



Are Big Data, Artificial Intelligence, Augmented Reality, Robotics, Teledentistry, and Metaverse Just Buzz Terms, or Do They Indicate a Paradigm Shift in Prosthodontics?

While optical impression systems and CAD/CAM procedures have become routine in prosthodontic daily practice, thanks to the continuing evolution of technologies, new digital means are gaining in importance for prosthodontics and for dentistry in general. All of these technologies will have a pronounced influence on daily practice in the future, and it becomes more and more evident that the prosthodontics tomorrow will not be the same as it is practiced today. Oral health monitoring will be done by the patient at home, supported by special software, and appointments with the general dentist or specialist will be made through software when needed. Patient case analysis and treatment planning will be at least supported, if not done, by software. The communication of treatment goals will also be supported by software and tested in parallel virtual “worlds” before treatment acceptance. Treatment execution may be performed fully automated by robots or at least supported in part, and, finally, monitoring will again be done by software as a support for the patients at home. Fewer visits in the dental office will be needed, treatments will become more efficient and less expensive (in the best case—at least we hope so!), and office structures will have to be adapted. Hence, the professional lives of dentist and prosthodontists will ultimately change.

All of this sounds exciting, but also a bit scary—What is the future of our profession as prosthodontists? We adopted the automated fabrication of restorations, yet it took us almost 50 years after Francois Duret’s visionary thesis and development of the optical impression and CAD/CAM restoration¹ and Mörmann et al’s market introduction of the first digital chairside system (Cerec)² to accept the changes.

Will we need another 50 years to change the way we practice? Let’s have a brief look at the different upcoming innovations and their potential to improve the quality of patient care.

Teledentistry was elaborated in detail in one of our past editorials (IJP volume 34, issue 4, 2021), so the focus here will be on the remaining technologies.

- Big data: A way to systematically analyze large datasets through extraction of various information from different sources (eg, mobile devices, cameras, software logs, microphones, etc) and subsequent use for predictive or user behavior analytics.
- Artificial intelligence: Imitation of the cognitive process of human intelligence to guide machines in the execution of complex actions supported by the respective software algorithms.³
- Augmented (and mixed) reality: Integration of 3D virtual objects into a 3D real environment in real time.^{4,5}
- Robotics: An interdisciplinary interaction between computer science and engineering allowing for the design and development of machines that can support humans in any domain. In medicine, the pioneering robotic developments were made in the 1980s by NASA, when a remotely controlled robotic system was developed to perform

surgeries on astronauts in space. In 2000, the first robotic system for laparoscopic surgery, the da Vinci Surgical System, was introduced and approved by the U.S. FDA, indicating the significance and the advantages of robotics for the improvements of medicine and, subsequently, dentistry.⁶

- Metaverse: A very recent new trend that all industry is currently aiming for, consisting of the convergence of virtual reality and a digital “second life”—two technologies that were existing already. Nowadays, with the use of virtual, augmented, or mixed-reality glasses, the merging of the real life and a parallel virtual life, including avatars, is possible. The advantages for the clinic seem numerous, as treatments can be virtually executed and tested before performing them in real life. Another field that will be significantly influenced by metaverse technologies is (dental) education. It is needless to say that communication technologies already have a high impact on interaction between clinical experts, as well as between clinicians and patients. These channels, like social media, will continue to evolve and influence our daily being.

In any case, we are facing fascinating changes in our profession; hence, in the upcoming years, research and development in prosthodontics needs to focus on

these changes in order to continue developing relevant concepts and procedures for the best interests of our patients.

On behalf of the Editorial Board team,



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