

The Role of Quality Management in Future Innovation Processes for Smart Products



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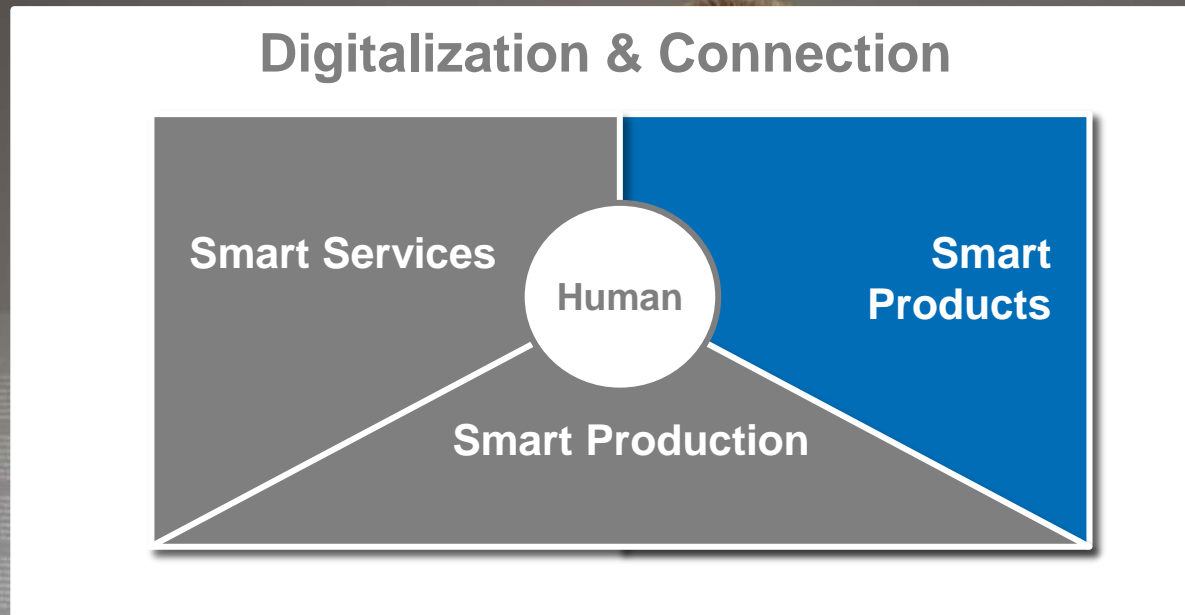


Papal election 2005



Papal election 2013

Digitalization and connection as a core element of “Industry 4.0”

