OVERVIEW

Please don’t send me hate mail it’s just a headline to get your attention. I’m the dummy and I learned quite a bit writing this article. The world of dentistry is evolving with the rapid advancement of digital technologies. You should be asking yourself; do I remain in the analog world of dentistry or do I cross-over and adapt new digital technologies? I made the switch from my CD player to my iPhone for a better music experience, but my wife still buys CD’s. I like new technology and she doesn’t. The CD player is equivalent to a traditional impression capture experience or an amalgam filling; it still works but occasionally skips a beat. New acquisition devices like intraoral scanners, facial scanners and cone-beam computed tomography (CBCT), which allow the capture of three-dimensional (3D) images of patients, are just more accurate than a manual impression taking process. After you capture a 3D image what can you do with it? 3D images are processed in computer-assisted design/computer-assisted manufacturing (CAD/CAM) software, which enables the design and manufacturing of surgical guides and prosthetic restorations through subtractive technologies (milling) or additive (3D printing) methods. These new digital technologies are here to stay because they are more accurate than traditional analog dentistry, and they improve processes, productivity, and customer satisfaction.

In this article we will focus on the assorted stages of full-arch digital workflows and how AvaDent and InstaRisa have partnered to provide practices with a new, low cost alternative to the current workflows with photogrammetry equipment.

There are various digital workflows and solutions to enable dental practices to design and manufacture fixed implant supported dentures, but they come at a price. Before dental practices can take full advantage of “implant related digitally designed workflows,” certain investments must be made. There are several ways to get started and we will walk you through the different investment stages from getting your toes wet to full immersion. The financial commitment and risks vary greatly. For this article we are assuming that everyone has a computer in their office, and everyone is placing their own implants. We look at only the capital equipment costs, not the other costs that you should be aware of like workspace, facility upgrades for imaging, facility upgrades to comply with OSHA, workstations, resin costs, waste disposal costs, obsolescence, and annual personnel costs.

Now let’s breakdown the different options to get to a comprehensive digital workflow.

CURRENT FULL ARCH IMMEDIATE LOAD OPTIONS

YOUR FEET ARE DRY
You take conventional impression and outsource the CT/CBCT scan to an imaging center. The dental lab will then utilize these records for surgical planning, prosthetic design, manufacturing of the denture for and immediate load conversion. You place the implants, convert the denture to an interim restoration and then deliver final prosthesis once implants integrate. No large capital cost but you end up with a smaller piece of the pie.

Approximate cost $0
You purchase a CBCT imaging system. In this scenario you are still outsourcing everything else. Owning the imaging system will help you treat more cases. If you let people go to an imaging center you will lose a great deal of these patients to the competition, especially those competitors that offer a free CT scan.

**Approximate cost of imaging system $50,000 to $125,000**

Your next purchase could be a desktop scanner to scan your impressions. With this technology you can scan your physical impressions and send your lab the STL files. Makes you slightly more efficient by speeding up the design process.

**Approximate cost of desktop scanner $5,000 to $15,000**

You may have skipped the desktop scanner and gone straight to an intraoral scanner (IOS) and treatment planning software. This will enable a more efficient workflow, and also delivers better results for your patients. With improved results you should see an increase in referrals and revenue for your practice. Before you choose an IOS, partner with a lab who is willing to go digital with you or has a digital path for you. This is the most critical aspect of successful digital restorative dentistry. Making sure that you and the lab are in sync and that expectations, deliverables, and accountability from both sides are clear. If you don’t spend the time syncing with your lab, you are destined for problems. You should also look into the warranties and service for the IOS. A warranty is often included for one year with the option to extend it for an additional year or two. Most systems will have warranties for up to three years. Do not overlook this and make sure you compare your options.

**Approximate cost of intraoral scanner $25,000 to $40,000**

Now you want to print your own guides and try-ins. 3D printing is a rapidly growing technology within dentistry, both labs and dental practices are buying printers at record pace. They are capable of producing implant guides and even complete restorations out of a range of resin materials. Just remember there are no long-term studies on any of the printed materials. By adding a 3D printer to a busy practice, you can increase efficiencies, and there are a wide range of printers fit for different scales of production and specific tasks. When selecting the best 3D printer for your practice evaluate the materials it prints, the software it is compatible with and the training and support provided by the manufacturer. There is no scientific evidence on the materials for long-term usage, so print for short-term indications only.

