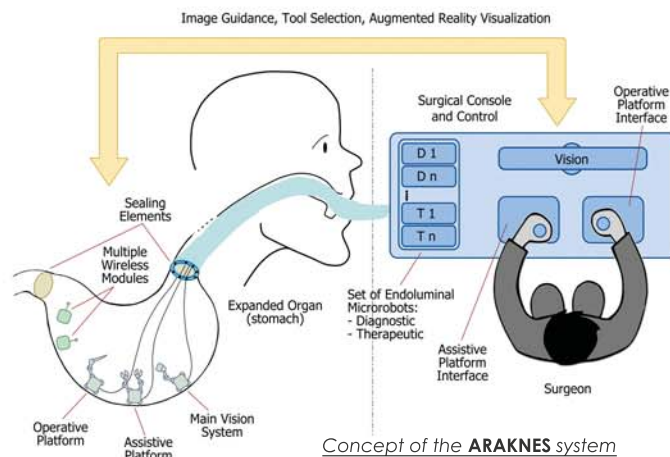


## Goal.

**ARAKNES** is focused on **innovative robotic system for endoluminal surgery**. The project aims at bringing inside the **patient's stomach** a set of **advanced bio-robotic and microsystem technologies** for therapy and surgery.

The ultimate goal of **ARAKNES** is to integrate the advantages of **traditional open surgery, laparoscopic surgery (MIS), and robotics surgery** into a novel operative system for **bi-manual, ambulatory, tethered, visible scarless surgery, based on an array of smart microrobotic instrumentation**.

According to these, the precise objective of the project is to **bring the ARAKNES system close to real industrial manufacturing and full product validation, so as to make it available soon to surgeons for clinical use**.



## Research Issues and Key Innovations.

The **ARAKNES** system attempts to **advance the current endoscopic surgical procedures** by adding the bi-manual tele-operation equivalent to that of laparoscopic surgical robots. The main key innovations are:

- development of a pliable single **oro-pharyno-esophageal-access port** for the **introduction of multiple instruments** rather than one single or serially inserted instruments, as in laparoscopy;
- development of an **array of monitoring, assistive and operative micro-robots** from which the surgeon can select the ones to use depending on the needs of the task;
- development of **in-situ monitoring platform** integrated in the robotic endoluminal units;
- **MEMS, photonic-based and nano-based devices** are integrated in the monitoring, assisting and operating micro-robots, thus allowing the performance of **tissue interrogation tasks** normally not available during traditional laparoscopy;
- development of **micro-systems for drug injection, tissue ablation, micrometric positioning and bio-magnetic therapy** that will be integrated in the bi-manual operative platform;
- development of a **miniaturized endoluminal video-module** with **sideview capabilities** and several lighting subunits that produce diverse angles of light incidence;
- development of a **user-friendly, ergonomic human machine interface**, with a high degree of transparency;
- **extreme flexibility** and a **high level of accuracy** that is a merging between **robot locomotion accuracy and tool accuracy**.

## Expected Impact.

The objectives and impact of the **ARAKNES** project are very broad and ambitious.

The concept of a **total micro-robotic based smart operating system for advanced endoluminal surgery** is entirely new and it provides a sound **technological basis for the eventual progression to the NOTES** (Natural Orifice Transgastric Endoscopic Surgery) approach, contributing to **reinforce European competitiveness** in endoluminal robotic surgical fields. **ARAKNES** has the ambition to **improve the quality of life of a large number of citizens**, with a relevant impact on the healthcare systems, in terms of **hospitalization time and costs, and general health management**.

In particular, the transfer of technologies of bi-manual laparoscopic surgery to the endoluminal surgical approach allows a significant reducing of the operative trauma and enhances the therapeutic outcome of minimally invasive surgical procedures for the most common **gastric disorders** such as **morbid obesity** and **gastro-esophageal reflux**.

**Morbid obesity affects 20% of adults in Europe** and **symptomatic reflux disease affects 30-40% of the adult population**, 5% of whom require surgery because of failure of medical therapy. Laparoscopic surgery is the only surgical treatment available currently, but for some patients with additional diseases, **the ARAKNES treatment with its endoluminal access can be the only possible solution**.