



# *Research Project Writing - “Absolute Beginners”*

## SCIENTIFIC PROPOSAL – EXCELLENCE

*Marta Capiluppi*  
*Daniela Grisi*  
*Claudio Nidasio*

**Part 1 – 11/06/2019**

## Tuesday **11 June**, 09:00-10:00 – **Scientific Proposal - Excellence**

- *How to structure the excellence part of the proposal*
- *How to define Objectives*
- *State of Art and beyond*
- *Methodology and Approach*

## Thursday **13 June**, 09:00-10:00 – **Impact**

- *Scientific, economic and societal Impact*
- *Dissemination & Communication (open access, data management, outreach)*
- *Exploitation of research results, IPR and Technology Transfer*

## Tuesday **18 June**, 14:00-15:00 – **Implementation**

- *Definition of Work Packages*
- *Deliverables and Milestones*
- *Graphical representation of project activities*

## Tuesday **25 June**, 14:00-15:00 – **Project Management**

- *Temporal assessment of project activities (e.g Gantt Chart)*
- *Project Management Structure*
- *Risk Analysis*



# Part 1

## Scientific proposal

- ✓ Summary
- ✓ Objectives
- ✓ State of the art
- ✓ Novelty
- ✓ Methodology and approach



# What is a project?

A project is a **temporary collection of resources and people**, with the aim of reaching **specific objectives**, usually with a known **budget** and during a certain **period of time**

The project is not the final result, but the **process** to reach such result, with consecutive **activities** and **structured phases**



# Structure of a project: Step by step

1. Analysis of **current situation** before writing the proposal
2. Identification of the causes (**problems**) generating current effects
3. Definition of **strategic objectives** of the proposed work (expected **impact** – long term on beneficiaries and target groups)
4. Definition of the **specific objective(s)** of the project, to solve the problem identified for the **target beneficiaries**
5. Definition of expected **results**
6. Definition of the **activities** which will be aimed at reaching the expected results



## Current situation

*"Alzheimer's disease is the most common form of dementia affecting more than 35 million people worldwide and its prevalence is projected to nearly double every 20 years with tremendous social and economical impact on the society. There is no cure for Alzheimer's disease and current drugs only temporarily improve disease symptoms. [...] Research efforts in the past decades have been focused on neurons and other CNS resident cells, but this "neurocentric" view has not resulted in disease-modifying therapies."*

## Problems

*"Growing evidence suggests that inflammation mechanisms are involved in Alzheimer's disease and our team has recently shown an unexpected role for neutrophils in Alzheimer's disease, supporting the innovative idea that circulating leukocytes contribute to disease pathogenesis."*

## Objectives – Activities – Results

*"The **main goal** of this project is to study the role of immune cells in animal models of Alzheimer's disease focusing on neutrophils and T cells. **We will first** study leukocyte-endothelial interactions in CNS microcirculation in intravital microscopy experiments. Leukocyte trafficking will be then studied inside the brain parenchyma [...]. Overall, IMMUNOALZHEIMER **will generate fundamental knowledge** to the understanding of the role of immune cells in neurodegeneration and will unveil novel therapeutic strategies to address Alzheimer's disease."*

[https://cordis.europa.eu/project/rcn/204896\\_en.html](https://cordis.europa.eu/project/rcn/204896_en.html)

# What do I have to write?

If the funder provides a template

→ Follow it **BLINDLY!**

If no template is provided

→ Look at the **evaluation criteria** and use them as sections of your proposal

In any case:

- **Start** with a first paragraph presenting the **challenge / problem** and its **relevance**
- **Conclude** with a paragraph reminding the challenge, the **ground-breaking nature** of your proposal and the **impact** on research and society

## REMARK

Evaluators follow their evaluation grid while reading the proposal

Ease them in finding the information they need!

# Introducing the project: a short summary

**Try to summarise the main features of your proposal in few lines**

## **Why – Motivation**

- Why is this proposal important for the research area?
- Why is this proposal important for the researchers involved?
- Why is this proposal important for the institutions involved?

