



ROB SURGICAL SYSTEMS S.L.

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surgitrainer

better training
means better surgery

From Research to Industry

Alícia Casals



Institut de bioenginyeria
de Catalunya

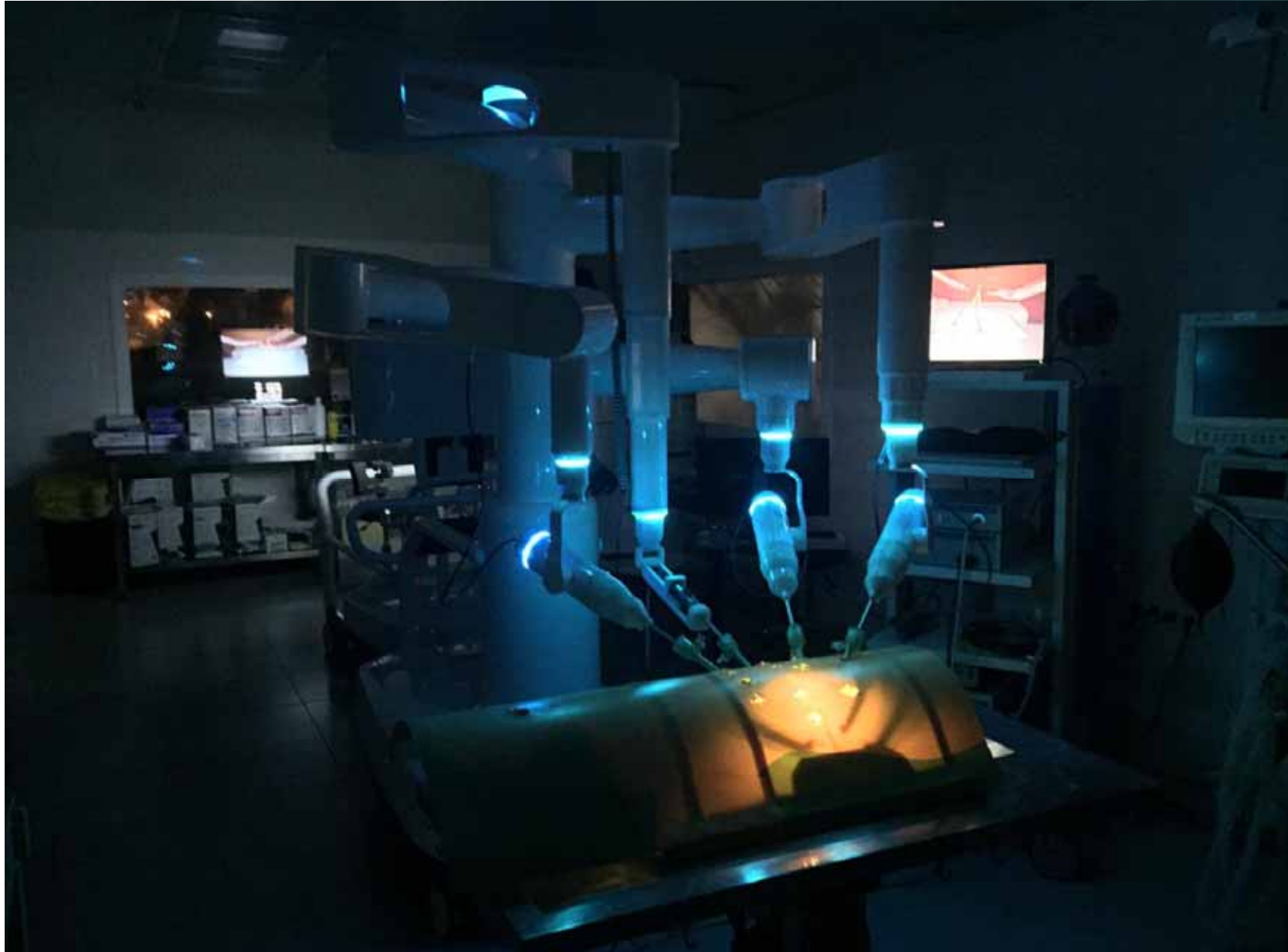


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RobSurgical: Spin-off
UPC-IBEC (2012)



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Universitat Politècnica de Catalunya. UPC

Research groups

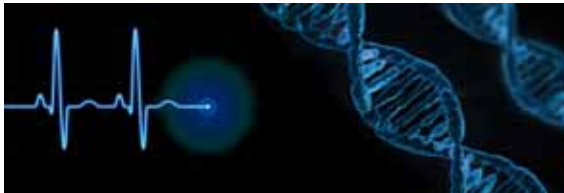
Biomaterials



Biomecànica



Senyals
Biomèdics



Gràfics



Dosimetria i
radiacions
ionitzants



Instrumentació
i e-Salut



Robotics and vision

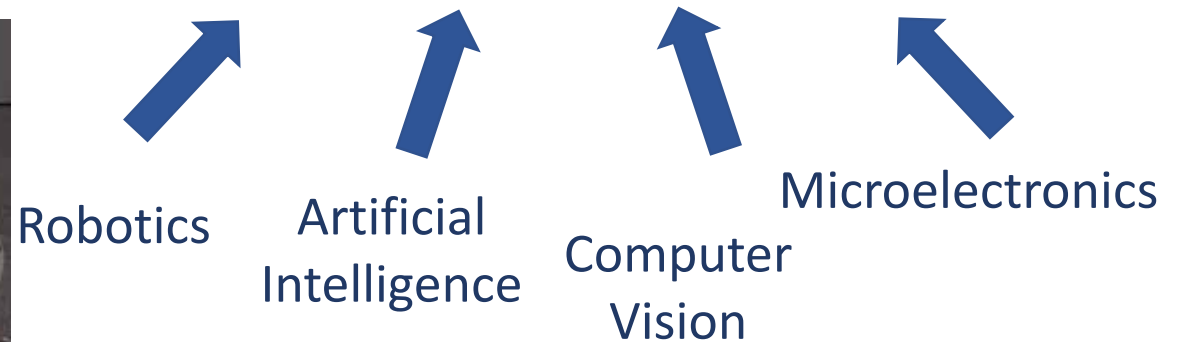


Robòtica i Visió per Computador

Medical Robotics:
Surgery, rehabilitation, technology
assistance



Laparoscopic surgery

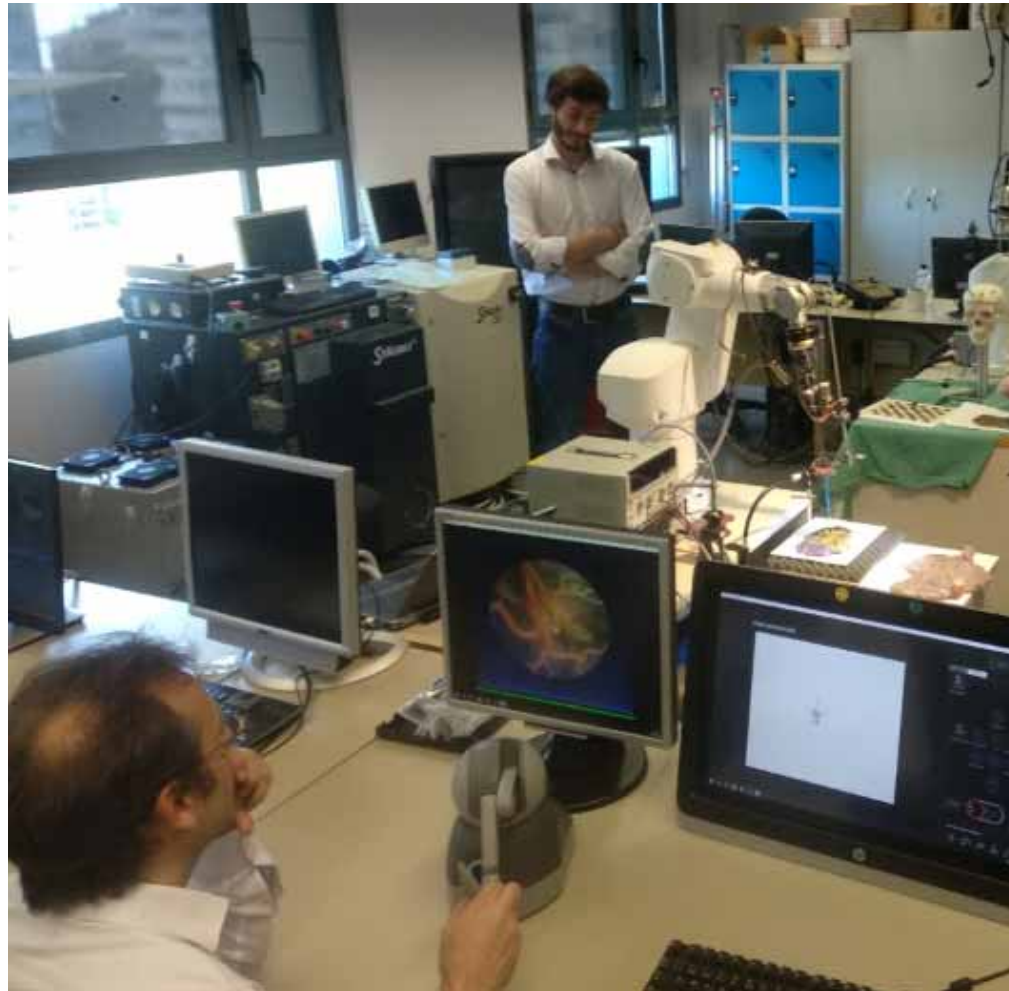


Robòtica i Visió per Computador



Maxilofacial surgery

Robòtica i Visió per Computador



Fetal surgery

Robòtica i Visió per Computador



Orthopedic surgery

Antecedents

From 1994: Research in robotics. Laparoscopic surgery with Dr. Laporte

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The spark!