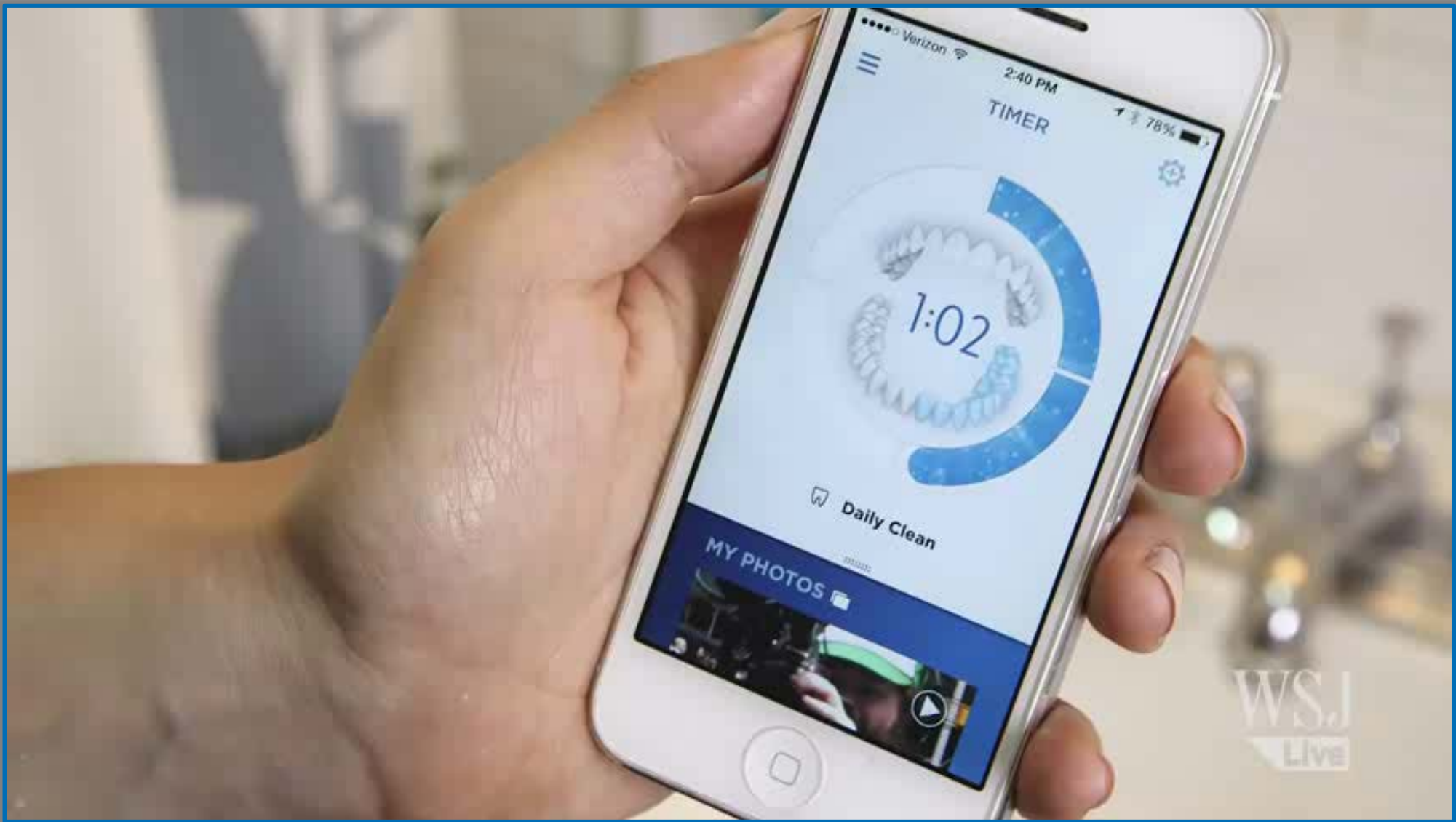


Future products are smart: 'Smart' Toothbrush



Pictures: Braun, ComputerBild

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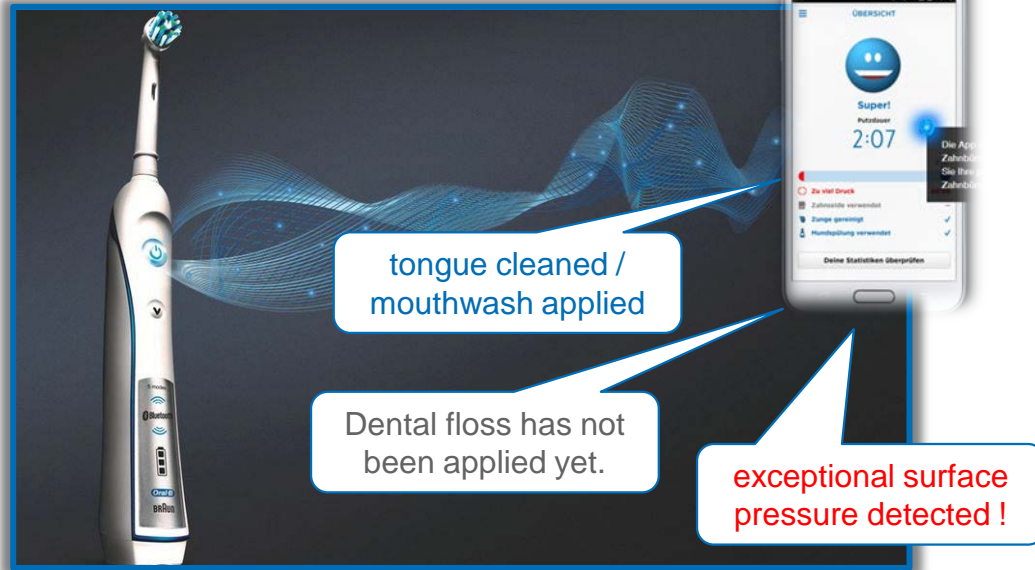