## **What – Main scientific result(s) of your project**

- The topic(s) of the project
- The research goal
- The main research results

## **Who – Key actors involved in the project**

- The Researcher(s) and their expertise
- The Institution(s) and their commitment

Review this summary once  
the proposal is finished!





### Why – Motivation

*“The fundamental idea in representation theory is to understand an abstract algebraic object - usually a ring or an algebra - by understanding how it acts on simpler additive structures such as abelian groups or vector spaces. These actions are known as representations and those associated to a particular ring form a category.”*

### What – Main scientific result(s) of your project

*“In this proposal we lay out a research programme that will develop modern tilting theory using a novel approach originating in mathematical logic: we will understand tilting theory via the theory of purity, functor categories and Ziegler spectra. [...]*

*Our focus will be on silting theory, which encompasses tilting theory but considers a larger collection of abelian subcategories of the derived category, including some that are not derived equivalent to the original category.”*

### Who – Key actors involved in the project

*“The project will take place at the University of Verona under the supervision of Prof. XXX who is a expert on the topic of tilting theory. Given my background in the functorial approach to the model theory of modules, this project will facilitate a valuable exchange of knowledge.”*

## How to find objectives?

### DEFINE THE PROBLEM/S AND SUBSTANTIATE THE NEED FOR STUDY

You must document a **need** (corresponding to a **gap**), demonstrate sufficiently that this particular project **meets that need**, and convince the reader that what is proposed is worth financing

**Objectives must be few!**

## Objectives must be SMART!



- ✓ **S = Specific:** *‘What specifically needs to be done to reach the global objective?’*
- ✓ **M = Measurable:** *‘How will you know when the objective has been successfully met?’ (use qualitative or quantitative indicators)*
- ✓ **A = Achievable:** *‘Can the objective be accomplished within the established timeframe and planned human and physical resources?’*
- ✓ **R = Relevant:** *‘Is it instrumental to the scope and impact set out in the call, and to the fixed General Objectives?’*
- ✓ **T = Time-bound:** *‘Will it be accomplished within the target date?’*



## Objectives

### ***Technical objectives – Develop a cognitive autonomous system for solo surgery***

- *Design a perception module, using the pre-operative information about the surgery and the data collected intra-operatively [...]*
- *Design a cognitive control module [...]*
- *Design a low-level multi-robot control architecture [...]*
- *Development of the two robotic assistive arms [...]*

### ***Clinical objectives – Perform solo surgery in robotic MIS***

- *Translation of medical knowledge into an engineering formalism easy to be interpreted by the autonomous system;*
- *Enhancement of the da Vinci console by integrating multi-modal visual feedback [...]*
- *Introduction of force/tactile feedback at the master console [...]*
- *Development of a new generation of disposable synthetic human abdomen and pelvic region models [...]*



## Objectives

- *The first scientific objective of the ARS project will be to fully analyze and formally represent real surgical interventions with abstract models*
- *The second scientific objective of the project will be to develop methods to plan an intervention for a specific anatomy*
- *The third scientific objective of the project is to develop methods for the real time control of the surgical instruments*
- *The fourth and most ambitious scientific objective of the ARS project is the development of situation awareness and reasoning methods capable to handle a real surgical intervention*
- *The fifth and final objective of this project is to demonstrate the autonomous execution of a representative surgical intervention using the DVRK setup and a patient specific physical phantom.*