Dr. Magrina (Mayo Clinics) and UPC researchers at Mayo Hospital at Phoenix (2008)



MOTIVATIONS

- Interest of the medical community
- Give a social output of a long term research
- Sense of responsibility on the use of public funds
- Frustration in front of the abusive attitude of a monopoly. Economic and with some drawbacks.
- Personal satisfaction

CHALLENGES

- Technical complexity
- Complexity “legal aspects”
- Economic difficulties
- Face a monopoly at world level
- Tenure position: Is it worth to complicate one's life?



CHALLENGES and CONTEXT

- **BITRACK:** New robot in the field of laparoscopic surgery
- Goal: Overcome the limitations of the Da Vinci robot
- Context: Application of the experience of a long time research in surgical robotics
- Technological step in the design of the robot and its operativity to increase efficiency and reduce its cost
- Break a monopoly which leads to an abusive use of technology



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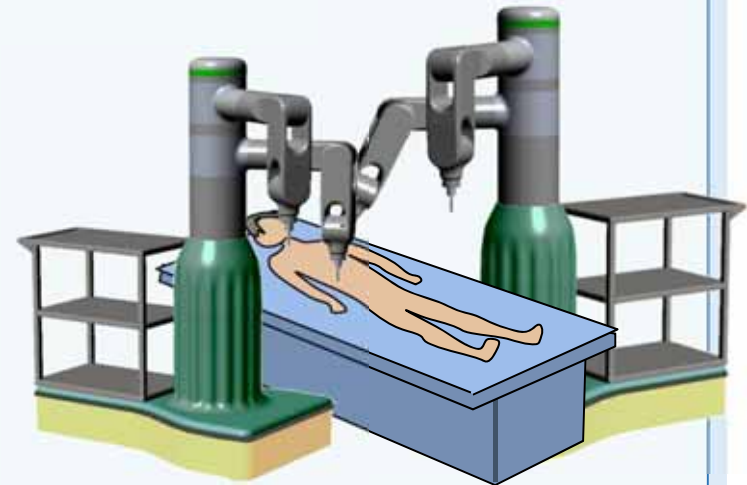
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Comparative

Centralized system with 4 arms



First system modular with 2 + 2 arms





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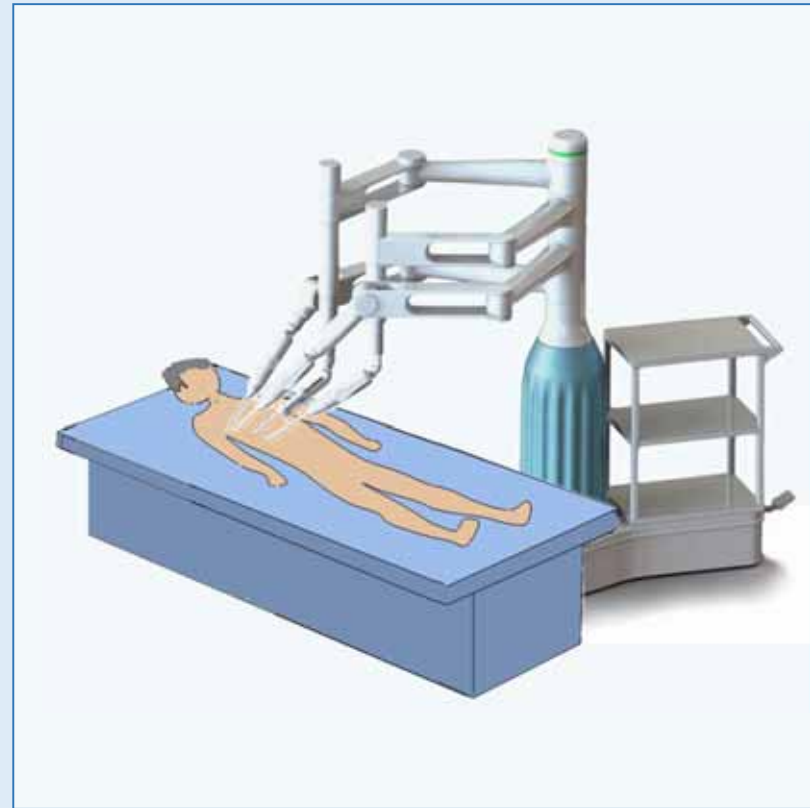
ROB SURGICAL SYSTEMS S.L.

Comparative

Centralized system with 4 arms



New system with 4 arms



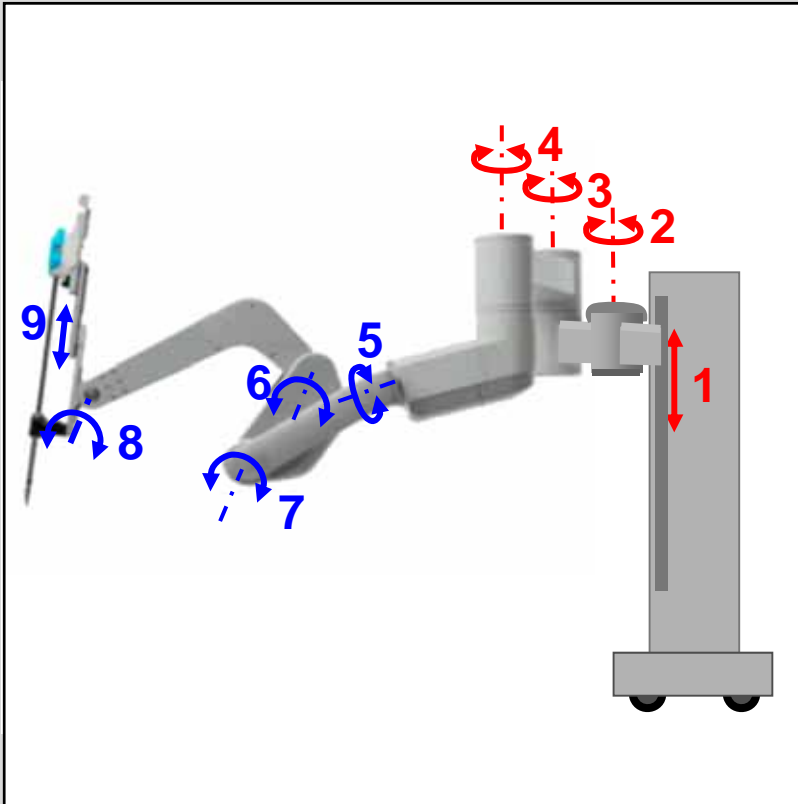


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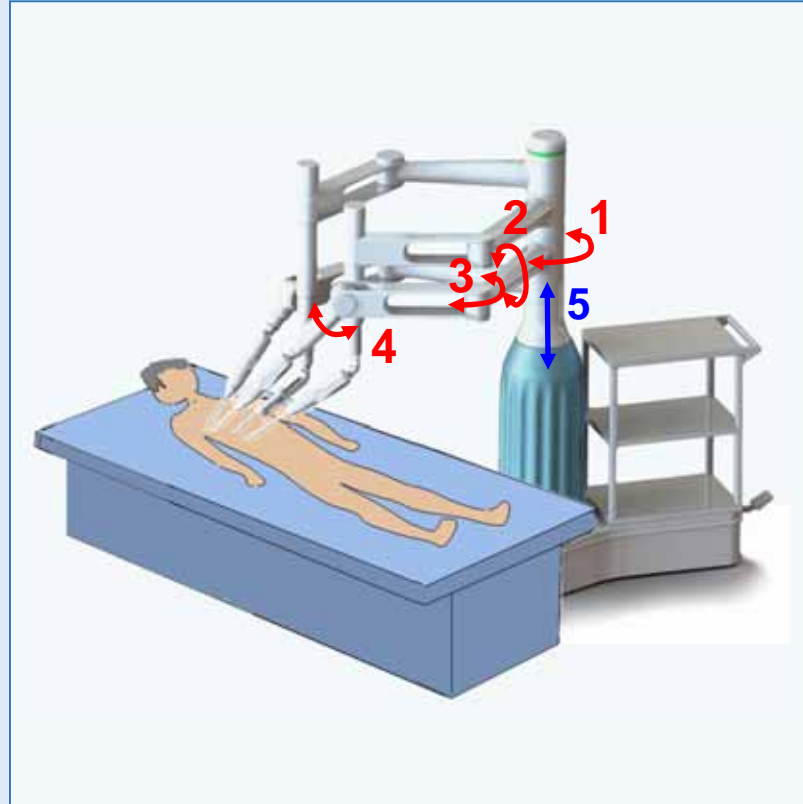
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Comparative

