



# APPLICATIONS OF LEAN INFORMATION TECHNOLOGY IN DENTAL LABORATORY TECHNOLOGY



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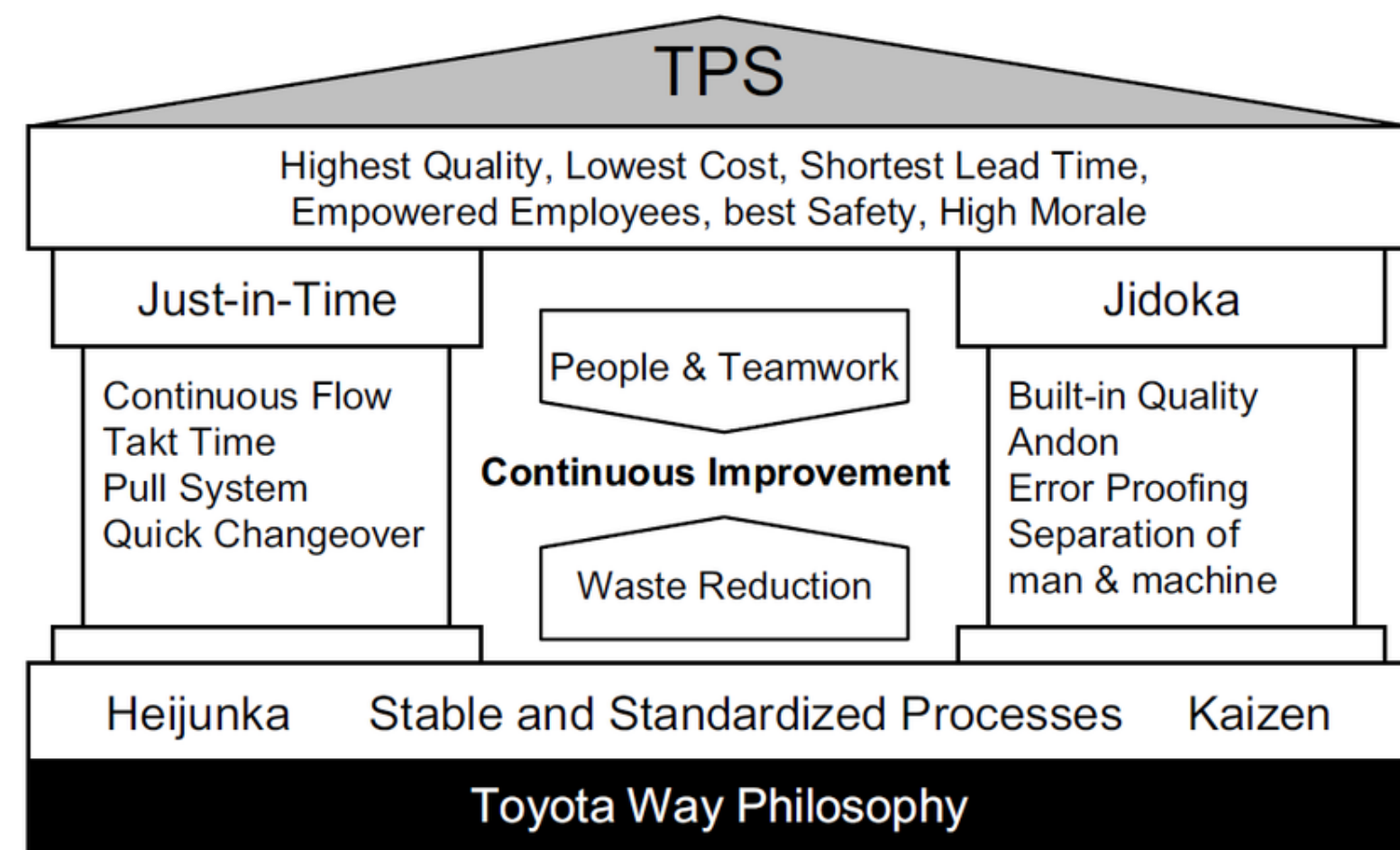
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## Abstract

The advances in dental technologies open the doors for new types of manufacturing processes and as a result the industry is transitioning from the traditional methods to digital design and manufacturing of dental appliances. During this transitional period, many dental laboratories are still using both methods of manufacturing, having a negative impact on their revenues. To reduce waste and increase production value is important to apply the LEAN Manufacturing and LEAN Services concepts, which were first developed and implemented, in the 1990's, by the Toyota Production System. Today, these principles are extended to include LEAN systems to Information Technology, creating the LEAN IT systems. In the recent years, due to the increased demands of implementing digital dentistry, the LEAN IT technology presents a viable solution for dental laboratories to increase their profits. This presentation describes the different applications of LEAN IT Technologies in dental laboratory technology, and what are the resources for adding production value during the transition from traditional methods to Computer Assisted Design and Computer Assisted Manufacturing production of dental appliances