**Approximate cost of printer $10,000 to $50,000+**

To get a complete digital workflow you would need to purchase a Photogrammetry system or some other option to capture implant positions. The complex task of taking an impression for a multi-implant structure is reduced to just a few minutes when utilizing this technology. You reduce costs and eliminate wasted chair-time and provide a “passive fitting” restoration.

**Approximate cost of photogrammetry system $30,000+**

Now you’re thinking you can really save on your cost by buying a milling machine. The pucks are inexpensive so this shouldn’t be a big deal. Keep in mind this next step really makes you an in-house laboratory and you will need the space and personnel to run it for you. Maintenance costs and upgrades can be expensive. If your mill goes down what do you do? It’s important to have a backup plan with your mill and personnel. Cross train two or more team members in case an employee decides to depart or becomes ill.

**Approximate cost of milling systems $30,000+**
Some of these items above may be absolutely necessary and others can be outsourced to a digital based lab. In capital equipment costs alone, you could easily spend $100,000 and again, this does not include any facility costs, maintenance, personnel, or cost of equipment obsolescence.

We spoke with one of the key leaders in digital dentistry, Tim Thompson, CEO of AvaDent Digital Dental Solutions, an ISO certified prosthetic manufacturing company based in Scottsdale, AZ and Tilburg, Netherlands. Tim was an early pioneer with his scanning technology that he designed for Align Technologies some 20 years ago, which enabled AlignTech/Invialsign to reduce manufacturing times while improving accuracy.

In 2009 Tim and his team at AvaDent had a vision and coined the term “Digital Denture” and labs and dentists thought he was out of his mind for tackling denture design and manufacturing. His ultimate goal with the digital denture was to eliminate many of the cumbersome manual processes of traditional denture design and to improve the fit and quality of the denture for patients. In addition, he wanted to reduce the number of appointments patients needed to get their final denture. Fast forward to 2020 and AvaDent has produced over 200,000 digital dentures, owns 61 patents and patent applications for digital prosthetic design, materials, and manufacturing.

AvaDent is at the forefront of digital denture design and manufacturing and now their capabilities go well beyond dentures. I’m sure Ray Kroc wasn’t thinking about the McNuggets when he first launched just as Tim wasn’t thinking about implant supported dentures, which has become a major focus for his company.

We talked to Tim about in-office dental labs and the obstacles to success. He had some interesting observations as he lives with many of the same difficulties a dental practice would have with equipment and personnel every single day. He says, “Most dental practices have overhead in the 65% to 80% range, so I don’t understand why they would want to burden themselves with the capital equipment investments, building improvements, maintenance, software upgrades, ongoing milling calibrations, equipment obsolescence, resin costs, waste disposal, and adding personnel to run a lab business. Now, add a pandemic to all of the above and your risk to manage and balance production goes up exponentially.

I do see the need for imaging and scanning systems, and as this technology improves it will open the door for more innovation at the procedural level. The quality, accuracy and speed at which you can perform manual tasks are improving, which enables greater efficiencies for the practice and improved outcomes for the patient. Our model embraces all digital workflows. If a doctor wants to send us a manual impression we scan that and begin the digital design, or they can send us the STL file and we can begin with that data. Our doctors can even design the denture teeth setup themselves by logging into our HIPAA compliant portal and utilizing our AI based software. Either way we offer a solution to meet the needs of every practice.”

**BENEFITS OF THE DIGITAL WORKFLOW**

Offices that incorporate a digital workflow see a variety of benefits in terms of patient care and profitability. For the patient, the advantages are enormous, especially when practitioners have printing capabilities in-house.

- Eliminates the stress of taking traditional impressions.
- The technology eliminates time consuming denture conversions.
- Improved comfort for the patient due to the quality of the fit of the final restoration.
- Easier for patients, shorter treatment times and office visits.