Complex system
(9 joints x 4 arms)
Limited accessibility



Simplified system
(4 joints x 4 arms + 1)
Widened accessibility





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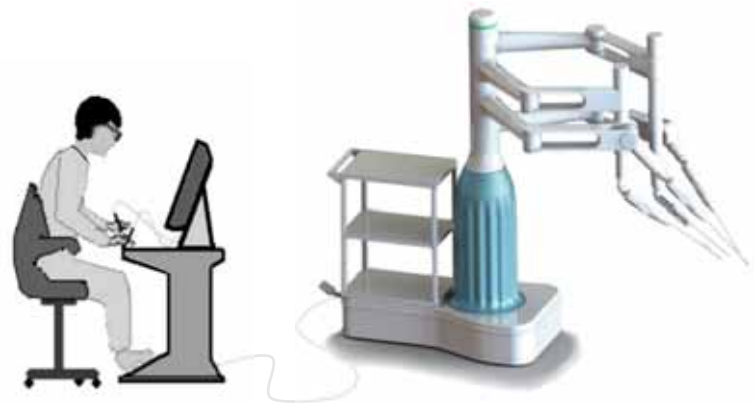
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Comparative

High cost (1,8 M €)



Lower cost (750.000 €)





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Comparative



5mm EndoWrist® Instruments for the da Vinci[®] S™ Surgical System

EndoWrist 5mm Instruments

420117	Needle Driver	1/box - 20 uses
420139	Schertel Grasper, 20 mm jaw	1/box - 20 uses
420141	Round Scissors	1/box - 12 uses
420142*	Monopolar Cautery Instrument	1/box - 18 uses
420143	Maryland Dissector	1/box - 20 uses
420145	DeBakey Forceps	1/box - 20 uses
420146	Curved Scissors	1/box - 12 uses
420173†	Harmonic™ Curved Shears	1/box - 20 uses
420176	Bulldog Nose Dissector	1/box - 20 uses
420177	Bowel Grasper, 30 mm jaw	1/box - 20 uses

* Requires disposable accessories, quench, or ground for use.

† New version instrument based on Ethicon Endo-Surgery Harmonic Technology. Requires Harmonic Curved Shears Insert (JTB 420173) for use.

5mm Reusable Accessories

420011	5mm Cannula	1/box
420012	Sharp Obturator	1/box
420013	Blunt Obturator	1/box
420019	8mm to 5mm Cannula Reducer	1/box

5mm Disposable Accessories

400156	Cautery Hook Tip	10/box
400160	Cautery Spatula Tip	10/box
400161	5mm Cannula Seal	20/box
400169	Harmonic Curved Shears Insert	5/box
420174	Separator Obturator	20/box

Software Requirements:

> A 5.0 patch 3 or higher

Features:

> 5mm wristed instrument
> Robust snake-wrist architecture

Benefits:

> Unparalleled dexterity and precision in a 5mm design
> Smoother tip manipulation
> Improved visualization of the instrument tip
> Functional in a tight working space

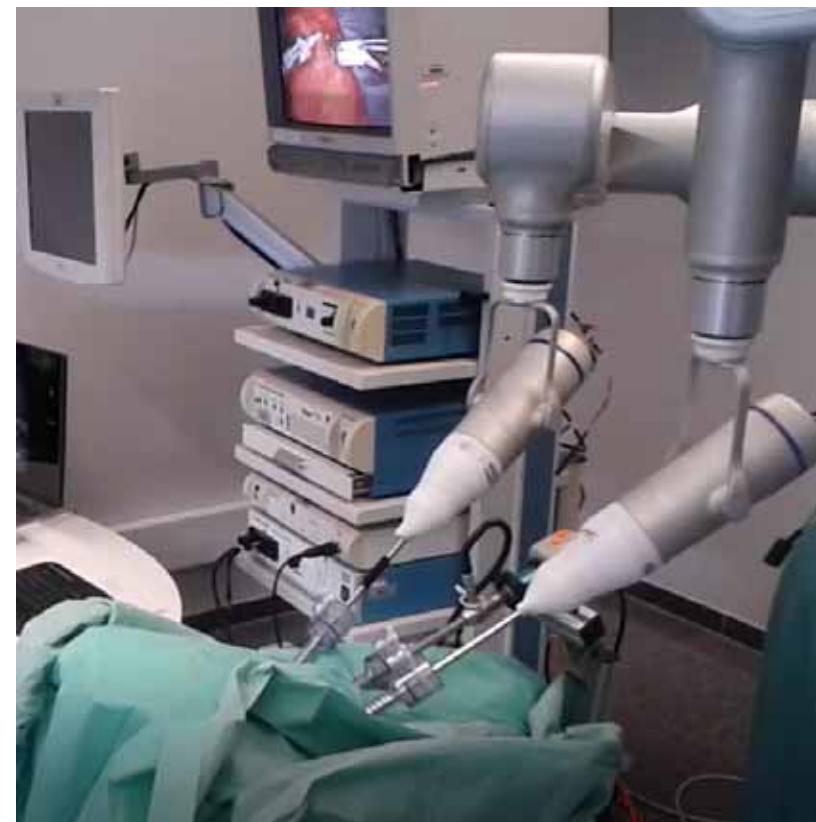
Targeted Primary Application (but not limited to):

> Pediatric general surgery procedures
> Pediatric urology procedures

For more information, please call Intuitive Surgical Customer Service in the United States at 1-408-523-2100, in Europe at: +33 1 39 04 26 60 or +00 800 46 88 78 74. www.intuitive surgical.com



Scale approximates actual size





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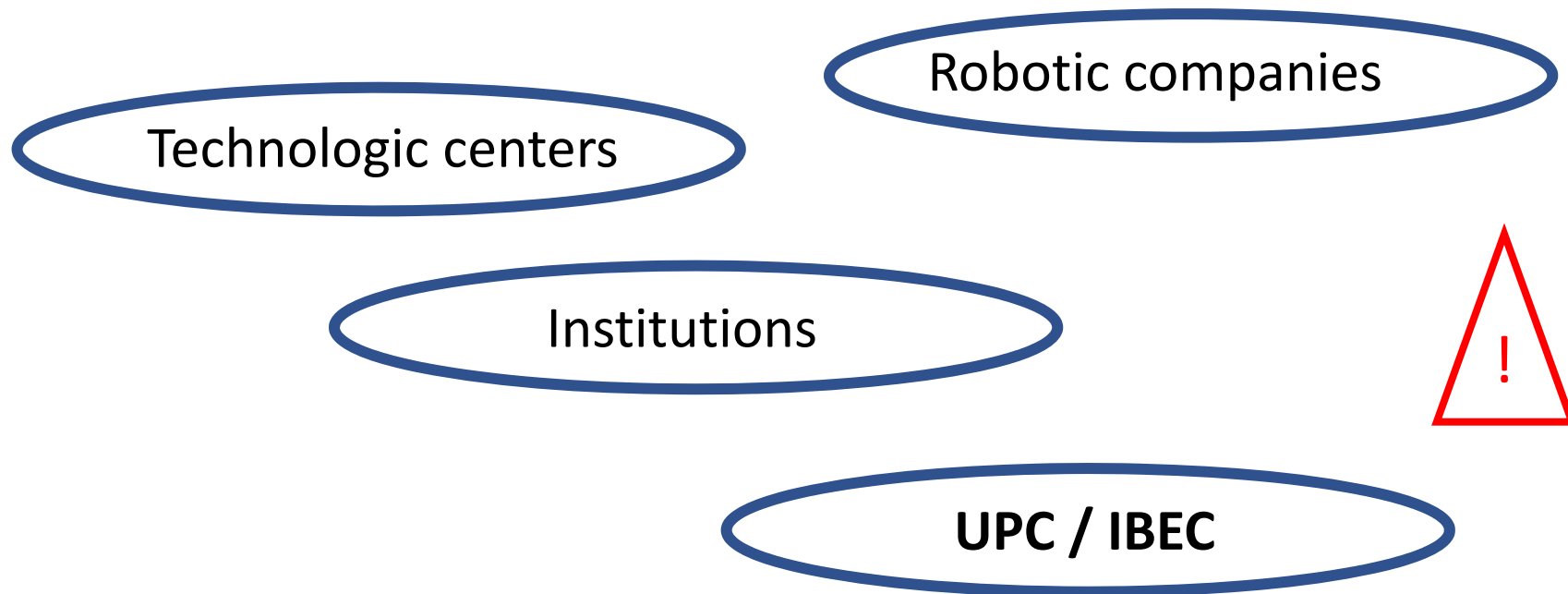
Main advantages of Bitrack

- Reduction of set-up time
 - *Less time of anesthesia and occupation of OR*
 - *Possibility of using it only along the phases of intervention when it performs better than manual*
 - *Better usability*
- No technological dependence of other manufacturers of auxiliary components
- Less mechanical complexity and cost



First steps

- Search of **TECNOLOGIC** and **BUSINESS** partners
- **Starting values:** Development of surgical aids using off the shelf industrial robots





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Software
development



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Design and construction of a
prototype