Video: Youtube.com

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Future products are smart

'Smart' Toothbrush



- *Toothbrush connects to smartphones via Bluetooth*
- *Evaluation of the 'brushing performance'*
- *Integrate brushing plan in coordination with the dentist*

Characteristics of 'Smart Products'

- Digital representation of products, connected to the physical world
- Products are 'aware' of their manufacturing parameters, their current location and state
- Seven attributes of Smart Products:
 - Autonomy
 - Adaption
 - Reactivity
 - Multi-functionality
 - Cooperation
 - Humanlike Interaction
 - Personality

Pictures: Braun, ComputerBild

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Changes and challenges for future innovation processes

1 Suitable application scenarios

- Threat: 'digital customer mismatch'
- Adaption of product to customer behavior



2 Smart product usability

- Smart user interfaces (e.g. force feedback)
- Design of intuitive digital operability



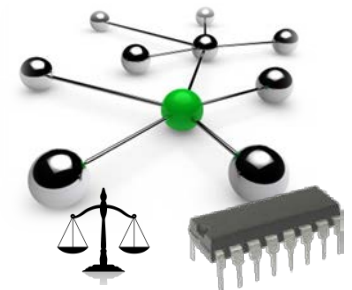
3 Smart defect management

- Digital multi-functionality: increasing error possibilities
- Availability of defect information by product intelligence



4 Rapid and interdisciplinary product development

- Cooperation of different disciplines (e.g. ICT, legal)
- Global pressure for rapid and cost-efficient innovation



Recording of suitable application scenarios with data mining and social media analysis

■ Changes

- Products as parts of a network
- Rapid data processing due to increasing computer performance
- Social Media platforms provide authentic field data



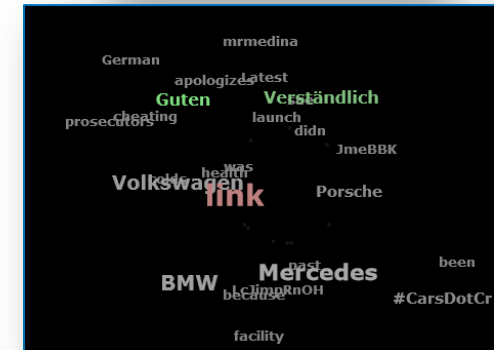
■ Challenges

- Handling of all relevant data (e.g. online customer reviews)
- Data protection in particular in personal data
- Guarantee of informational self-determination



■ Research Approaches

- Gaining knowledge of the behavior, errors and the use of products at the customer (e.g. Transforming linguistic pattern into algorithms)
- Customized services regarding maintenance and repair



Improving product features for different application scenarios.

Pictures: business2community.com

Optimizing usability experience by designing 'Perceived Quality'

■ Changes

- Digitalization of smart products leads to functional enhancement
- Smart interfaces (e.g. force feedback) offer new possibilities for designing usability

■ Challenge: Design of intuitive product operability despite increasing functional complexity



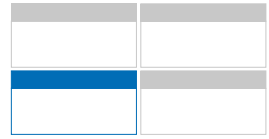
■ Research Approaches

- Design of user interfaces and product perception by applying the 'Perceived Quality' approach
- Correlation of technical product features with the subjective customer evaluation for an optimal product specification



Increasing customer satisfaction by selective design of product perception.

Smart defect management by defect coding approaches



■ Changes

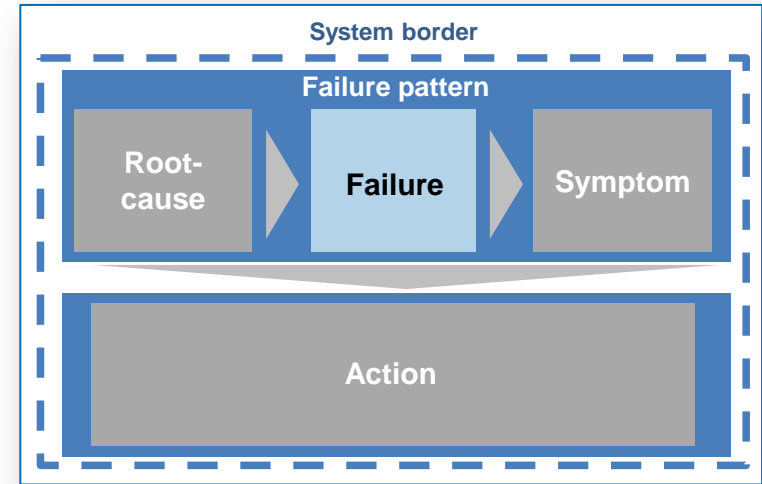
- Increasing error possibilities by digital multi-functionality
- Availability of defect information by product intelligence

