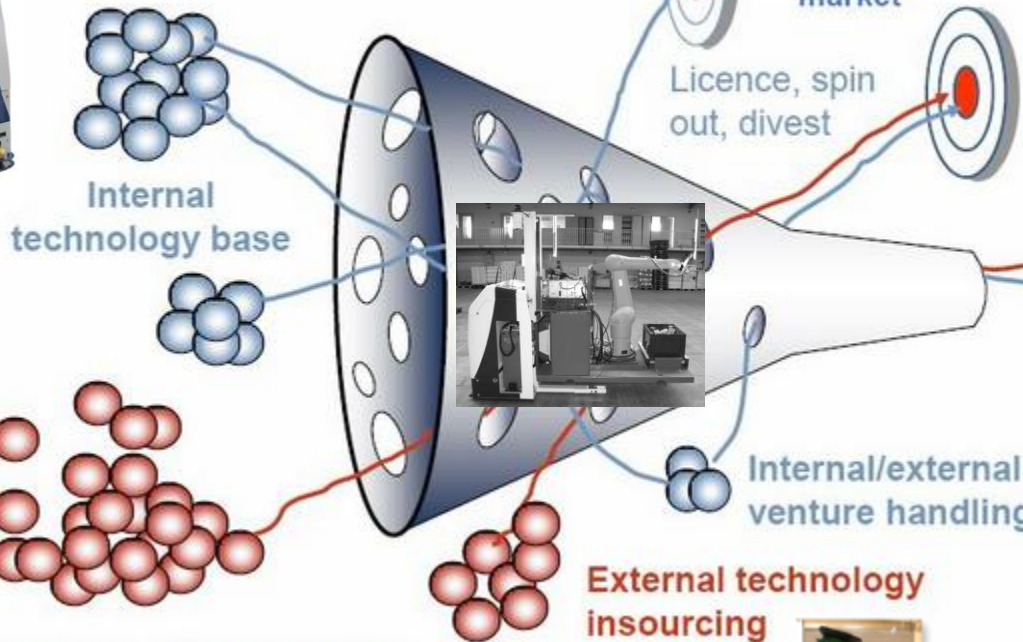
Mécatronism  
AGV



patents



Construction  
Our new market



Our current market  
Production  
Logistics

External technology base



Robotics  
Cobotics  
Vision



Grapping





# AGV et robot polyarticulé le sujet n'est pas nouveau !

1991-1993

Projet STAUBLI, CEA LIST et BA SYSTEMES





# 2 – Apport de briques techniques

# ROB@GRO: automatic feeding robot



- **Mobile robot to automate animal feeding**

Goats, cows, sheep...

- **From a manual forklift**

Automatisation box directly installed on standard forklift

- **5 partners**

Chambres d'Agriculture de Bretagne, Centrale Nantes, MANITOU Industrie, MEITO, BA Systèmes



# ROBOT portuaire



# 3 – Co développement

Usage,

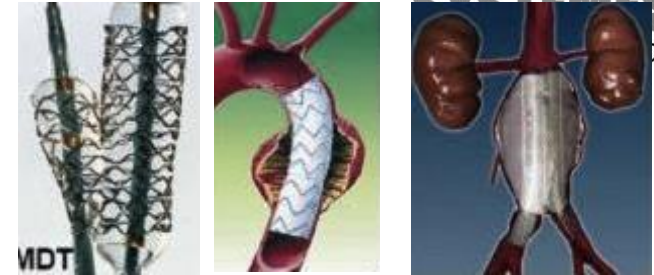
Open innovation,

Production & valeurs

# Needs of minimally invasive surgery

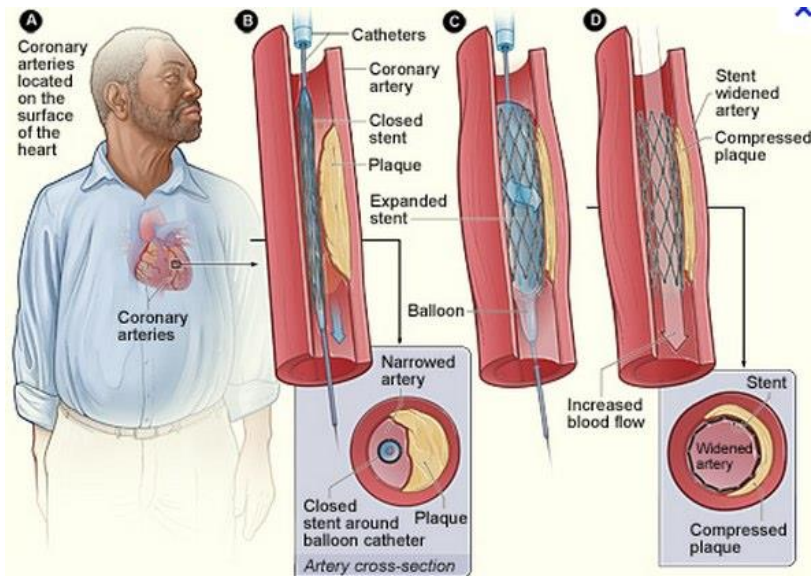
Necessity to **evaluate** the surgical intervention **in real time** emerges