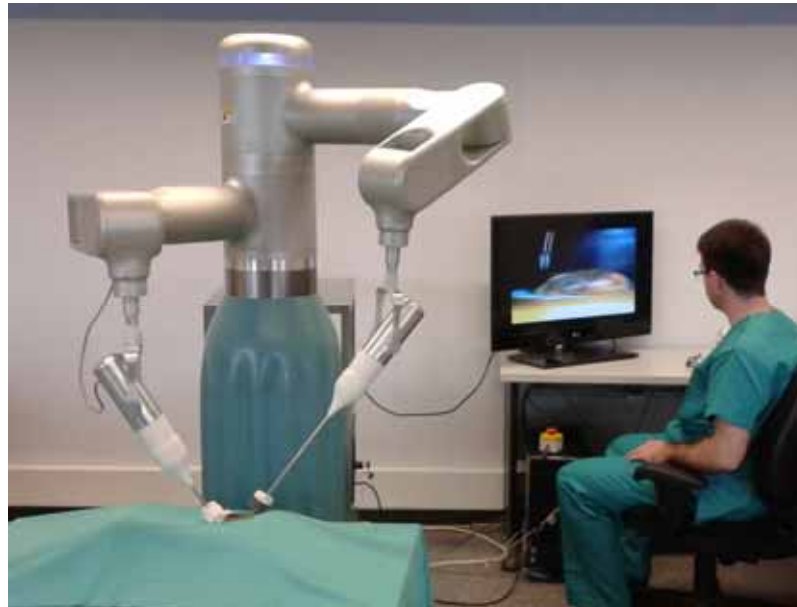


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UPC

IBEC



1st Prototype 2012

UPC Social Council

Research resources



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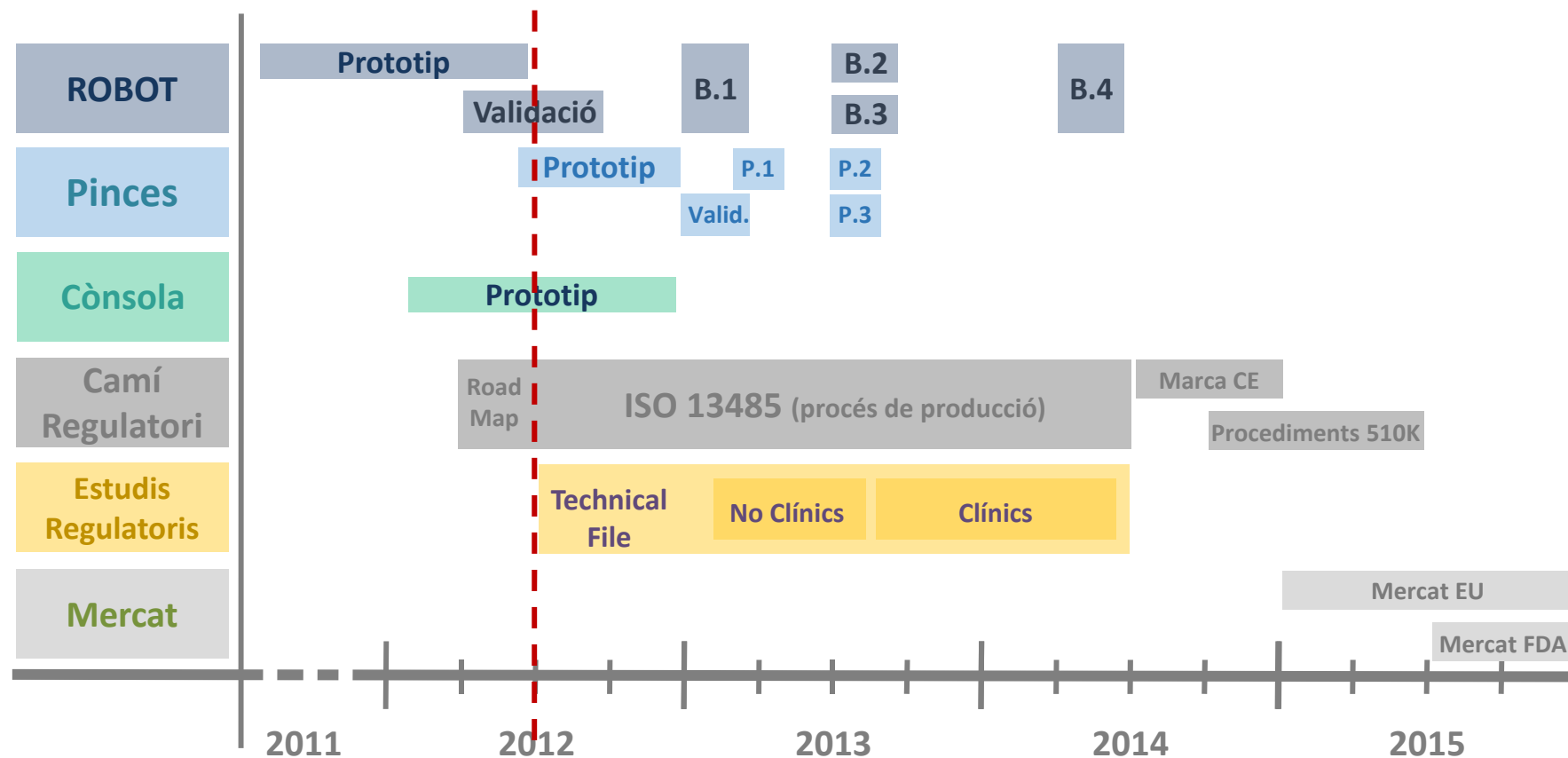
STARTING THE COMPANY

- Prepare a Business Plan
 - Surgical specialties and number of interventions
 - Study of market competitiveness
 - Temporal planning
 - Costs of each phase considered



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Prospective business plan



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STARTING THE COMPANY

- Prepare a Business Plan
- Search for a CEO
- First steps in UPC
- First round Family Fools and Friends

- Entails the creation of
RobSurgical Inversions

250.000 €



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STARTING THE COMPANY

- Prepare a Business Plan
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- Creation of the company (2012)





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STARTING THE COMPANY

- Prepare a Business Plan
- Search for a CEO
- First steps in UPC
- First round Family Fools and Friends
- Creation of the company (2012)
- Rent a space at the UPC premises
- Search for new grants

Goal: Get funds at 6 months terms

- Public calls 250K
- Bank loan 50 K€
- Research project (1M€)
- 2ª inversion round (RSI + professionals)



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UPC

IBEC



2º Prototype 2016

RSI

Innovation resources



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STARTING THE COMPANY AND EVOLUTION

- Prepare a Business Plan
- Search for a CEO
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- Creation of the company (2012)
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- Search for new grants
- New company site, with experimental Operating Room





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3º Capital increase





3º Capital Increase

How to present the company to investors

- A message on history, mission market need, kind of product and its value
- Business model
- Quantify the company value
- Compare with other potential competitors
- How much do we need and periods



