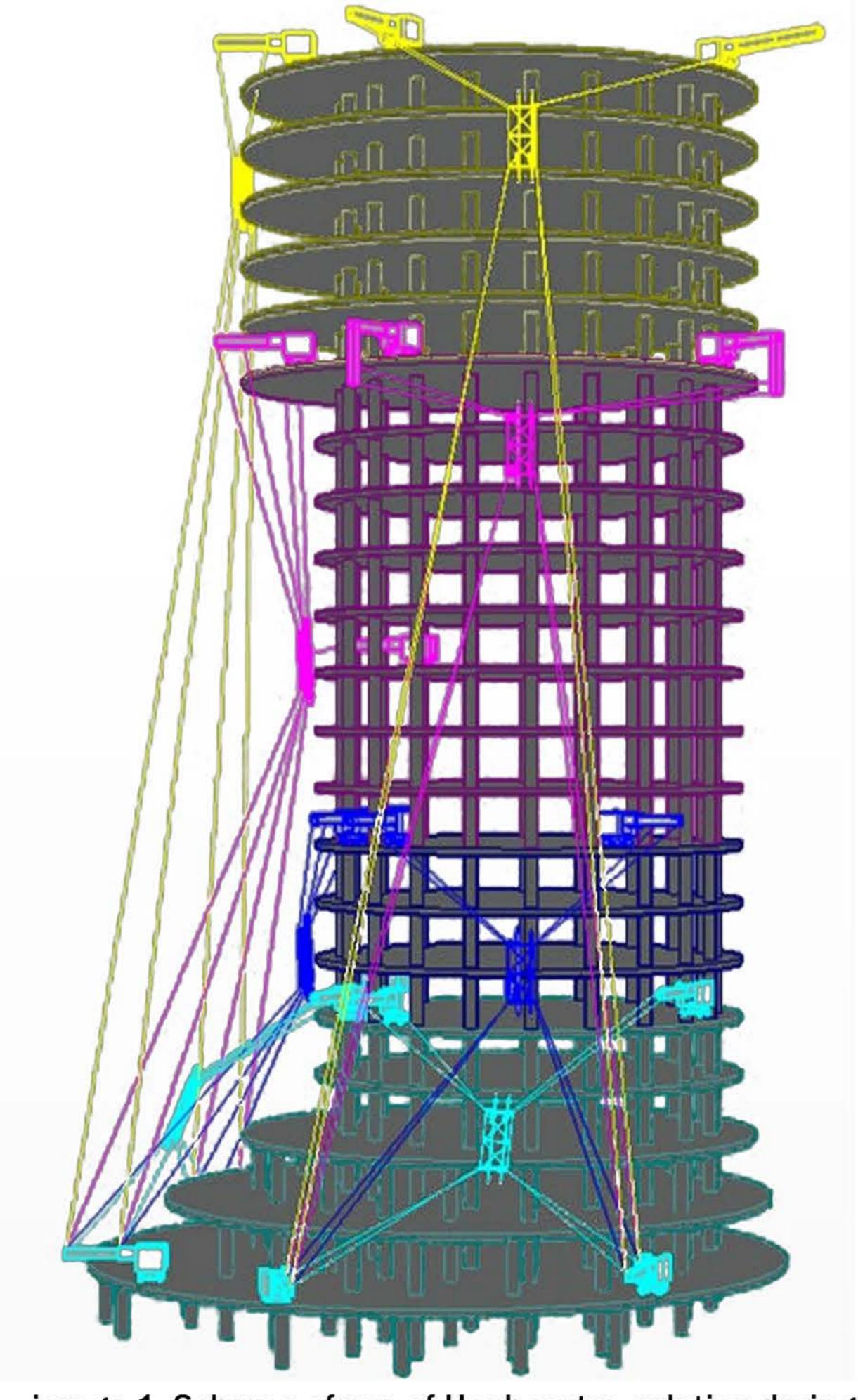


Highly automatEd PHysical Achievements and performancES using cable roboTs Unique Systems

www.hephaestus-project.eu

Grant Agreement number: 732513 — HEPHAESTUS — H2020-ICT-2016-2017/H2020-ICT-2016-1