Ex : Stenting operations



Surgery operations procedures demand **extremely high precision**

EX : valves implant



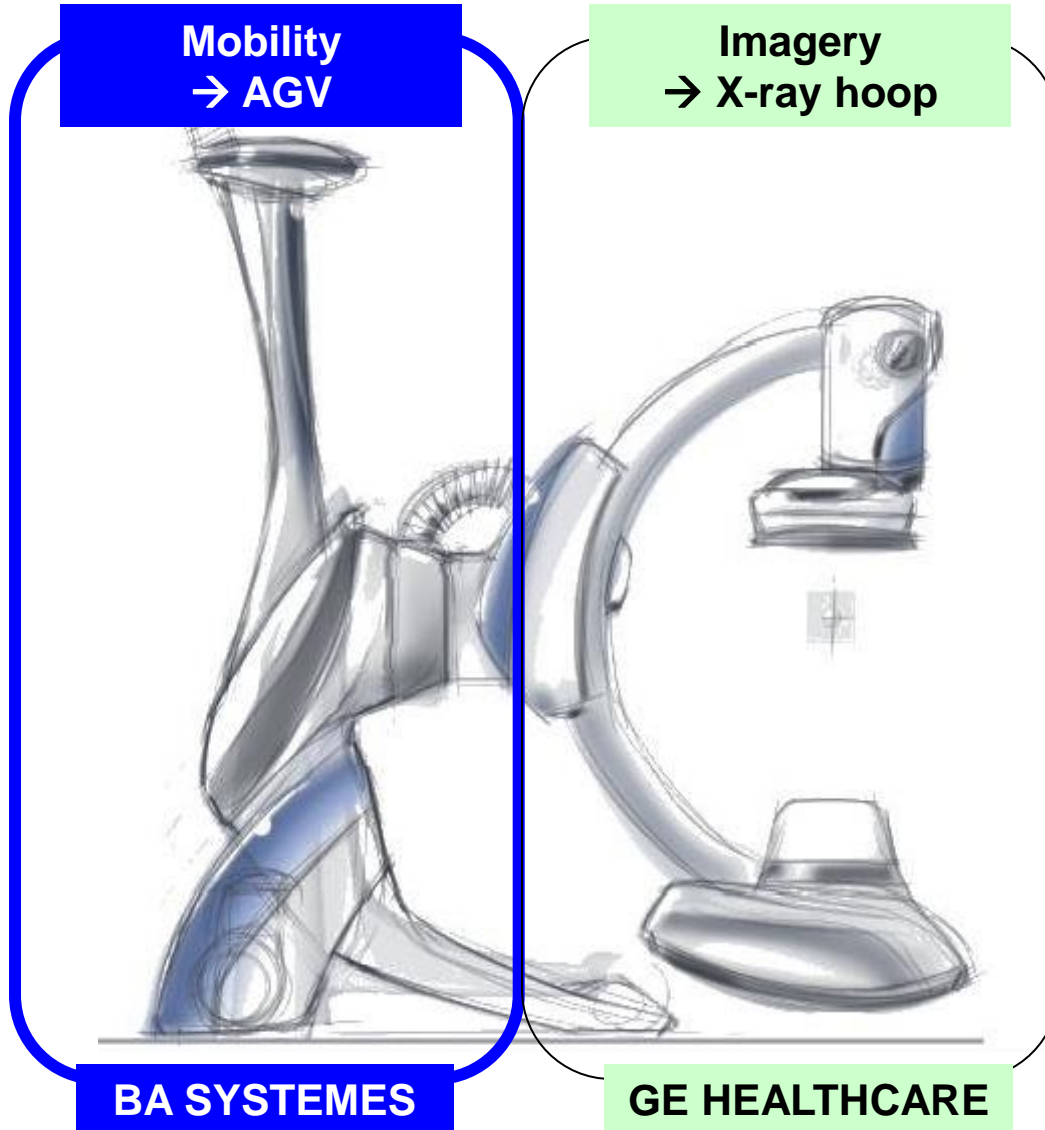


# INNOVATION : AGV for imagery in mini-invasive surgery

**Mobility**  
→ AGV

**Imagery**  
→ X-ray hoop

Navigation  
Control  
motion  
IT Interfaces



Imagery chain  
C-XRAY  
Safety

# Innovation processus of IRIMI project



Avril 2009 à octobre 2009

Démonstrateur  
250 k€



Avril 2010 à avril 2012

Projet collaboratif  
FUI IRIMI – 18 ME

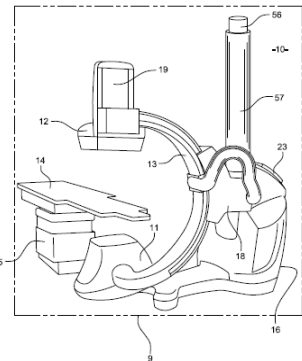


mars 2011 à ~~juin 2012~~ *novembre 2012*

Industrialisation



**B to B**  
General Electric  
BA Systèmes



Zones de test (sans possibilité d'imagerie X)



Salles plombées (possibilité d'imagerie X)



Système prototype à l'IRCCyN



Robot d'essai AGILA



**B to B**  
General Electric  
BA Systèmes



Construction d'une usine  
Création de 20 emplois  
(1500 m<sup>2</sup> en Bretagne)

**Open innovation**

General Electric - BA Systèmes – C&K  
IRCCyN (CNRS) – CEA List - INRA - APHP