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Other robots

TITAN MEDICAL



Single port

TransEnterix



Multi-robots

VERB SURGICAL



Digitalization of Surgical intervention

INTUITIVE SURGICAL®



Leader- High Precision

CMR SURGICAL



Portable and transportable



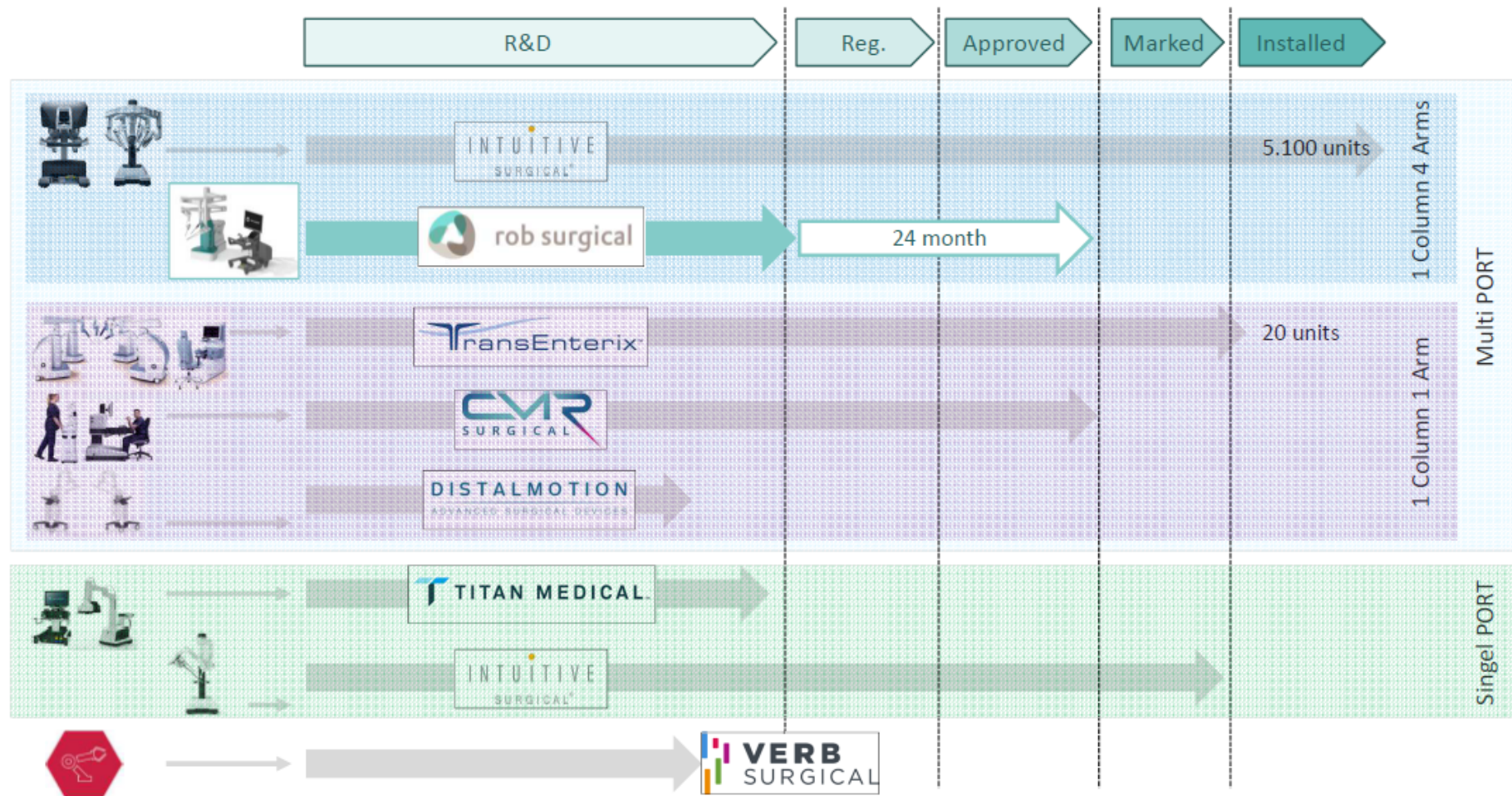
Efficiency



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Comparative situation





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July 2019



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The motors

Unexpected roadblocks

Gamma of RSS motors





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- **Regulatory pathway**
- Industrialization process
- Sales/Distribution

- ✓ Functional prototype
- ✓ Engineering prototype
- ✓ Certified unit (EU / FDA)
- ✓ Clinical validation unit (market)

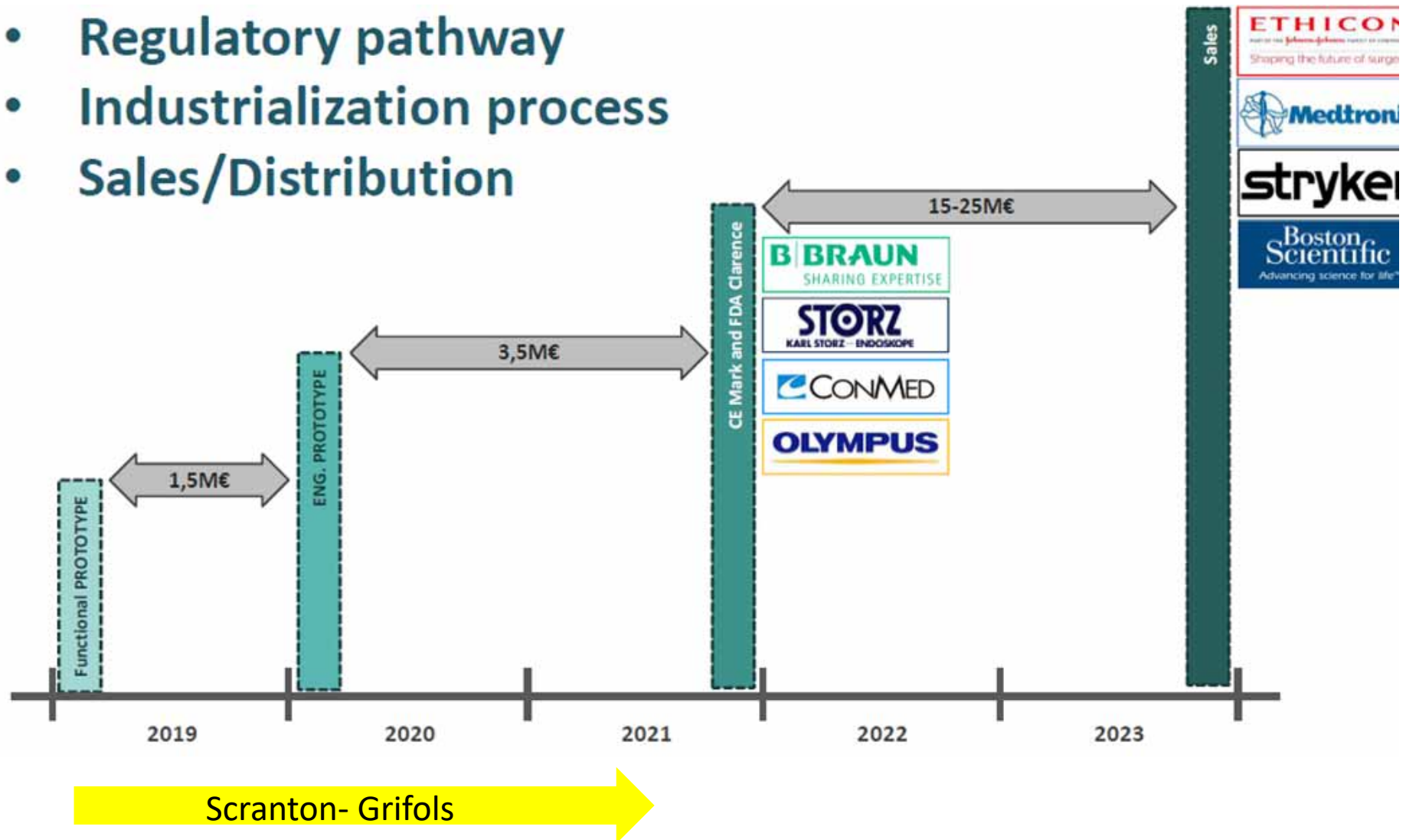




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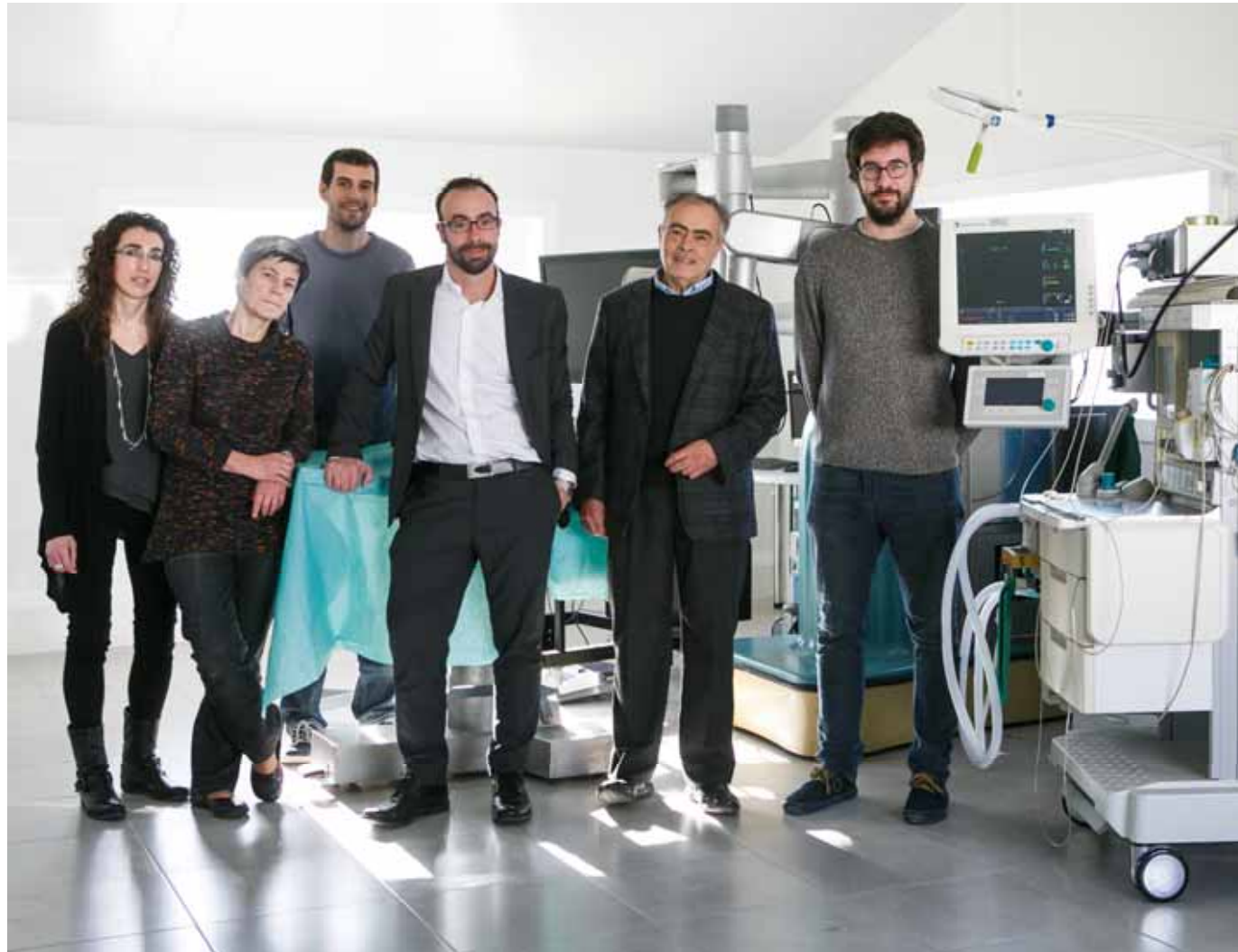
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Technical director, CEO, 7 personnel, 3 university professors + . . (2018)