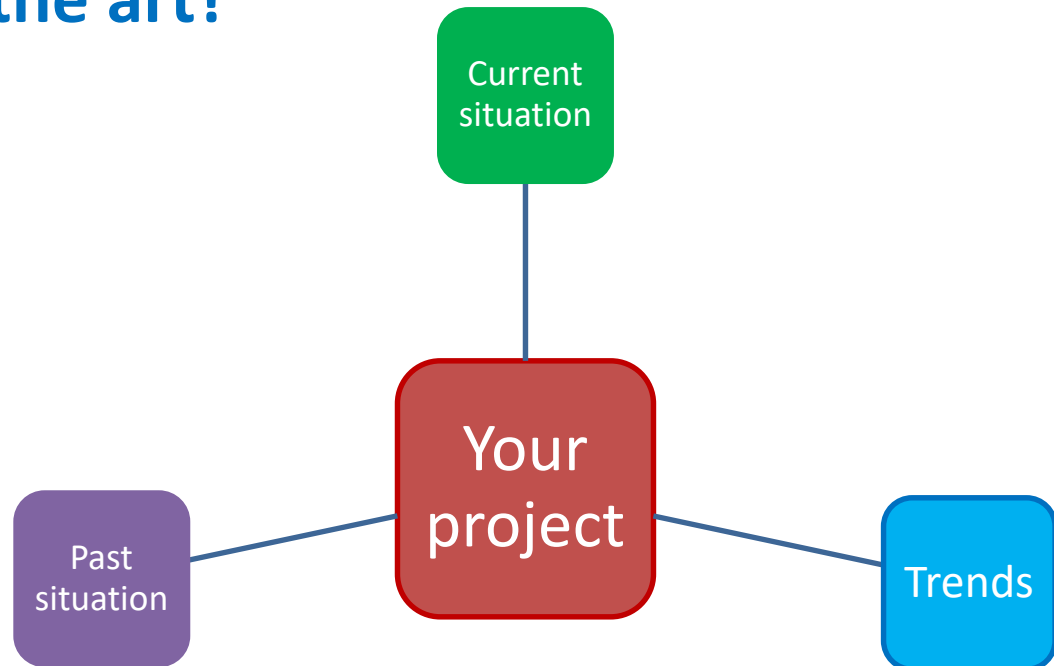
- ✓ Formulate the **main question** of your research project
- ✓ Expose the current/past solutions to your question with their strong and weak points
- ✓ Outline the trends and stress the difficulties in choosing one of the available solutions expressed by the scientific community

References to bibliography



State of the art → Basic / fundamental concepts and ideas

**How could your project bring the investigation beyond the actual state of the art?**





## State of the art

### ***Object detection and recognition***

*Common approaches to object detection and recognition from images are based on the Support Vector Machine (SVM) classification of a dense set of handcrafted features (e.g. SIFT). Most recently, however, Neural Networks with an increased depth of network layers and more effective learning strategies have come back to the forefront of machine learning, as they allow us to learn multiple levels of feature representation at different abstraction levels. These ‘deep’ networks [30] have recently achieved state-of-the-art performance on image classification thanks to Rectified Linear Units [31] activation functions and parallelisation across multiple GPUs.*

## ... and beyond

### ***Innovations on Object detection and recognition***

*We will apply and further develop the most recent **deep neural network architectures for the online detection and recognition of [...]**. Previous Faster Regions with Convolutional Neural Network (R-CNN) architectures contemplate a Region Proposal Network telling the detection network where to look for objects of interest within the image, and a separate object detection network whose purpose is to assign a cost [...] to each region proposal. The most recent Single Shot MultiBox Detector object detector addresses Faster R-CNN’s issues with accuracy and speed at frame level, as it completely eliminates the region proposal generation step and is single-stage, end-to-end trainable. **An even faster object detector [...]** will be implemented and compared to SSD. **Sophisticated online tracking algorithms will be explored for dealing with the tracking of multiple objects of interest.***