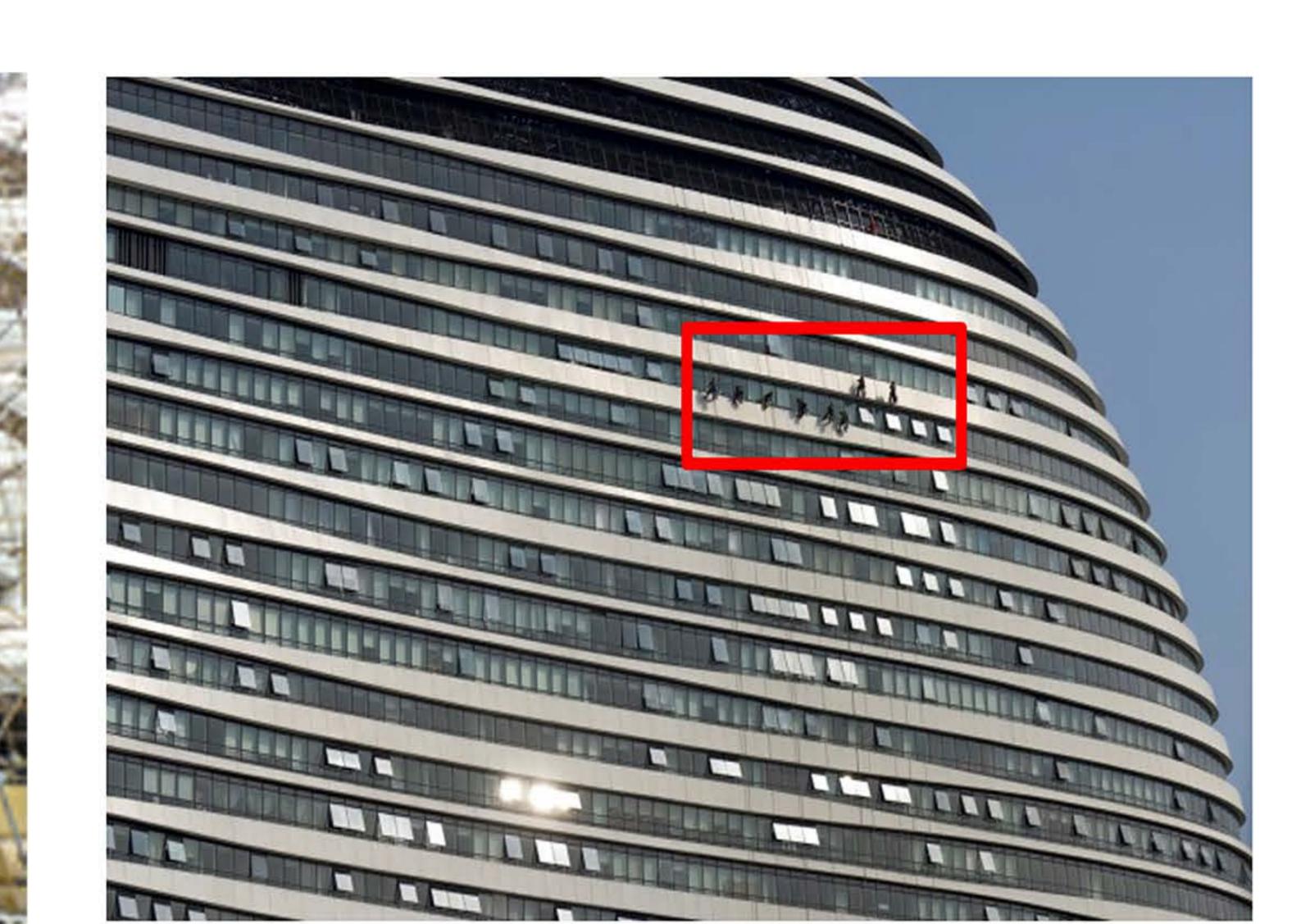


the construction of a complex Building facade. Image: Iturralde, Linner and Bock, Chair for Building

Picture 1: Problems that solve the project.