# DISCOVERY IGS 730: The GE project



- **Newest Image Guided System for surgery**  
BA Systèmes laser guidance system is accurate within 4 mm
- **GENERAL ELECTRIC chose BA Systemes because:**
  - Time to market decrease: -3 years, with BA Systèmes
  - No european equivalent
  - Special skills in accurate motion control
- **Creation of a new company: BA HEALTHCARE**  
20 employees hired

# 4 – Vers de nouveaux usages



# ASIMOV Project

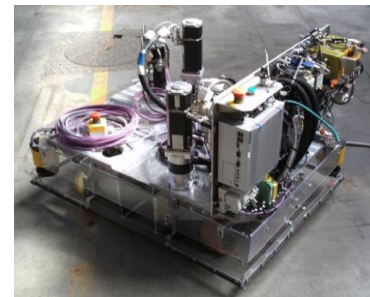
## Assistant for Industrial structure and Systems and Manufacturing Optimization Value

Objective: Reducing costs and time of the cycles for assembly and installation of system in final assemble line and major component aircraft

## New generation of COBOT for aerospace industry

Length: **43 months**

Budget: **2 M €**



# STAMINA Project

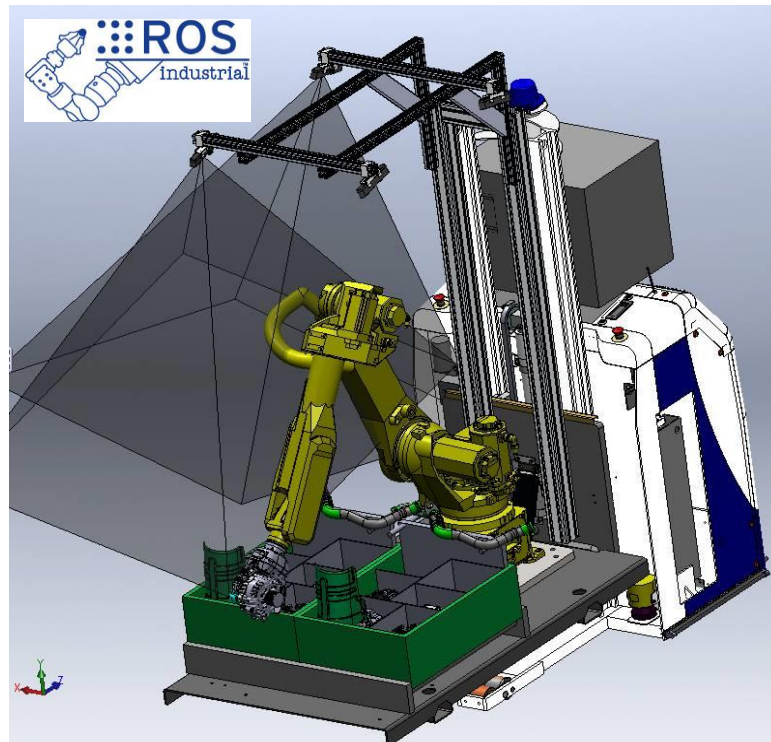


## Sustainable and reliable robotics for part handling in manufacturing

to develop a fleet of autonomous and mobile industrial robots with different sensory, planning and physical capabilities