Describe and explain the **overall concept** underpinning the project

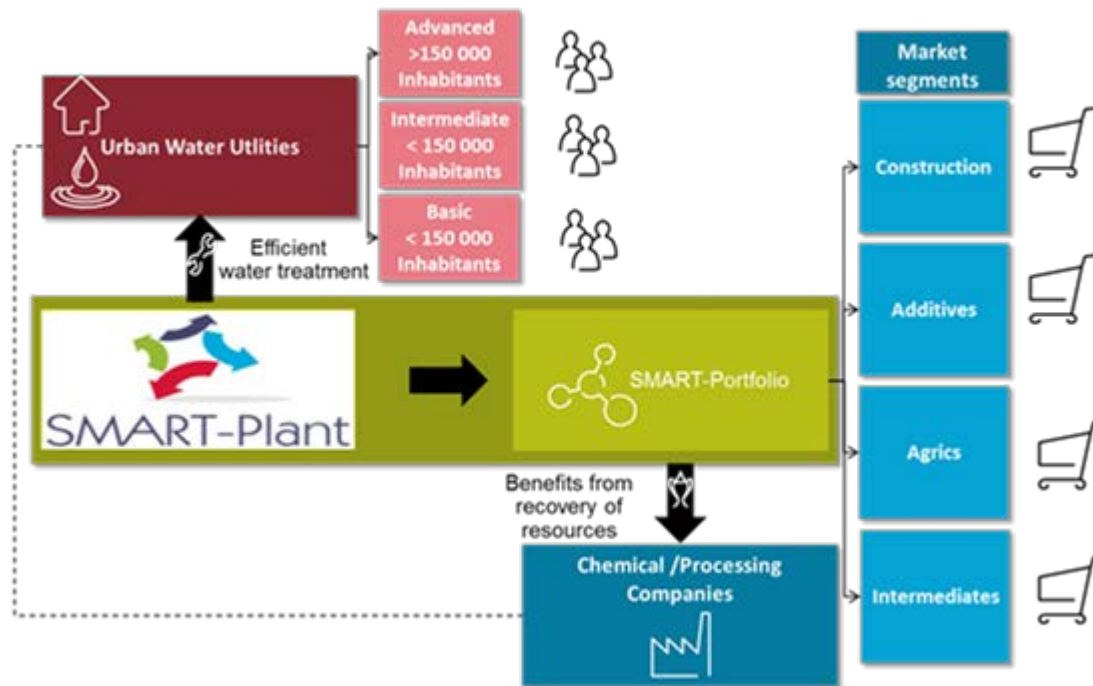
- ✓ Describe the **main ideas**, models or assumptions involved
- ✓ Identify any **inter-disciplinary considerations**
- ✓ Include **measures** taken for public/societal engagement on issues related to the project
- ✓ Describe the **positioning of the project** e.g. where it is situated in the spectrum from 'idea to application', or from 'lab to market'