Scaffolding to install curtain wall facades

image 1: Scheme of use of Hephaestus solution during Realization and Robotics, Technische Universität München



Picture 2: Problems that solve the project - Workers cleaning a glass façade by climbing

AABITOH

- Hephaestus project addresses novel introduce Robotics and concepts to Systems use Autonomous in the Construction Sector where the presence of this type of products is minor or almost non-existent.
- It focuses to give novel solutions to one of the most important fields in Construction, the field related to the facades and the works that need to be done when this part of a building is built or need maintenance. -Hephaestus proposes new automatized ways to install these products, providing a highly solution only not industrialized in production but also in installation and maintenance.

APPRIACH

- Hephaestus is mainly based on a cable-driven robot that integrates several technologies for creating a multiple job performer.
- Hephaestus has been conceived as a solution for accomplishing multiple tasks on vertical or inclined planes of the built and outdoor environment.
- Hephaestus will be equipped with a modular end-effector kit to host several tools:
 - -All the processes to install the façade on the building
 - -All the accessory devices necessary for the sensing and controlling system
- The research will focus on the installation of curtain walls (some modification to these systems will be necessary)
- Robot Oriented Design criteria will be applied.

177867

- Hephaestus aims at automating the On-site Installation Execution process empowering strengthening and Construction Sector Europe positioning the European Robotic Industry as leader and reference in the huge and new growing market for the robotics.
- Hephaestus solution would allow reducing up to 90% the number of work accidents during façade installation and cleaning processes.
- Hephaestus can reduce around 20% of installation cost and around 44% of the annual maintenance and cleaning costs.
- The target market for the solution, the Curtain wall sector, currently accounts for an annual market of €30,000 million in Europe.
- The solution can be easily adapted to other tasks in the Construction Sector.



Image 2: Scheme of use of Hephaestus solution Iturralde, Linner and Bock, Chair for Building Realization and Robotics, Technische Universität München