## What is the LEAN Information Technology

- LEAN Technologies were first developed and applied in the early 1990's by Toyota Company to improve production efficiency by:
  - controlling the unnecessary manufacturing waste
  - improve productivity by applying the supply and demand principles
  - eliminating production errors through better time management
  - fast implementation of innovative methods of manufacturing
- LEAN IT Technologies are the extension of LEAN Manufacturing and Services principles applied to the improvement and management of information technology (IT) products and services



## Implementation process of LEAN IT applications

- Develop and integrate a digital workflow which will support the new practices
- Adopt the new practice into the daily routine
- Periodically evaluate process performance and efficiency
- Ensure that employees know their responsibilities of performing efficiently
- Improve the system by researching different other digital software that will add value to the manufacturing process
- Perform regular system assessment to ensure that all defined standards are being executed and followed
- Implement improvements whenever possible
- Worker inputs and feedback can be used for identifying upgrades
- When issues arise, identify their cause and
- Identify possible system problems, their cause and implement the changes necessary to avoid recurrence



## Benefits of Implementing LEAN IT

- The implementation of LEAN Information Technology in Dental Laboratory can help with the transition from traditional manufacturing processes to the Computer Assisted Design/Computer Assisted Manufacturing processes by:
  - Controlling the demand and supply process
  - Reducing or eliminate waste in the manufacturing process
  - Reducing or eliminating downtime between different stages of dental appliances fabrication
  - Adding value to the manufacturing process which will increase profits

