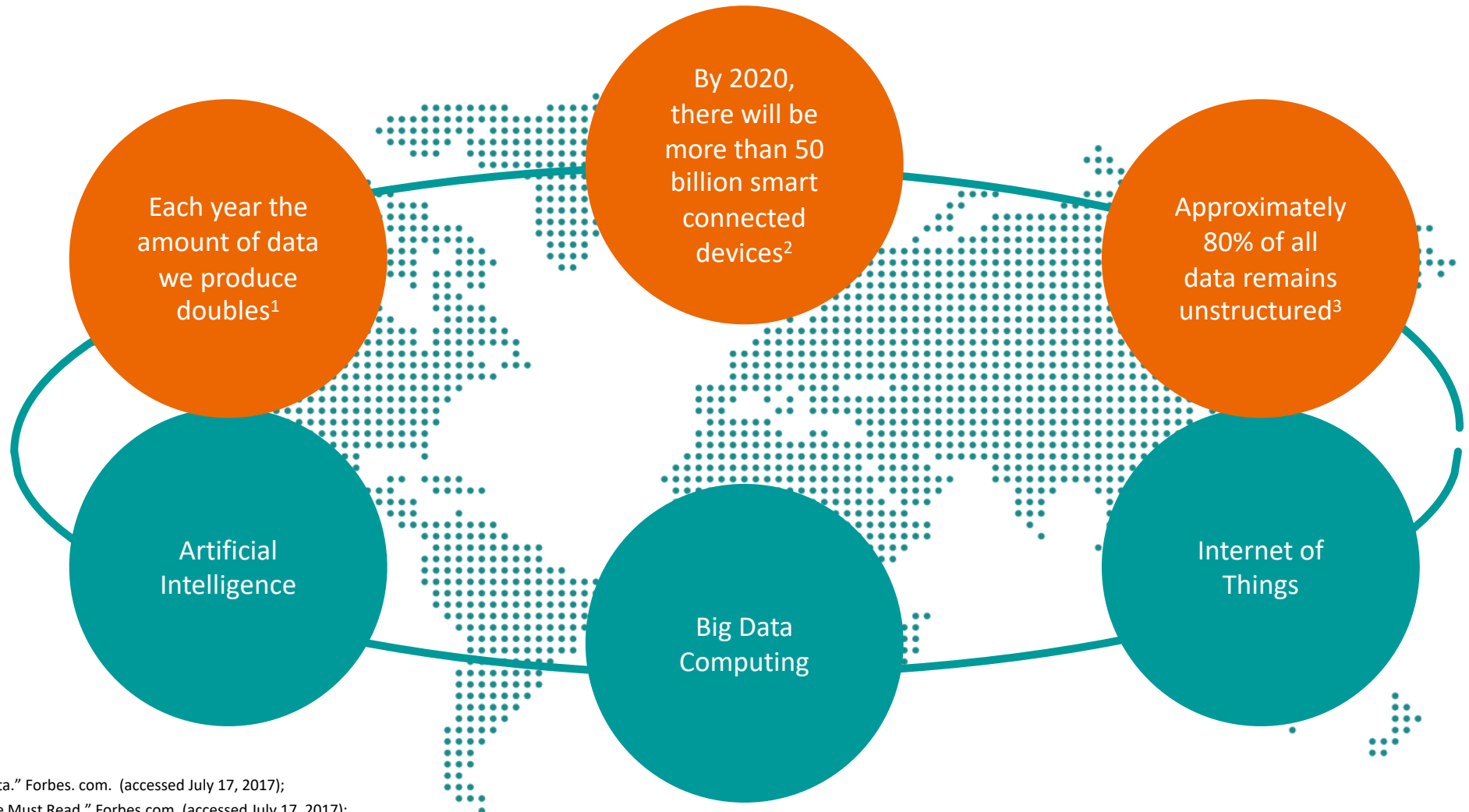


Roadmap to Digital Transformation

Clinical Laboratory

Jennifer Sanderson, US Informatics Marketing Manager
Siemens Healthineers

Digital World



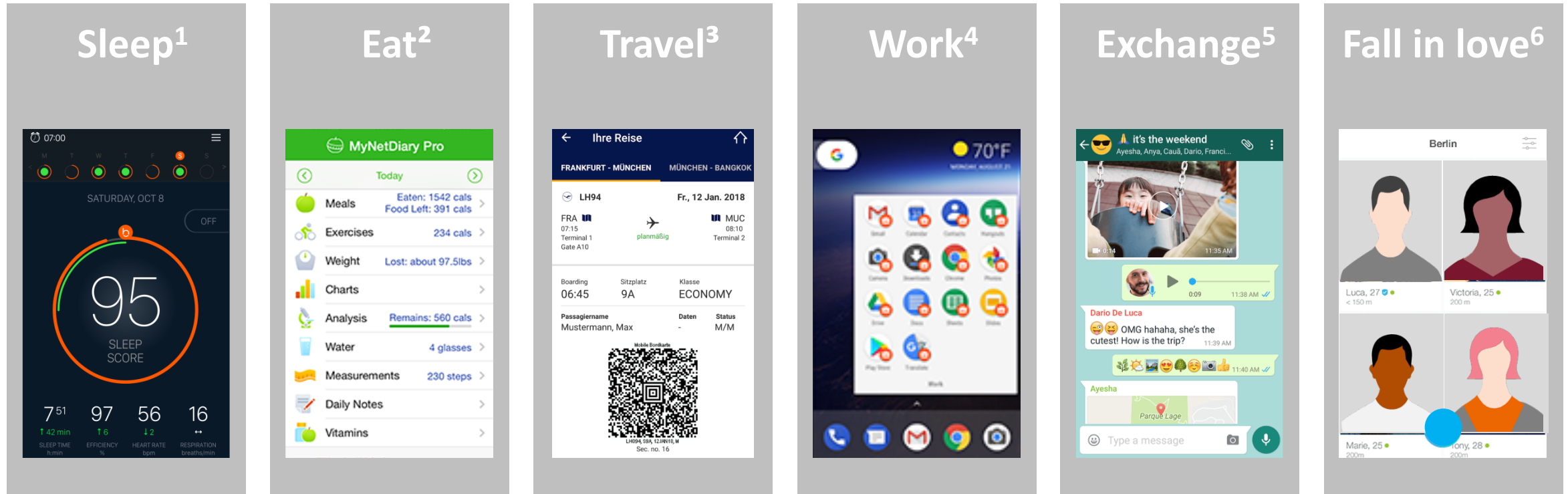
¹ Marr, B. "Why AI Would Be Nothing Without Big Data." Forbes. com. (accessed July 17, 2017);