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Technical director, CEO, 13 personnel, 3 university professors + . . (2020)



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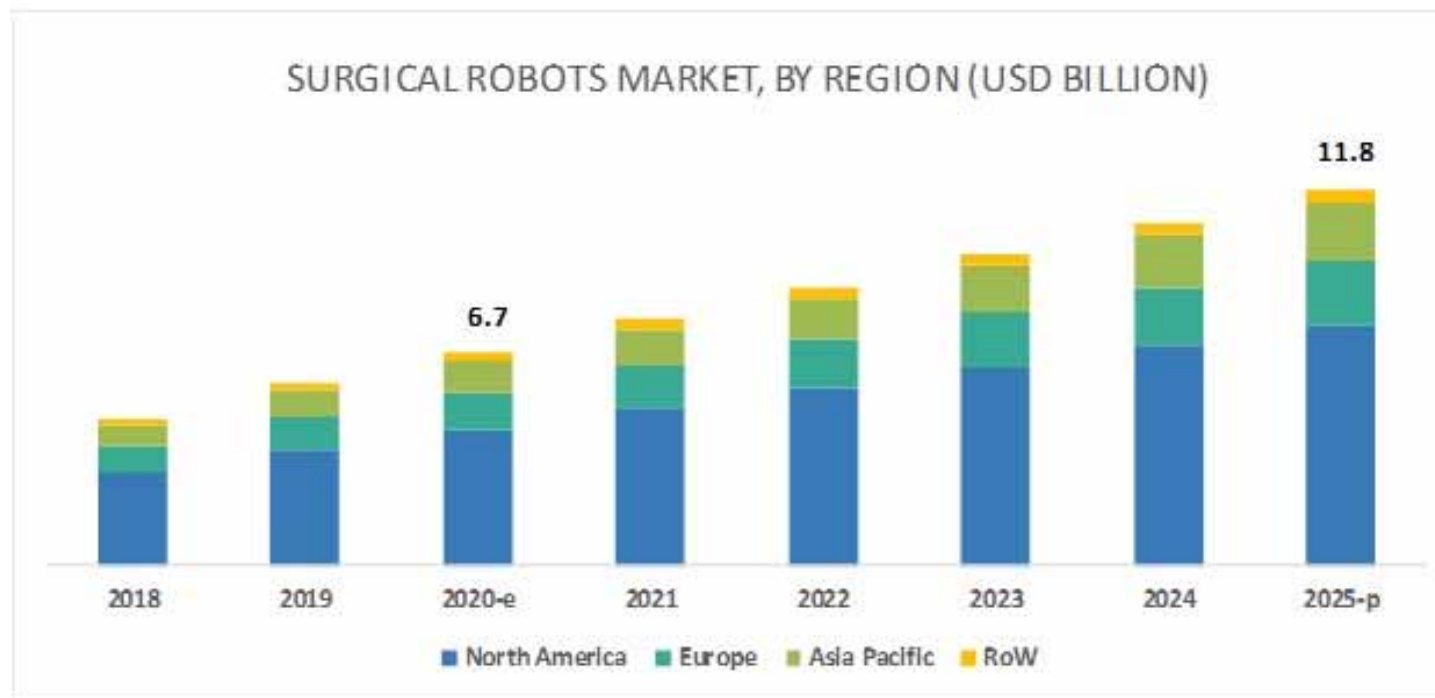
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Technical director, CEO, 13 personnel, 3 university professors + . . (2020)



From research to the market





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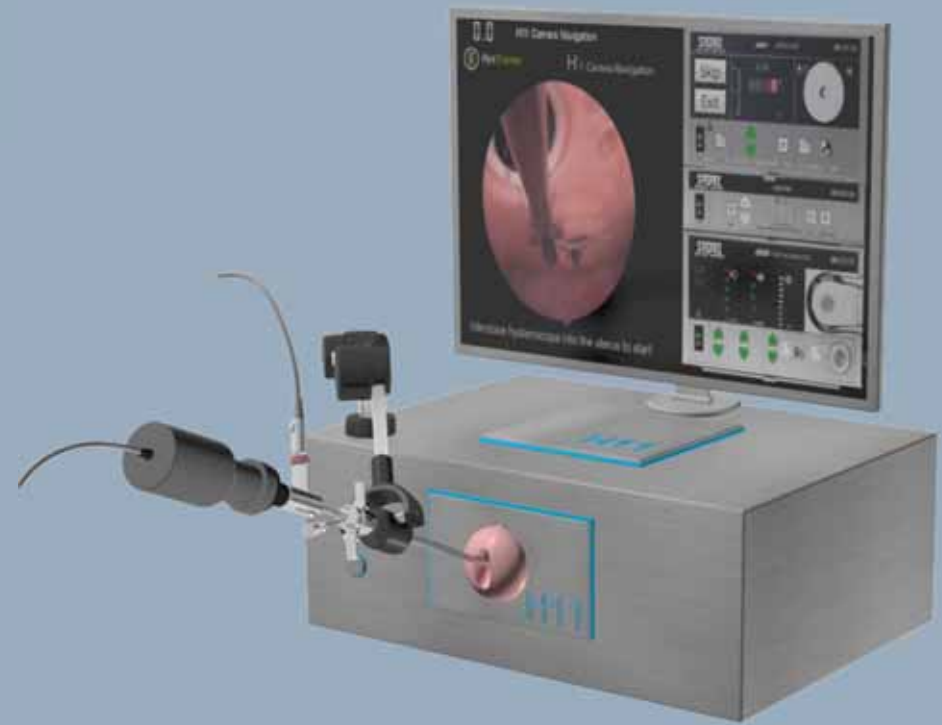
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surgitainer

better training
means better surgery





- Minimally invasive surgery requires high dexterity
- Surgeons are not obliged to get certification
- Trainers to gain abilities in surgery
- Phantom or muck-ups
- Not realistic enough
- Simulators that model surgical environments
- More versatility
- Not realistic enough





suraitrainer

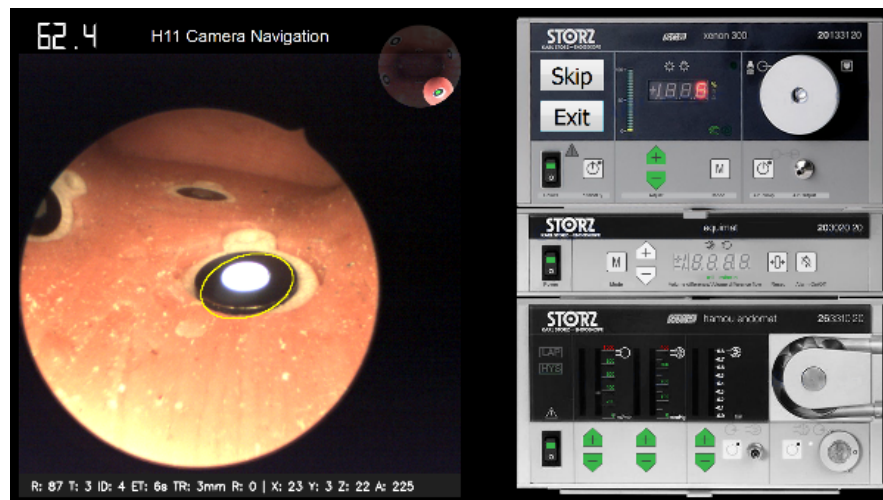
- Origin meeting engineer-surgeon in evaluation of a simulator
- Interact and discover that new developments could improve training
- Start vocationally developing a trainer