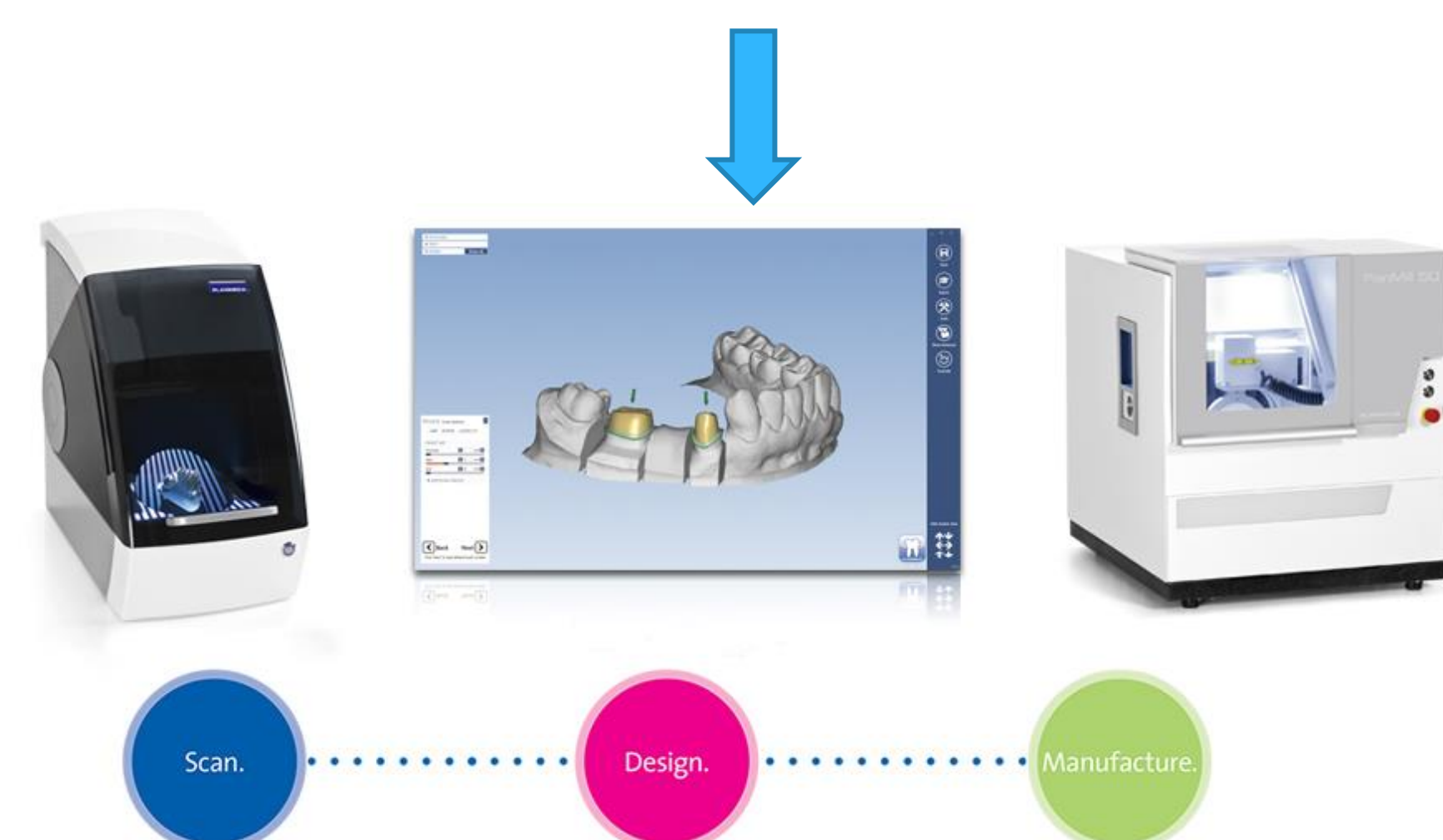


## Implementation challenges

- The following are challenges may be encountered during the process of transitioning from analog technologies to the implementation of digital dentistry in the laboratory settings:
  - Investing in new laboratory equipment, such as: milling units, 3D printers, sintering ovens, etc.
  - Investing in implementing and maintaining the software necessary to implemented CAD/CAM system
  - Training the dental technicians how to operate, maintain and most important the qualities and proprieties of new dental materials
  - Maintaining a supply of materials and equipment for analog or conventional methods of fabricating dental appliances

## Conclusion

- During the transition period from traditional to digital methods of fabricating dental appliances, the implementation of LEAN IT technology can improve the manufacturing process, and it can enhance the delivery system of products and services by:
  - Improving patients' well-being
  - Meeting the needs and desires of dentists, dental technicians, and patients
  - Faster return of dental products and services
  - Providing constant quality and high predictability
  - Promoting social responsibility by using environment friendly (green technology) methods of fabrication of dental appliances



## Applications of LEAN IT in Dental Lab Settings

- **Inventory control** - Lean inventory management is based on five principles:
  - **Value**: Define the dental laboratory products and services that the costumers (dentists and patients) are willing to pay for
  - **Flow**: Monitor the inventory flows in the dental digital design and manufacturing process by eliminating or reducing any obstacles that do not add up
  - **Pull**: Move inventory only when needed in the manufacturing process
  - **Responsiveness**: Being able to adapt to change by adjusting the workflows
  - **Perfection**: Continuously refine the dental laboratory inventory management processes to improve quality, cycle time, efficiency, and cost
- **Better communication** between dental practitioners and dental laboratory professionals by:
  - reducing or eliminating miscommunications because of direct connections between doctors and technicians
  - real time communication, such as Teamviewer, etc.
  - written communication (through digital prescriptions) vs. oral communication reducing or eliminating misunderstandings
- **Systems development by customizing the digital workflow by**:
  - integrating digital software that allows for fast tasks switching between different CAD/CAM system applications, such as transferring data from the design process to the manufacturing process
  - acquire CAD/CAM applications should be compatible with each other, which guarantees the transmission of all data from one system to another
  - eliminate unnecessary steps in the workflow by purchasing only the CAD/CAM systems application that add value to the manufacturing process
- **Workplace organization** using the LEAN methodologies which includes five aspects:
  - **Sort** by removing:
    - (1) certain CAD/CAM applications and or files that are not used which will improve the performance of the server/computer by creating space in the hard drive for useful data storage and applications
    - (2) unused lab equipment or dental materials
  - **Set-in-order** by
    - (1) develop and maintain production schedule and arrange the CAD/CAM application in sequence to make them user friendly
    - (2) arrange workstations and all tooling / equipment for easy access
  - **Shine** by
    - (1) develop and maintain inventory schedule and periodically inspect and clean or remove unnecessary files/data
    - (2) regularly cleaning and inspecting the workplace, tools and equipment
  - **Standardize** by:
    - (1) establish procedures and schedules to ensure the repetition of the first three 'S' practices
    - (2) implement a daily operating schedule
  - **Sustain** (also translates as "do without being told"), by:
    - (1) organize training sessions for employees
    - (2) monitor the system productivity and efficiency

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