² Marr, B. "Big Data: 20 Mind-Boggling Facts Everyone Must Read." Forbes.com. (accessed July 17, 2017);

³ Schneider, C. "The biggest data challenges that you might not even know you have." IBM.com. (accessed July 17, 2017)

Digitalization changes all aspects of our life

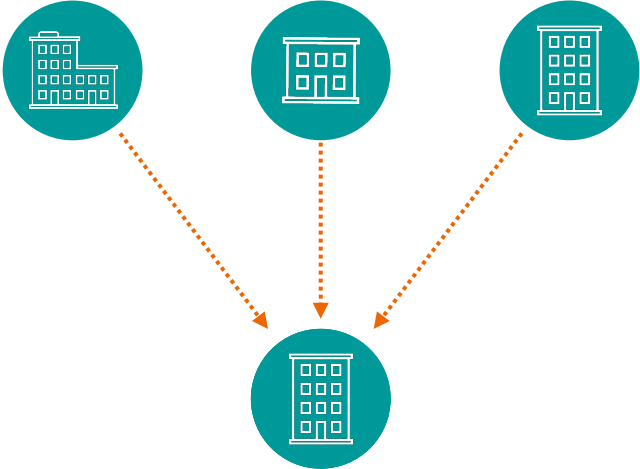
The way we...