### Concept

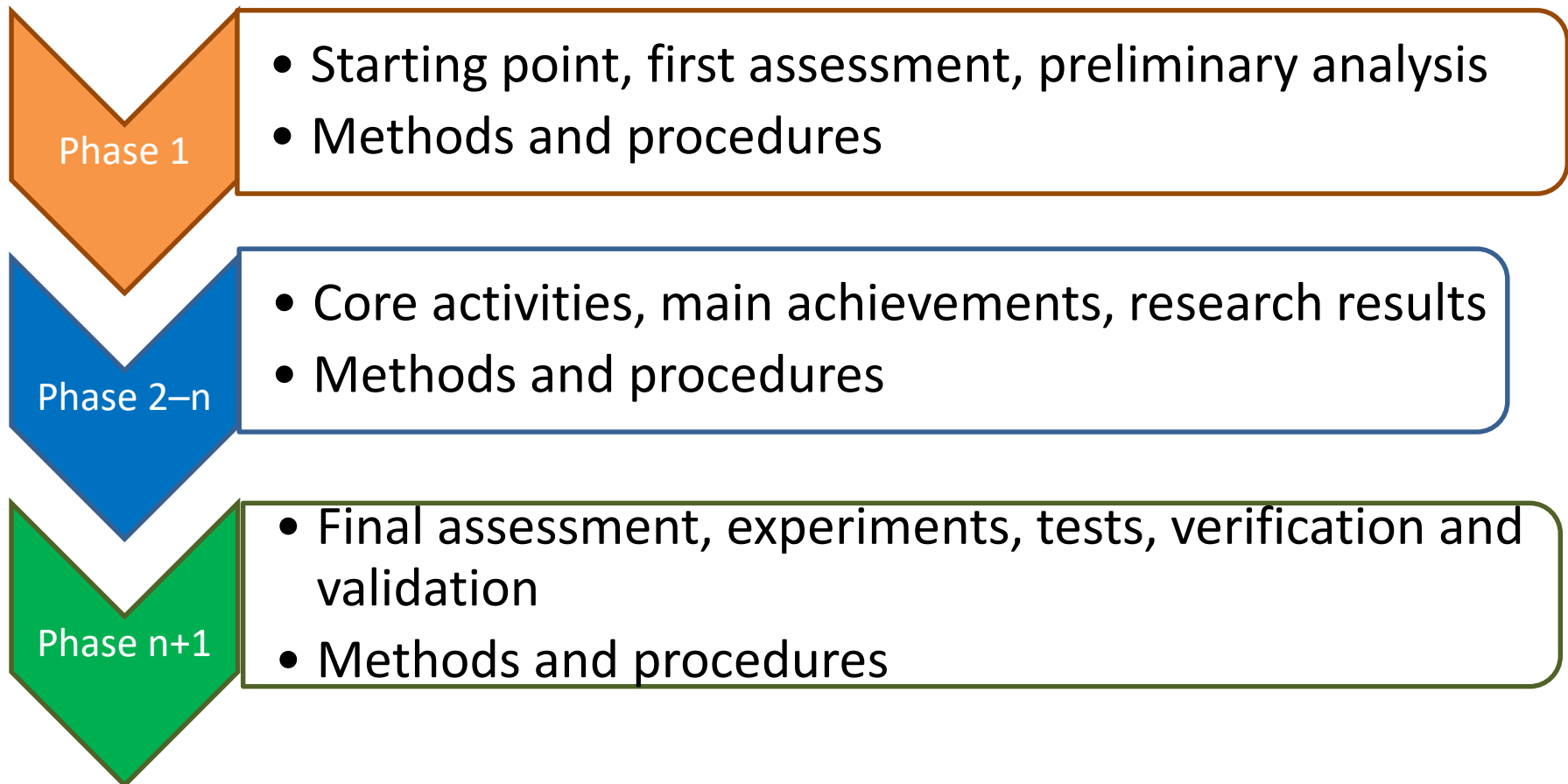
#### Schematic view of SMART-Plant Model



- ✓ Methodological **steps** (sequential phases, thematic areas)
- ✓ Research **methods** and how they are connected
- ✓ Key **concepts**
- ✓ Protocols, experimental plans, pilots, activities of testing and demonstration
- ✓ Make use of **graphs and tables**



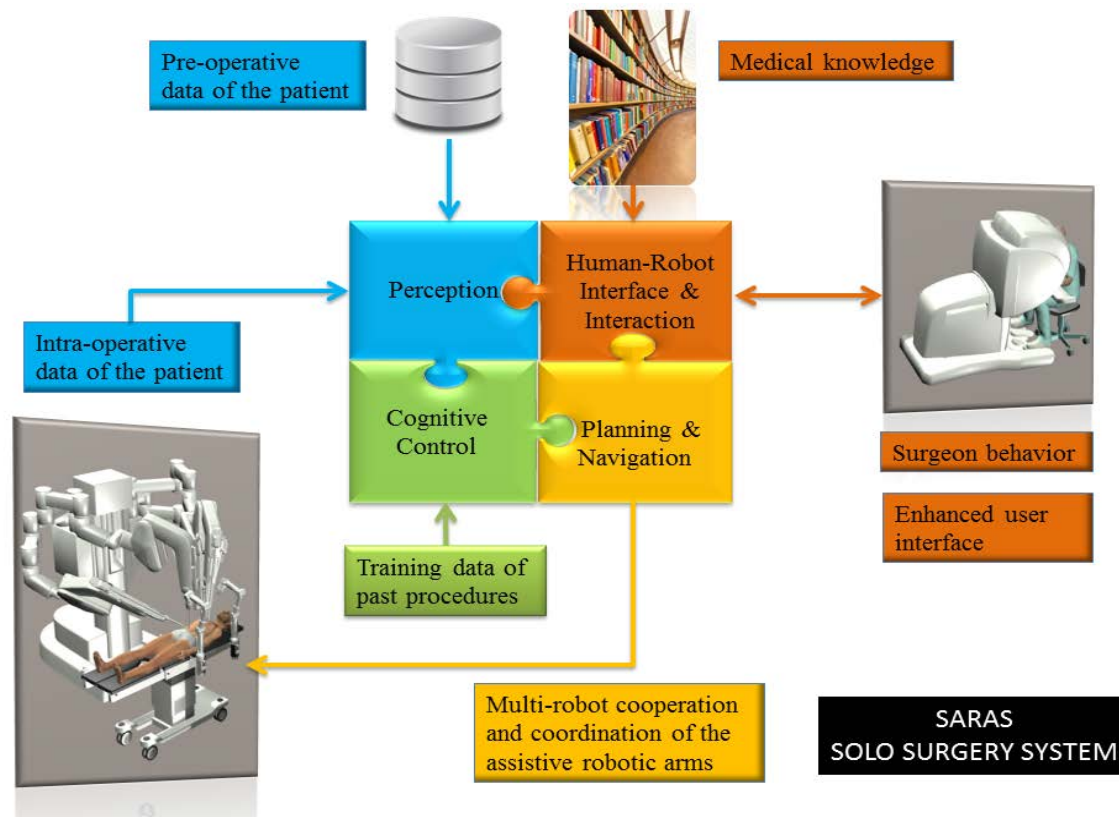
## How will your project implement its concept?