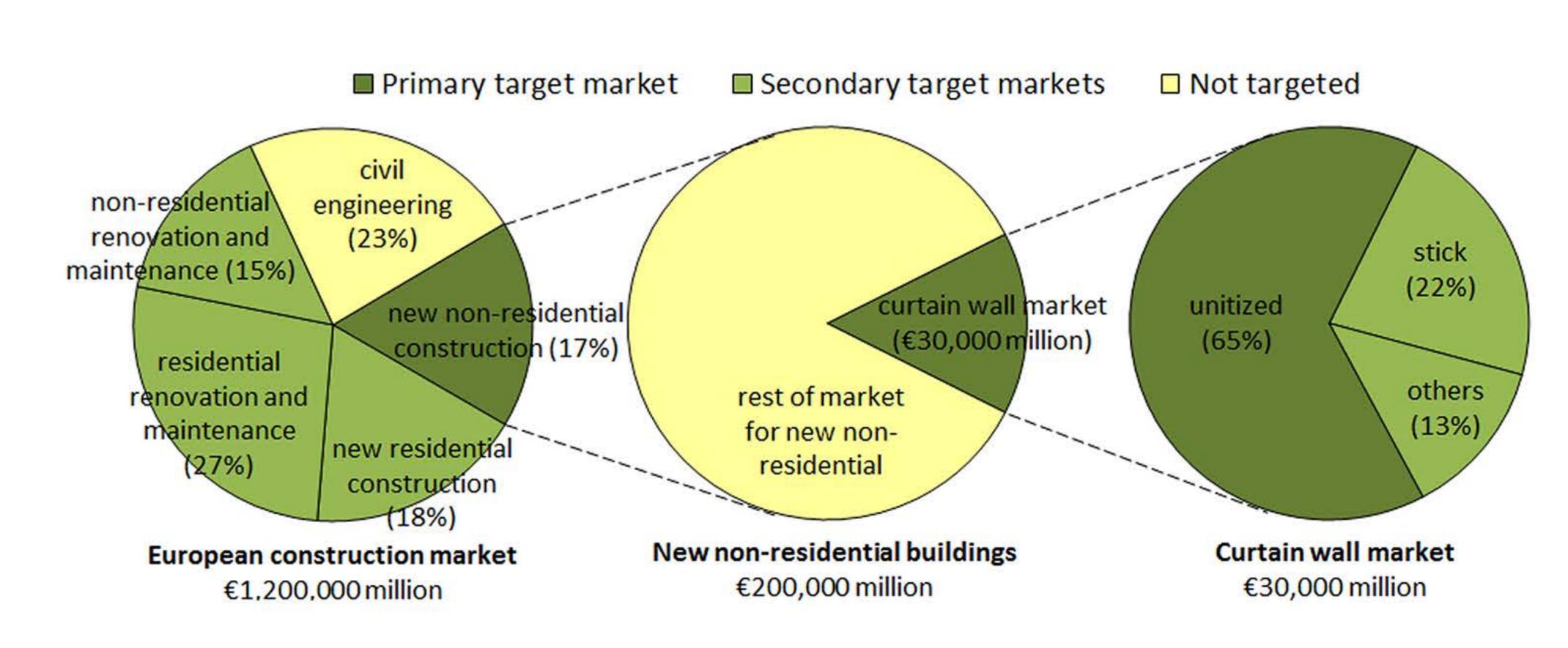
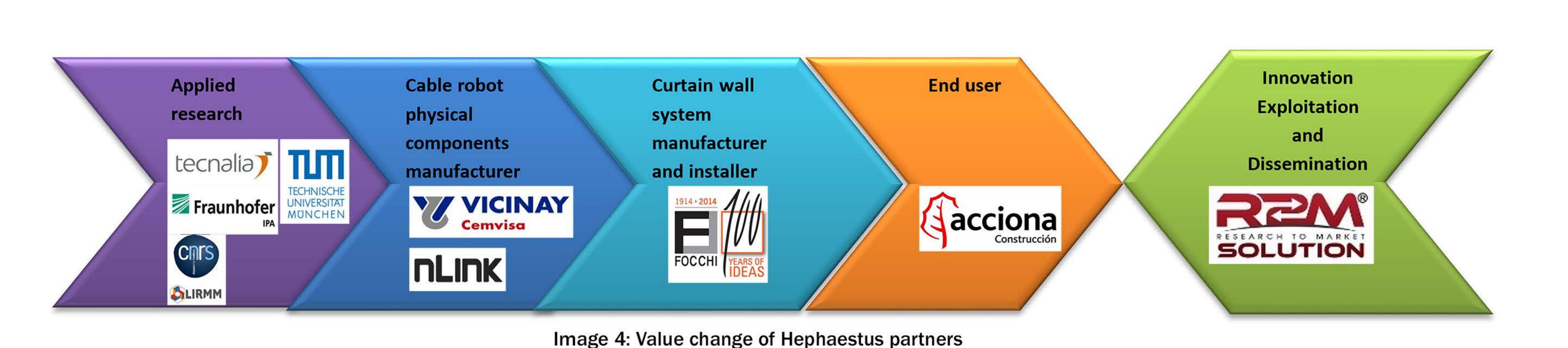


Image 3: Target market for Hephaestus solution. Size and segmentation of European construction market by building typologies (left), for curtain wall industry (centre), and by curtain wall construction technologies (right)

TRL1 Basic principles observed	TRL 2 Technology Concept	TRL 3 Experimental proof of	TRL 4 Technology validated in	TRL 5 Technology validated in	TRL 6 Technology demonstrated	TRL 7 System prototype demonstration in	TRL 8 System complete and	TRL 9 Actual system proven in
	formulated	concept	lab	relevant environment	in relevant environment	operational environment	qualified	operational environment
			Cable driven robot for vertical Works					
			Subsystem 1					
			Subsystem 2					