■ Challenges

- Handling and consolidation of heterogeneous defect data from different sources (Smart products, Manufacturing Execution Systems)
- Filtering and analysis of large amounts of feedback data

■ Research Approaches

- Development of defect coding procedures for a consistent defect language
- Use of data based analysis approaches for intelligent and rapid defect detection



Efficient use of defect knowledge for rapid product optimization.

Picture: www.bertrandt.com

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Rapid and interdisciplinary product development with an agile approach

■ Changes

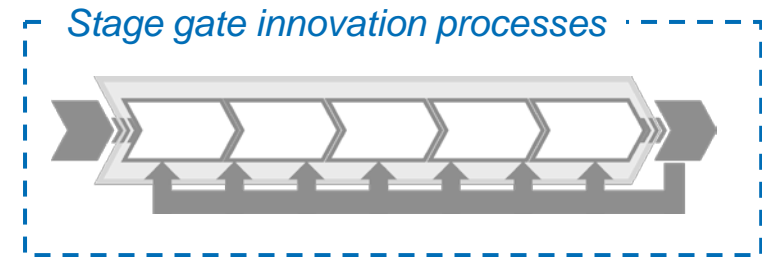
- Smart product development requires cooperation of different disciplines (e.g. engineering, ICT, legal)
- Global pressure for rapid and cost-efficient innovation
- Opportunities for customer integration into product development

■ Challenges

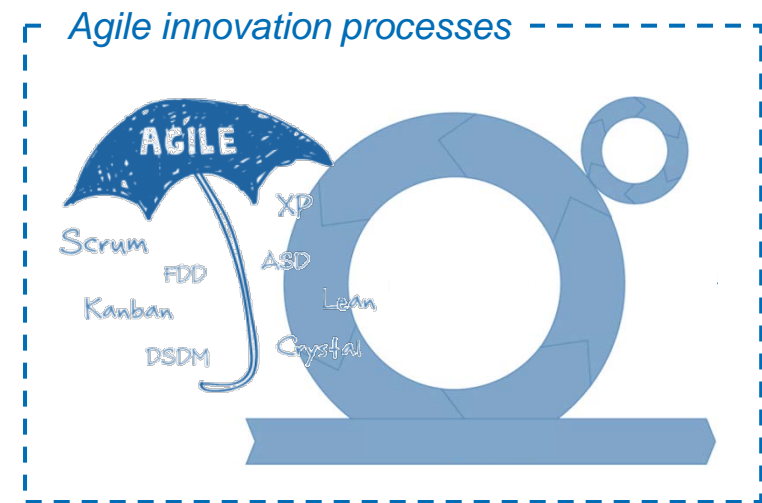
- Measuring and controlling product maturity enhancement
- Synchronizing development teams for parallelized component development
- Ensuring a proven product development in due time

■ Research Approaches

- Transferring agile development concepts from software development to smart product development



Tomorrow?



Rapid and flexible innovation processes by applying agile development concepts.

Pictures: www.zprinter.de, www.chip.de

Rapid validation with rapid prototyping in agile development processes

■ Changes

- Faster and more cost-effective production of prototypes by 3D printers
- Higher use of prototypes for product validation

■ Challenges

- Balance between virtual and real prototypes for product reviews
- Integration of models in all in product development involved departments
- Non-transparent market environment regarding 3D printers

■ Research Approaches

- Development of reference processes that provide at selected points a particular prototype application
- Optimizing the production process (production time, quality, costs)
- Development of test planning based on prototypes



Early concept validation and consumer acceptance analysis with 3D printing.

Pictures: www.zprinter.de, www.chip.de

Conclusion

- Smart products are real; however, they contain virtual models and will rely on them
- Their integration into the „real world scenarios“ will rather affect customers perception than technical features
- Integrated toolkits will allow for collecting quality data in real time
- Availability of data will foster new quality management paradigms („six sigma in seconds“)

Thank you very much for your attention.



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