

INNOVATION REPORT

Boosting health on three fronts: patients, the healthcare system and the economy



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The costs of sustaining healthcare for the world's ageing population are rising constantly and have become a significant component of global GDP. A growing number of patients require complicated surgical interventions, which are more and more replaced by image guided minimally invasive procedures as these have shown to improve patient outcome and reduce costs. The aim of the MEDIATE ITEA 2 project was to improve these minimally invasive procedures by fully integrating all medical imaging sources and therapeutic devices into the interventional workflow including optimised UI's and decision support.

The economic burden of chronic disease

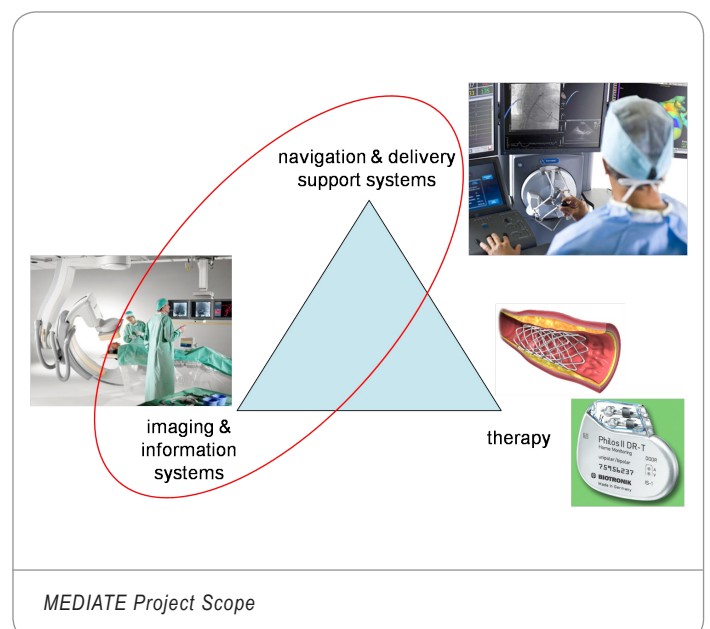
With chronic diseases responsible for the consumption of the vast majority of healthcare resources around the world, exceeding 70% in developed countries, a focal shift is occurring in healthcare practice, from acute to chronic care. Cardiovascular diseases alone are responsible for 42% of all deaths in the EU, for 21% of productivity losses and cost the EU economy €192 billion a year, with the consequence that healthcare staffing needs are rising due to greater demand for patient attention. While the drive to increase hospital efficiency will continue and the average length of stay for acute care has fallen by a third in nearly all OECD countries since 1990, costs continue to increase inexorably. By 2015 global healthcare spending is expected to have risen to 15% of world GDP.

Knowledge of patient's condition an essential starting point

MEDIATE developed a set of technologies to improve healthcare practitioners' knowledge of individual patient condition as well as the predictability of procedures, reduce complications and obtain better clinical outcomes from treatment. This ITEA 2 project focused on the medical fields of cardiology, oncology and orthopaedics, the planned minimally invasive procedures for which follow a pre-programmed workflow, namely medical imaging to aid diagnosis, intervention planning, the intervention itself using image-guided navigation of therapeutic devices (like needles, catheters, artificial heart valves or endoscopic instruments) and finally evaluation and follow up.

Smooth and seamless integration

MEDIATE geared its efforts to developing system architectures that enable the integration of multi-modal systems, support multi-vendor interoperability, allow integration of third-party solutions and facilitate user interaction. The platform-independent, interoperable solutions were based on open, stable standards such as XML Web Services, Dicom and DVI while new software and electronics concepts for user interaction, communication and ergonomics were optimised for the specific tasks and environment of the clinical user. It became clear that the solutions needed to be intuitive and easy to use, support communication between clinical staff, address logging and reporting as well as facilitate optimal workflow. As for the software and electronics for navigation and autonomous steering of diagnostic and therapeutic devices, these devices were smoothly and seamlessly integrated with imaging systems to enable the real-time acquisition, processing, integration and visualisation of high-resolution medical images from different sources. Finally, there was a focus on the analysis, pattern recognition and decision support for diagnosis, planning and treatment during medical interventions.