## Methodology

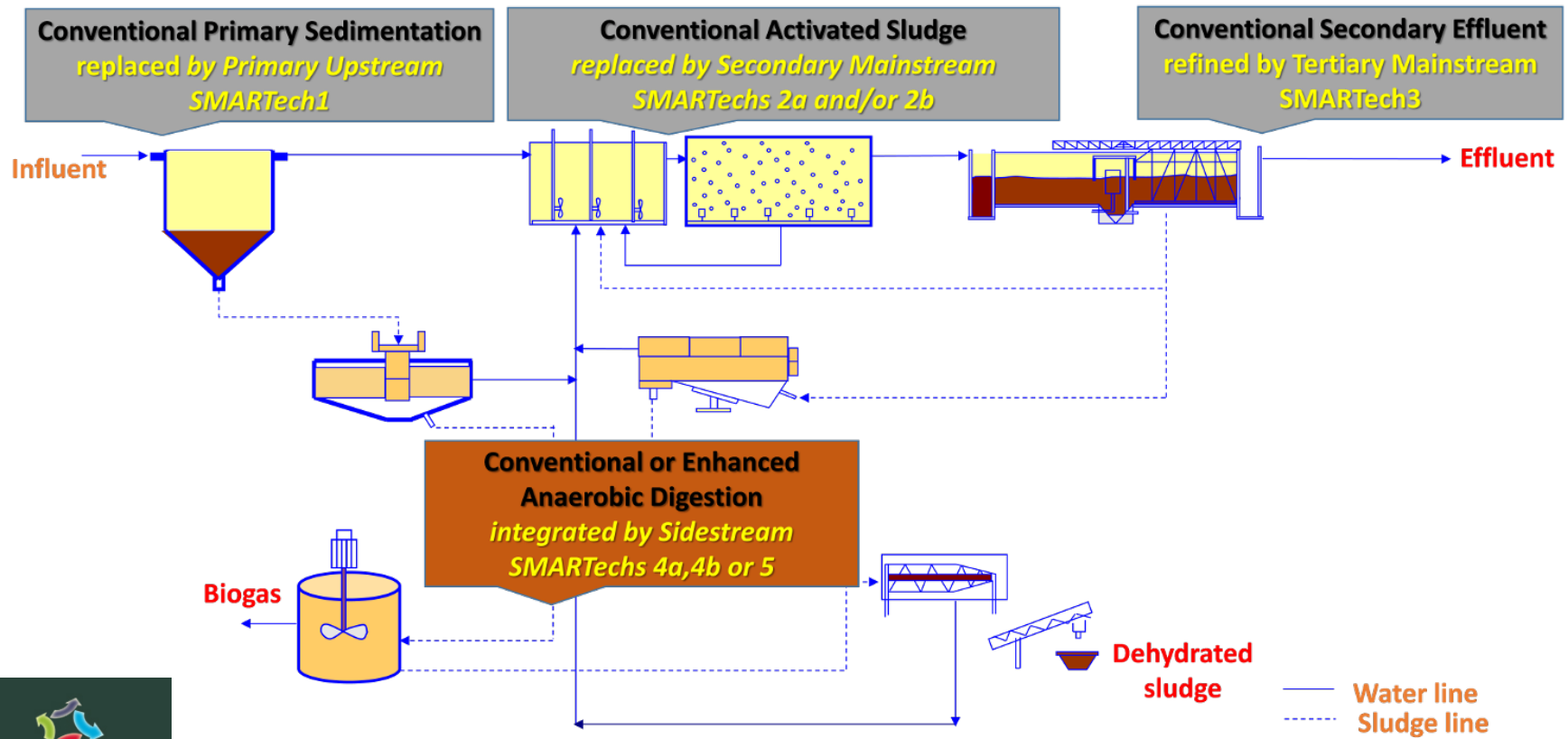
*“The architecture core is composed of four tightly connected technologies (Perception, Interaction, Cognition and Planning) that provide the abilities needed by SARAS.”*