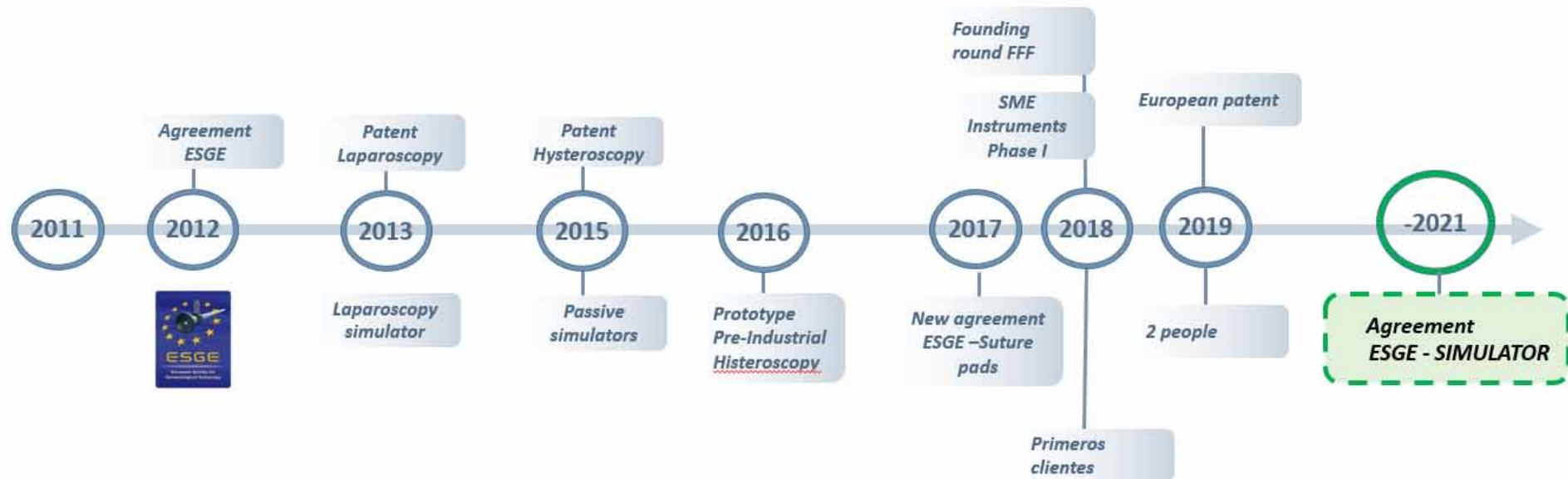
suraitrainer

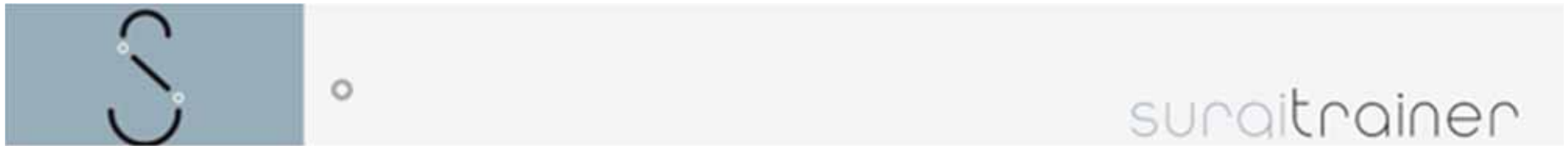
- Realistic surgical field (physical components)
- Modular (various scenarios)
- Program of exercises





suraitrainer





Active platform



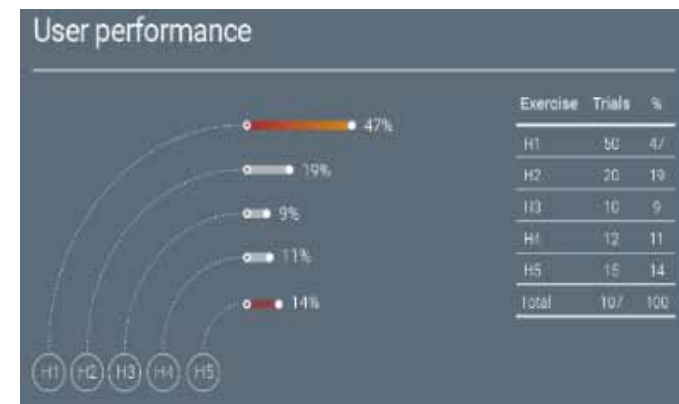
Passive platform



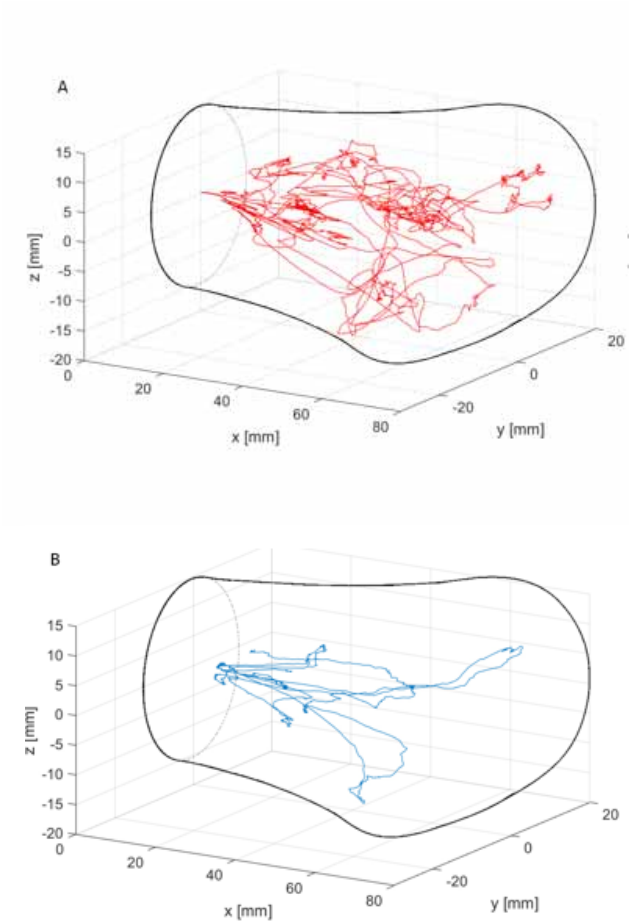
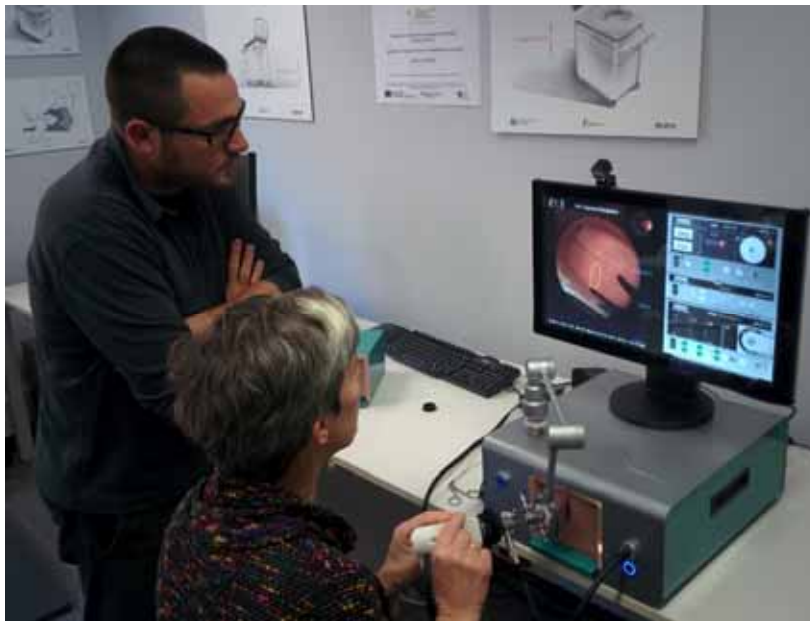
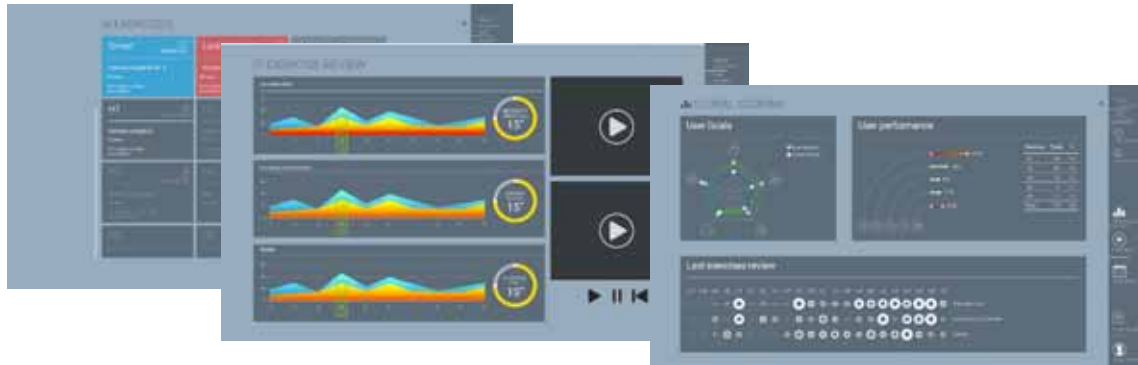
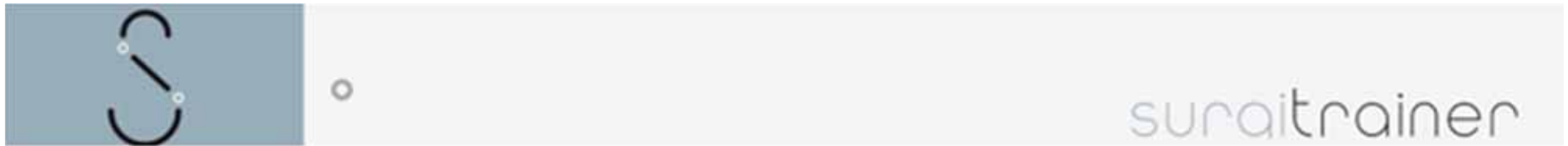
Consumables