Table 1: Position of the Project in the Technology Readiness level scale



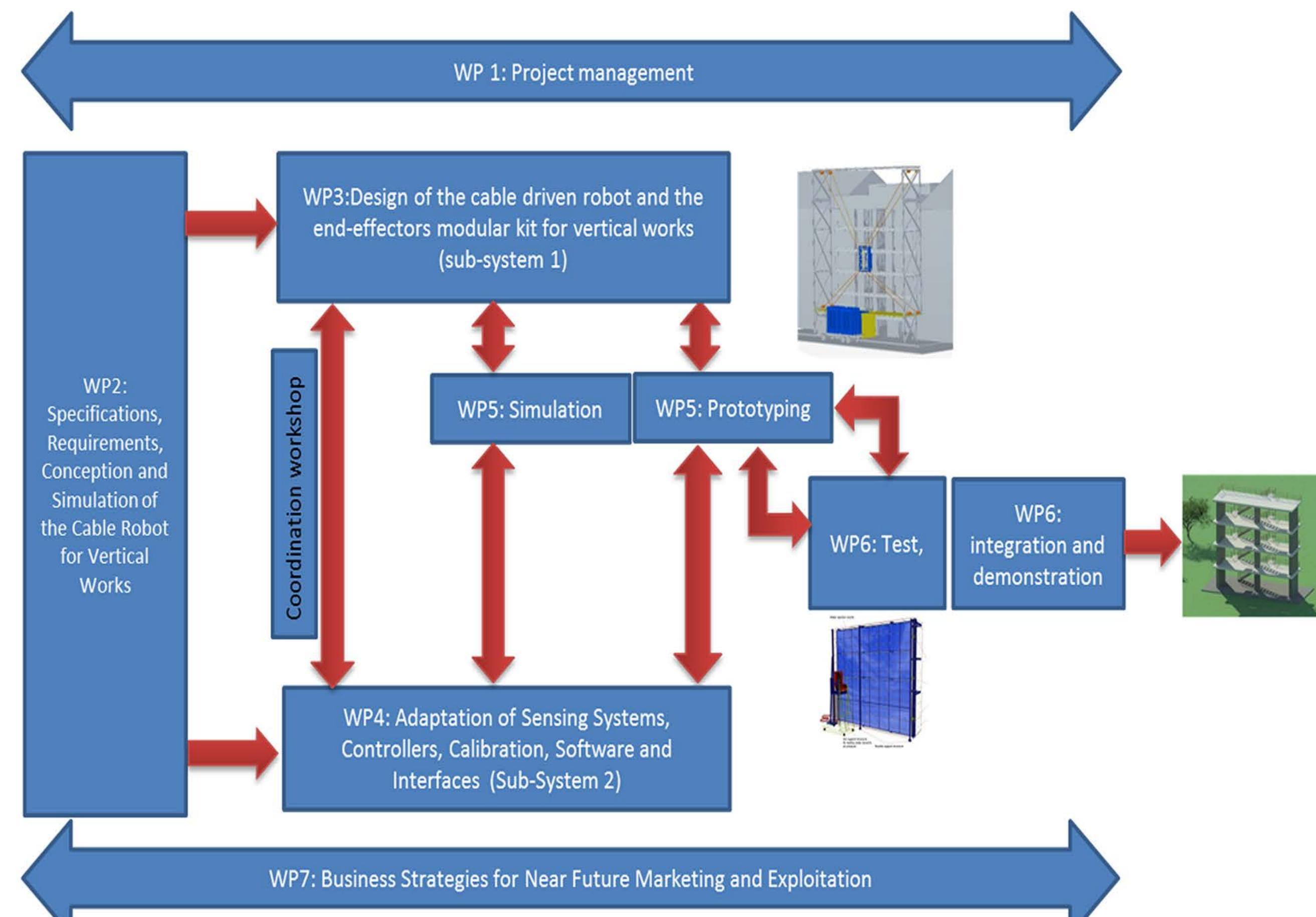


Image 5: PERT diagram of the Project WorkPackages







undertakes applied research

components.



LIRMM The Centre National de la Recherche Scientifique (National

Center for Scientific Research) is a public organization under the responsibility of the French Ministry of Education and Research. As the largest fundamental research organization in Europe, CNRS carries out research in all fields of knowledge, through its ten scientific institutes. CNRS encourages collaboration

different disciplines in particular with universities thus opening new fields of enquiry to meet social and economic needs. The Montpellier Laboratory of Informatics, Robotics, and

Technologies.

French) is a Joint Research Unit (JRU 5506) of Montpellier University (UM) and the National Center for Scientific Research (CNRS). The LIRMM's research automatable production activities position is at the heart processes, as well as the development of robotic of Information, Communications systems and their key and systems Sciences and

Within the VICINAY Industrial Group, which has its roots in the eighteenth century, CEMVISA VICINAY S.A. was established as a result of companies' merger-split on 3rd November 1993.The merging firms, VICINAY ELEVACION S.A. and CATENA INDUSTRIAL S.A., with more than 50 years of experience, had a high reputation in the domestic and foreign markets. The VICINAY group holds commercial offices in several countries and owns manufacture facilities in Spain, Brazil, Sweden and China.