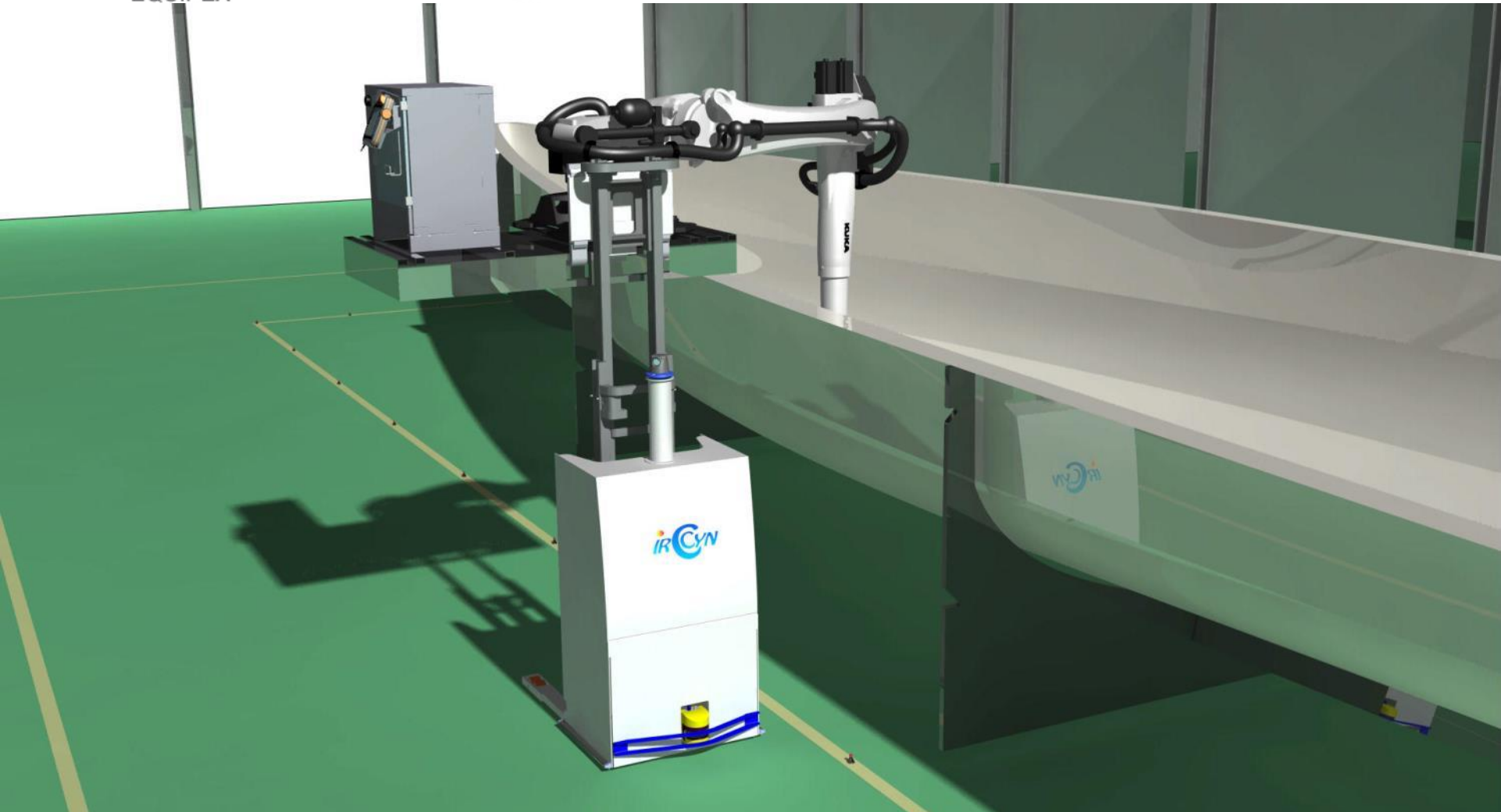
**42 months** - From October 2013

Total budget **Million € 6.2**



**7 European partners**

# ROBOT pour procédés de fabrication



Conclusion



# Conclusion

“Il s'agit d'**éclairer** les enjeux en mécanique et **technologie** au travers d'approches **pluridisciplinaires**, un des moteurs de l'**innovation**”

- **Activités industrielles**

Commercial, BE, Usine, service Clients.

Méthodes d'innovation (organisation, RID, CK)

- **Innovations « pluridisciplinaires » tirées par les usages**

Méthodes de gestion, sciences douces

Diversification, innovation

- **Liens forts avec les secteurs académiques**

Projets collaboratifs (ANR, FUI, FP7), enseignements, Projets pédagogiques - Implication, compréhension des besoins

- **Perspectives**

Ouverture internationale, associations

Nouveaux projets en Asie

**MERCI DE VOTRE ATTENTION**

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