Patients also understand that digital means high accuracy, and they have a high level of confidence in a practitioner who uses the latest technologies.
WHAT’S NEW

We asked Dr. Art Mirelez of Clovis, CA, Founder and CEO of InstaRisa Technologies, LLC what he is doing in his practice and Dr. Mirelez says, “My goal has always been to improve the patient experience and end results, while reducing costs when possible. I knew I wanted to explore a complete digital workflow, but photogrammetry is a one-dimensional solution that is cost prohibitive for most general dental practices. So, for the past three years my lab technician and co-founder Fernando Polanco and I developed a complete digital workflow without the need for photogrammetry to capture implant position at the time of surgery. Our proprietary workflow incorporates a CT scan, intraoral scan and a 3D facial scan, we merge all three scans to create a virtual digital patient, then design and mill or print the immediate load interim prosthesis. Now, I’m simplifying the process, but we have been able to provide enhanced care with better diagnostics and treatment at a lower cost with the elimination of photogrammetry.

Our digital workflow utilizes 3D facial scanning technology at a third of the cost of photogrammetry and does much more. In addition to provide high resolution facial scans, it also provides a very accurate bite scan and can be utilized as desktop scanner. We believe our digital workflow achieves high quality and precise fitting restorations that ultimately provides better outcomes for our patients. Our digitally enabled workflow has improved all aspects of my implant practice. I have higher case acceptance rate because we scan the patient and can provide a preview of what their smile will look like with a 3D image. I can treat more patients as I no longer have to do rigorous time-consuming denture conversions and our restorations fit precisely with minimal adjustments.

Since a monolithic interim full arch restoration is provided, I no longer experience chips, fractures and staining issues during the healing phase as I once did with denture conversions. Utilizing our facial scanner as a bite scanner has made the interim delivery appointment fast due to minimal occlusion adjustments. Ultimately, it’s improved the experience for my patients, with fewer appointments, less chair-time and beautiful results. Lastly, by eliminating physical impressions, the element for human error is reduced, you are bound to improve your end results. A side benefit to the patients is the assurance of having a digital record in case something happens to their prosthesis we can mill a new one quickly.”

A DIGITAL DESIGN PARTNERSHIP

Combining AvaDent and InstaRisa is a win for doctors and patients around the world, providing a low-cost digital workflow and the best design software and prosthetic products available today.

Thompson says, “I’m really excited about our new partnership with InstaRisa because it fits perfectly with our design software to deliver a workflow that eliminates traditional steps through technology adoption. This opens the door for us to deliver our products and services to any doctor interested in doing All-On-X in any part of the world. There is even a workflow for our new SurgiDent guided interim prosthesis. Doctors can now benefit from the best digital design workflow and receive the world’s only true monolithic hybrid with a fully integrated Ti bar.”

Mirelez says, “We saw AvaDent as the perfect partner because they design and manufacture dentures, overdentures and hybrids at a reasonable price and have digital workflows for all three solutions just like us. AvaDent also distributes the NexDent printing system which could be an ideal solution for practices that want to print their try-ins and interim restorations immediately. Also, communicating and tracking between AvaDent and dental practices is immediate and simplified, all of which leads to better dentistry, which is a shared goal of InstaRisa.”
WHAT’S AHEAD
As materials continue to improve, both milling and printing will utilize their unique attributes and have a place in the dental industry. Thompson says, “We expect the most demanding cases will require optimization of material and manufacturing processes to combine the best systems for the case at hand. Where 3D printing is having an immediate effect now is in the fabrication of try-ins and other short-term indications, there are no long-term clinical studies on their performance within dentistry. The best prosthetic solution will likely combine both subtractive and additive manufacturing and as a company AvaDent offers both. The restorative materials presently available to us for 3D printing have not demonstrated the strength and the durability as those used in milling. The integration of printed (mesh) titanium bars opens an entirely new class of high-performance products for the All-On-X market. These can be easily designed to conform to the prosthesis thereby maximizing the strength and reducing breakage.”

FINAL THOUGHTS
I want to thank Dr. Art Mirelez, and Tim Thompson for their critical insights. The digital tools discussed here are transforming the experience for patients, and the productivity for practitioners. The ultimate goal for everyone, is to deliver better clinical outcomes for patients.

ABOUT THE AUTHOR
Daniel Hinkle is personally known for his expertise in dental implant and full-arch marketing, emerging technologies, and digital marketing methods. He is currently Sr. Vice President of Marketing for AvaDent Digital Dental Solutions, and prior to AvaDent Dan consulted for The Straumann Group and was VP of Practice Development for ClearChoice Dental Implant Centers and was Sr. Director of marketing for Nobel Biocare.