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Large and growing market

The diagnostic and interventional medical imaging market is worth almost €20 billion globally, with the USA taking about half and Europe a quarter. The market is growing steadily at an average compound annual growth rate (CAGR) about 4%. For some segments, projected growth rates are even higher. The European market for 3D imaging has a CAGR of 14% from 2004 to 2014, and the global clinical decision support system (CDSS) market almost doubled from €159 million in 2006 to €289 million by 2012.

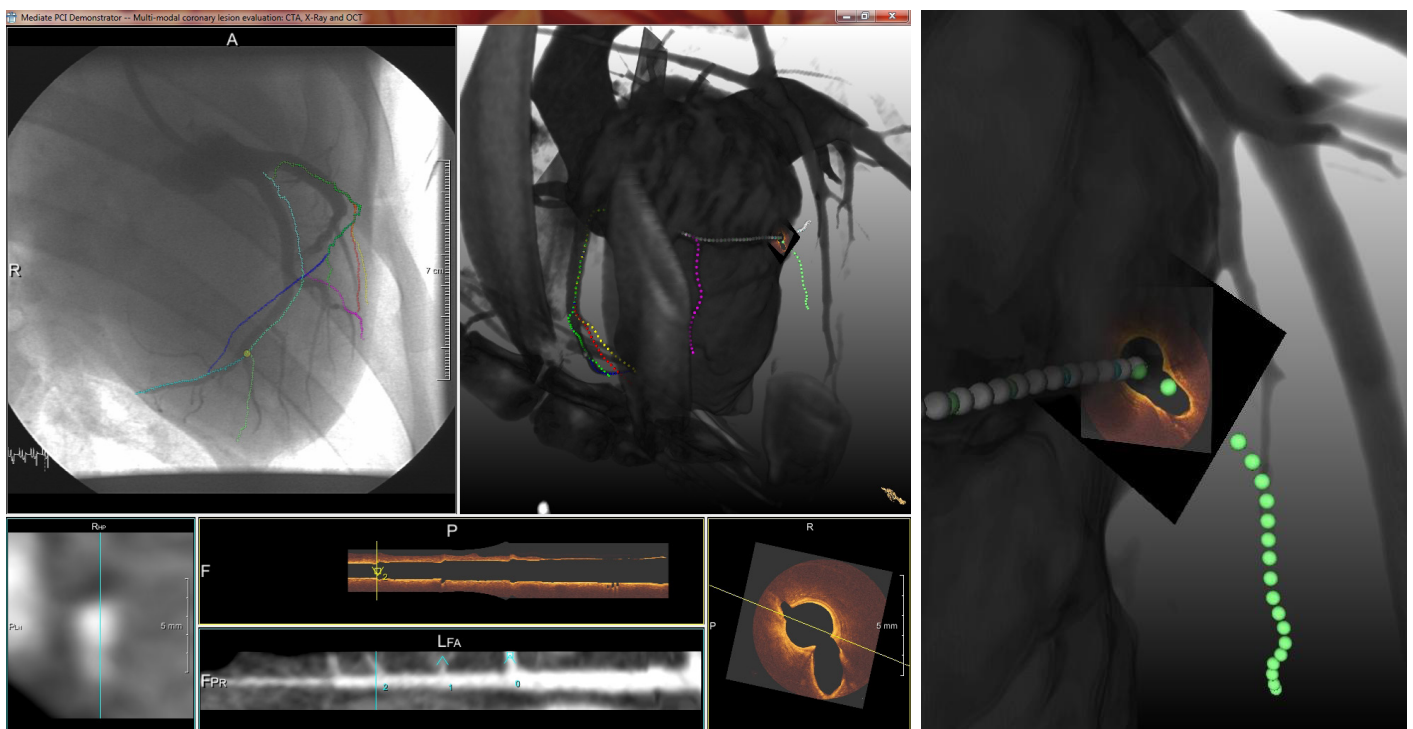
More efficient medical care

The idea in MEDiate is to make the medical intervention more efficient by enabling the physician to see at a glance all the pre-operative and operative data on a single screen. Which means that he can then concentrate on the patient rather than having to search through different information sources. To this end an architecture has been developed that enables this integration to be managed, in terms not only of the information but also of the robotics that is increasingly becoming a feature of surgery. This will also be of benefit for

instantaneous interventional support by medical specialists to remote situations such as in peripheral hospitals and makeshift battlefield hospitals where not all the expertise is to hand. For society at large, the move towards minimally invasive surgical solutions based on medical imaging will deliver more efficient care and shorter time in hospital, with most of the growth in minimally invasive solutions occurring in the cardiovascular and oncology areas. Given the very high costs of healthcare in these oncology segments, the most immediate cost savings can be realised here.

Demonstrating ...

The technical innovations that emerged during the course of the project have been shown in demonstrators for all the three clinical domains. A nice example is the demo from a collaboration of 7 partners at the Final review of the completely aligned view of pre- and intra-interventional images from several sources for treatment of an obstruction in a cardiac artery: see picture below. It also included other aspects like remote image distribution and adaptive screen lay out.



Multi-Modal Coronary Lesion Evaluation: CTA, X-Ray and OCT

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... and reaping the results

Among the results are being exploited in a range of healthcare IT products are:

- High-speed, high-resolution image-acquisition and processing technologies;
- Multi-modality registration and motion compensation algorithms;
- Decision-/navigation-support, image analysis and reconstruction software tools;
- User-interaction models; and
- Enhanced surgical tools.

Philips, the leading player in the MEDiate consortium, is expected to release new features in 2014 on motion compensation and metal artefact correction as well as enter the Image Guided Intervention and Therapy solutions market. This strategy and these improvements are likely to add a significant sales volume over the next five years. Another key consortium member, Barco, has more than 250 installations of its image distribution solution Nexxis to its name and some 30 people working on Nexxis. Other beneficiaries of the project results are Nucletron, with its integrated and real time Brachytherapy treatment system, and the Surgiquil Institute, which integrated a Web SDK into a set of collaborative clinical applications and whose work in MEDiate will contribute to half its revenue by 2016.

A bright future of opportunity

The future healthcare challenges being faced by society create, of course, opportunities for the kinds of innovations being generated in projects like MEDiate, and they are not restricted only to the healthcare imaging market. Some of the techniques that have been developed in MEDiate can be used in other domains like traffic and microscopy. Interestingly, with a mechatronics company involved in the healthcare field, using its specific expertise to develop a robotics application for precise needle placement, it is clear that there is plenty of opportunity for exploitation from other domains and in other domains. MEDiate addressed a major societal challenge, delivered a very powerful impact on both revenue and jobs, and brought together a large number of innovations. The transition from Open Surgery to minimally invasive Image Guided Intervention and Therapy (IGIT) brings happiness: in the clinical and economic sense, improving cooperation between clinical and industrial partners to maintain Europe's leading position in IGIT, but also, and more importantly, in terms of the end-user – the patient.

Vision: breakthrough innovation in medical treatment



surgery:
invasive, open

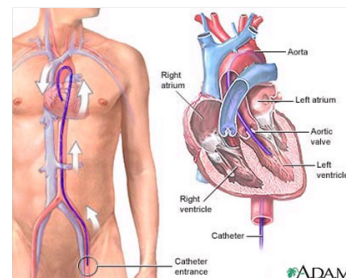
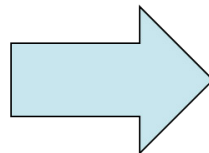


image guided intervention:
minimal invasive, closed