### Methodology

SMART-Plant technology platform: approach for integration in existing conventional wastewater treatment plants



Why is your research project **original or innovative**?

- ✓ Methods/approaches
- ✓ Final expected results
- ✓ New field of Application
- ✓ New products/services
- ✓ Big Pilots
- ✓ New markets



Innovation can refer to **Technology transfer** and/or **Social innovation**



## Innovation and Originality

**Surgical robot actual scenario:** Currently during a laparoscopic or a robotic assisted surgical procedures several units of medical personnel are requested in the operating room:

- the main surgeon tele-operating the surgical robot
- the assistant surgeon
- nurses

This practice leads to **an inefficient management** of the hospitals' economic resources and to unnecessary long waiting lists for patients.

**The future:** The goal of SARAS is to develop the **next-generation of surgical robotic systems**. These will allow a **single surgeon to execute Robotic Minimally Invasive Surgery without the need of an expert assistant surgeon**, thereby **increasing the social and economic efficiency** of a hospital while guaranteeing the same level of safety for patients.

**Innovation:** The robot developed by the SARAS project [...] will consist of a **pair of cooperating and autonomous robotic arms** holding the surgical instruments.





## Conclusions

***Three unique factors make this project very timely and with great chances of success***

***Factor 1***

*The encouraging results of our past project I-SUR on autonomous robotic surgical actions*

***Factor 2***

*The availability of a large dataset of clinical robotic surgical interventions thanks to the collaboration with international clinical research centers.*

***Factor 3***

*The readiness of a da Vinci surgical robot equipped with the da Vinci Research Kit (DVRK) on which to demonstrate the results.*

*[...]*

***The ARS project will focus on robotic surgery and will demonstrate the feasibility of autonomous surgery in a complete surgical procedure.***



# Contacts



[Info\\_Ricerca](#)



[LinkedIn](#)



[Facebook](#)

Università di Verona

Area Ricerca

Unità Progettazione e Rendicontazione Progetti di Ricerca

Website: <https://www.univr.it/it/organizzazione/area-ricerca/progettazione-e-rendicontazione-progetti-di-ricerca>

**POLO MED (Life sciences)**

[ricerca.poloMED@ateneo.univr.it](mailto:ricerca.poloMED@ateneo.univr.it)

**POLO SCI (Biotechnology – ICT)**

[ricerca.poloSCI@ateneo.univr.it](mailto:ricerca.poloSCI@ateneo.univr.it)

**POLO SSH (Social sciences and Humanities)**

[ricerca.poloSSH@ateneo.univr.it](mailto:ricerca.poloSSH@ateneo.univr.it)