The mission of our company is the design and accordance with the specific needs of our Quality Management

NLINK VICINAY

nLink specialises in advanced The Focchi Group was robotics for the construction founded in 1914, and has industry, and have developed retained its original name the world's first mobile thanks to its continuous ownership by Focchi family. drilling robot that drill holes based BIM-coordinates. It is Up to the 1950s, Focchi designed to relieve operated in the metal carpentry sector, later construction workers from expanding its technology to overhead work involved with measuring and drilling in aluminium work and, in concrete ceilings, while particular, to door and eliminating concrete dust om

site. The Mobile Drilling

Work-Related

(WMSD), and increase

also focuses on integrating

BIM (Building Information

Model) and robots, and

providing analytics and

monitoring for robot systems

that are not followed by

technical personnel.

window frames. It was in the 1970s that the Robot will greatly reduce company entered the curtain walling sector, and Musculoskeletal Disorders this has remained the company's core business productivity by saving days or ever since.

FOCCHI YEARS OF IDEAS

The core business is the on larger industrial buildings realization of curtain walling for architecture. installation of curtain

The activity can be defined as: design, manufacture and walling systems with high technological and service content, and curtain walling with high-energy efficiency. Focchi is engaged in the full cladding process from design, manufacture,

delivery and site installation.



Acciona is a leading

European construction

company constructing and

managing buildings and civil

infrastructures under the

sustainability principles. It

has an international

presence in more than 30

countries and its total

turnover in 2014 was about

2.6 billion €, employing by

15.200 people. It is part of

Acciona Group, whose

business lines are

Construction, Energy, Water,

Real State,

Urban-Environmental

Services, Logistic and

transport. Acciona's business

strategy is tightly linked to

sustainability and in

recognition of the company's

efforts and commitments in

that direction, received in

2009 the Award for

Corporate Sustainability of

the EU Business Award.



R2M Solution is an integrated and multi-disciplinary consulting company that aggressively targets filling the gap between research activities and market implementation. We excel at helping companies grow and acting as an accelerator for bringing

technologies and services to the market across the fields of Innovation Management, Engineering,

Energy, and ICT/Automation. We invest in opportunities, conduct research, and offer pure engineering, energy services, and ICT consulting services. We actively seek spinoff creation opportunities, showcase promising

technologies and build

clusters for their uptake.

FUNDACIÓN TECNALIA RESEARCH & INNOVATION is a private, independent, non-profit applied research center of international excellence. Legally a Foundation, Tecnalia is the leading private and independent research and technology organization in Spain and one of the largest in Europe, employing 1,319 people (198 PhDs) and with income of 94 Million € in

committed to generate major impacts in economic terms, by means of innovation and technological development, addressed by 8 business divisions, covering economic sectors of Energy, Industry, Transportation, Construction, Health and ICT. TECNALIA has been granted over 250 patents and promoted more than 30 spin-off companies. Two Divisions of Tecnalia have a key role in the project:

the Sustainable Construction

and Industry & Transport

Divisions

2014. TECNALIA is

TUM is one of Europe's top The Fraunhofer-Gesellschaft universities committed to excellence in research and interdisciplinary education. The Chair for Building Realization and Robotics (br²)

merges management competency (construction management, technology management, innovation management) with competency in advanced technologies (production technology, ICT,

Microsystems technology, mechatronics, automation, robotics, personal assistance technology) and applies it to solve challenges of our society by considering all phases of building's lifecycle (development, planning,

construction, use/performance, de-construction/end-of-life)

of direct utility to private and public enterprise and of wide benefit to society. Its services are solicited by customers and contractual partners in industry, the service sector and public administration. The Fraunhofer-Gesellschaft maintains 58 Institutes, at over 40 different locations throughout Germany. A staff between specialists from of some 12,500, predominantly qualified scientists and engineers, works with an annual research budget of over one billion euros. Fraunhofer IPA includes the Micro-electronics (LIRMM in Robotic Systems department whose research areas encompass all the subject areas connected with robot deployment and

like office buildings, schools and shopping malls. nLink

manufacture of Lifting **Equipment and Chains in** customers, strictly adhering to the principles of our System.