

Accessibility & Openness: Hardware & Software Innovations to Improve Accessibility & “Jailbreak” Your Scanner

Oliver Heid, M.D.

After more than a quarter of a century of dynamic technical development and market growth it seems that the field of MRI is becoming mature. It seems that its defining forces are changing, and with it the field itself.

1. MRI hardware is mature.

For a long time MRI systems were at the bleeding edge of technology. To a large part owing to the digital revolution this is no longer the case. Moreover MRI scanner hardware has reached physiological limits in all important aspects. Magnetic field nerve stimulation curtails gradient systems, RF heating (SAR) severely limits RF transmitter power, thermal body radiation dominates electronic RF coil and receiver noise. Additionally, clinically visible scanner performance depends only weakly on hardware performance, a fact which made the early, very low performance scanner generations clinically acceptable, but now becomes its own end.

2. Customer experience drives buying decisions

User interfaces, cover designs and ergonomics play an increasingly important role in the value perception of MRI machines. From a patient's viewpoint MRI scanners are rings, to the extent that ring shapes define the epitome of modern medical diagnostic equipment. This also explains the astounding market success of increasing the patient bore size from 60cm to 70cm while simultaneously reducing its length. Reducing the patient's exposure to the machine became its own value. Along a similar vein reduction of scan noises, another dominant patient experience, motivates noise abating technologies, e.g. vacuum enclosed gradient coils.

3. MRI becomes part of a bigger value chain

The trend towards providing automatic distributed diagnostic services puts more emphasis on quality assurance, reproducibility, robustness and reliability. Ease of use is especially important for less experienced operators. Increasingly computer aided diagnosing and data mining demands high quality primary data, from which relevant information can be drawn. This implies standardized protocols and procedures, defined image contrasts, identifiable image artifacts and so on. The economics of diagnosing also put more emphasis on energy consumption, siting requirements and other environmental issues.

The field of MRI will continue to change with its medical and economic environment. The main driving forces may switch from pure MRI technology towards a broader, holistic system design. This will offer a broad range of new opportunities for the research community.