Evaluation and statistics



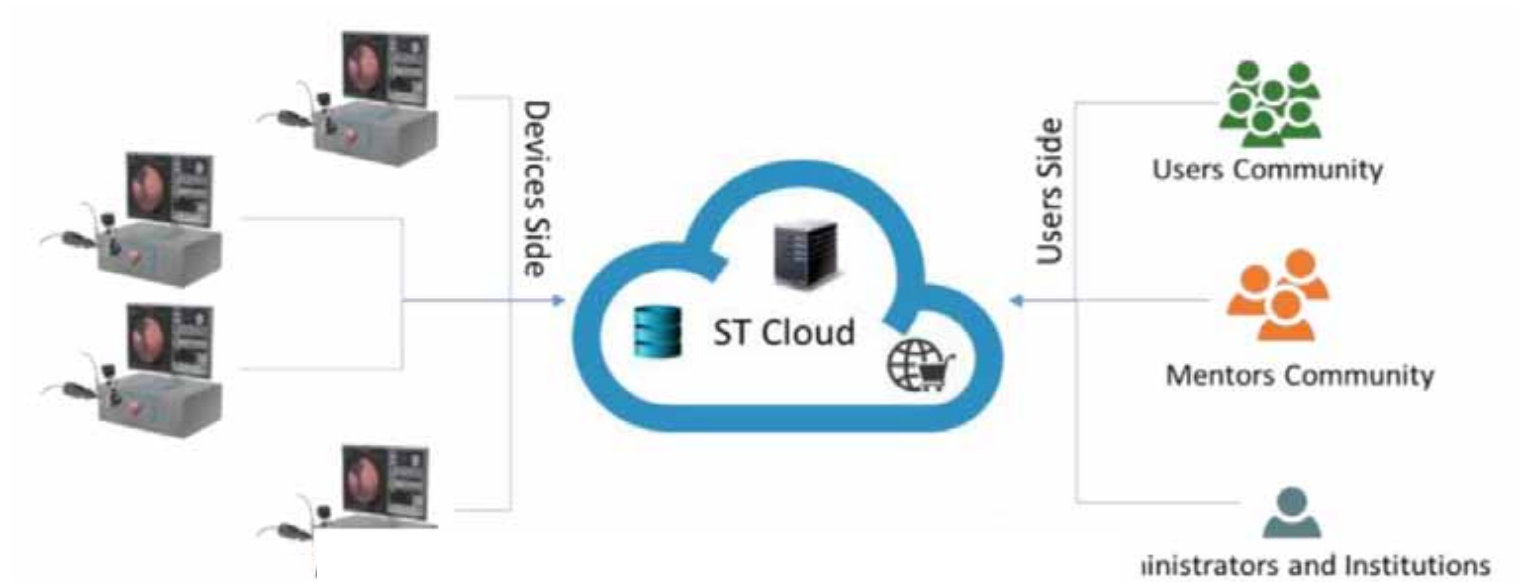
Products



The first hybrid trainer

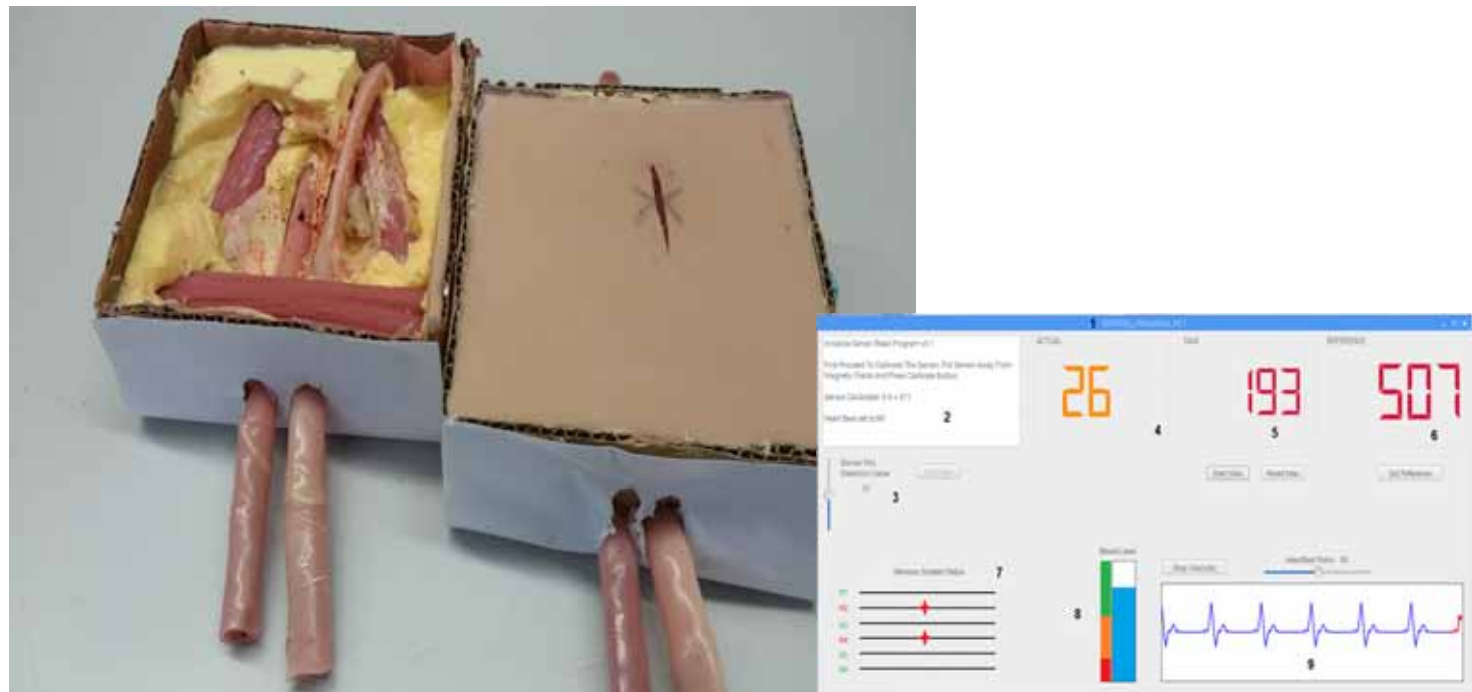


Services on line (Cloud)



To complete the products range

Anatomic realistic models Sentinel Lymph Node Biopsy

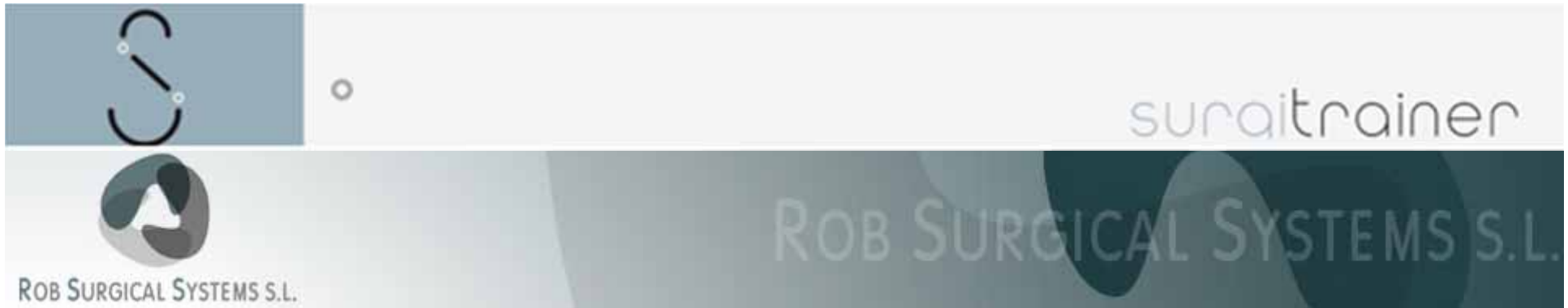


New product? New company? Just research?

Anatomic realistic models Sentinel Lymph Node Biopsy



Training course in an Hospital



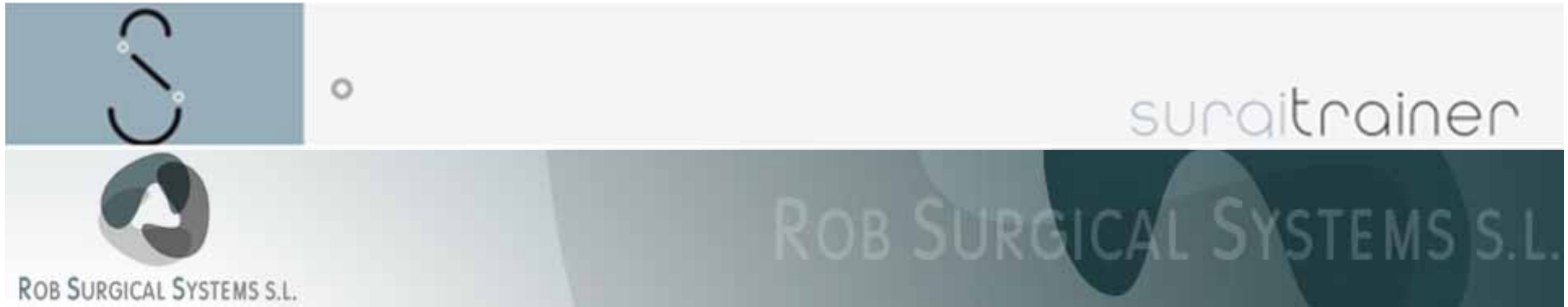
Kind of prospective market



- Growing market in surgical robotics
- Extremely long certification process
- Very high investment costs



- Still no much culture in training
- Relatively short certification process
- Moderate investment costs



Considerations and conclusions

- Basic research versus applicable research
- Partners: A company? Medical staff?
- The long way from the lab to the market
- The challenge to get funds, to find the way . . .
- A loop to start moving
- The value of the research? Of the company? Of the investment?