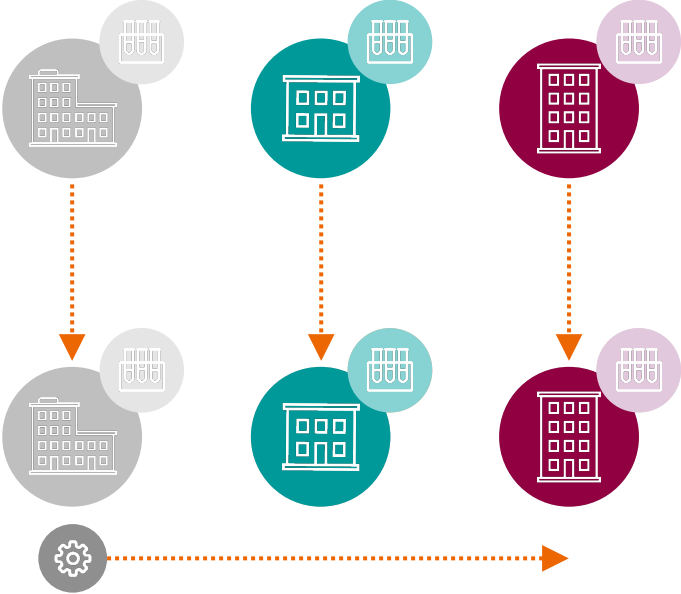
- 1) beddit (2018): beddit 3 sleep monitor (03.05.2018)
 - 2) MyNetDiary (2018): Easy and most comprehensive iPhone diet app (27.04.2018)
 - 3) Google Play (2018): Lufthansa App (04.05.2018)
 - 4) android (2018): Lassen Sie Android für sich arbeiten (04.05.2018)
 - 5) WhatsApp (2018): Einfach. Sicher. Zuverlässiger Nachrichtenaustausch (04.05.2018)
 - 6) LOVOO (2018): Where real life happens (04.05.2018)
- HOOD05162002957215

Market trends are driving the need for digitalization in Healthcare

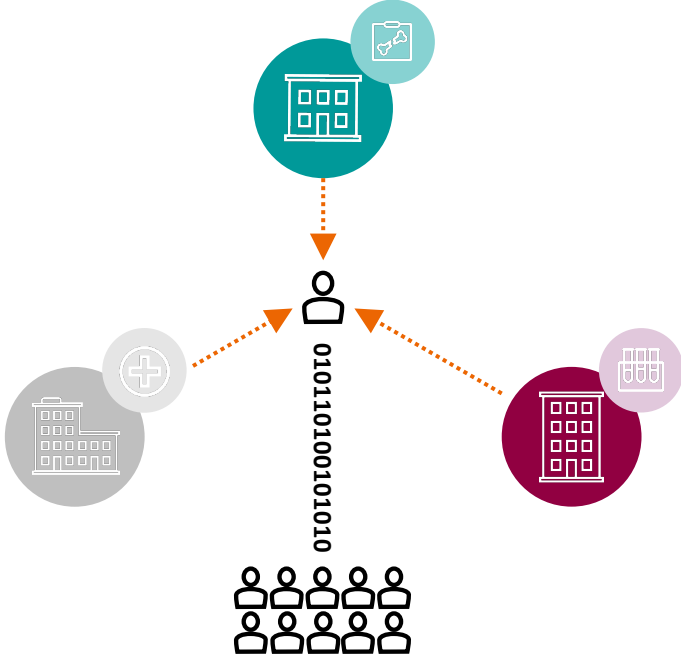
Consolidation



Standardization



Value-based care



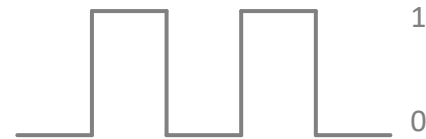
Driving the need for digitalization in Healthcare

Digitization

The process of transforming analog data into digital data without any changes to the process itself.



“Paper-based”



Digital

Digitalization

The use of digital technologies to improve business processes and provide new value.



Digital
Technologies



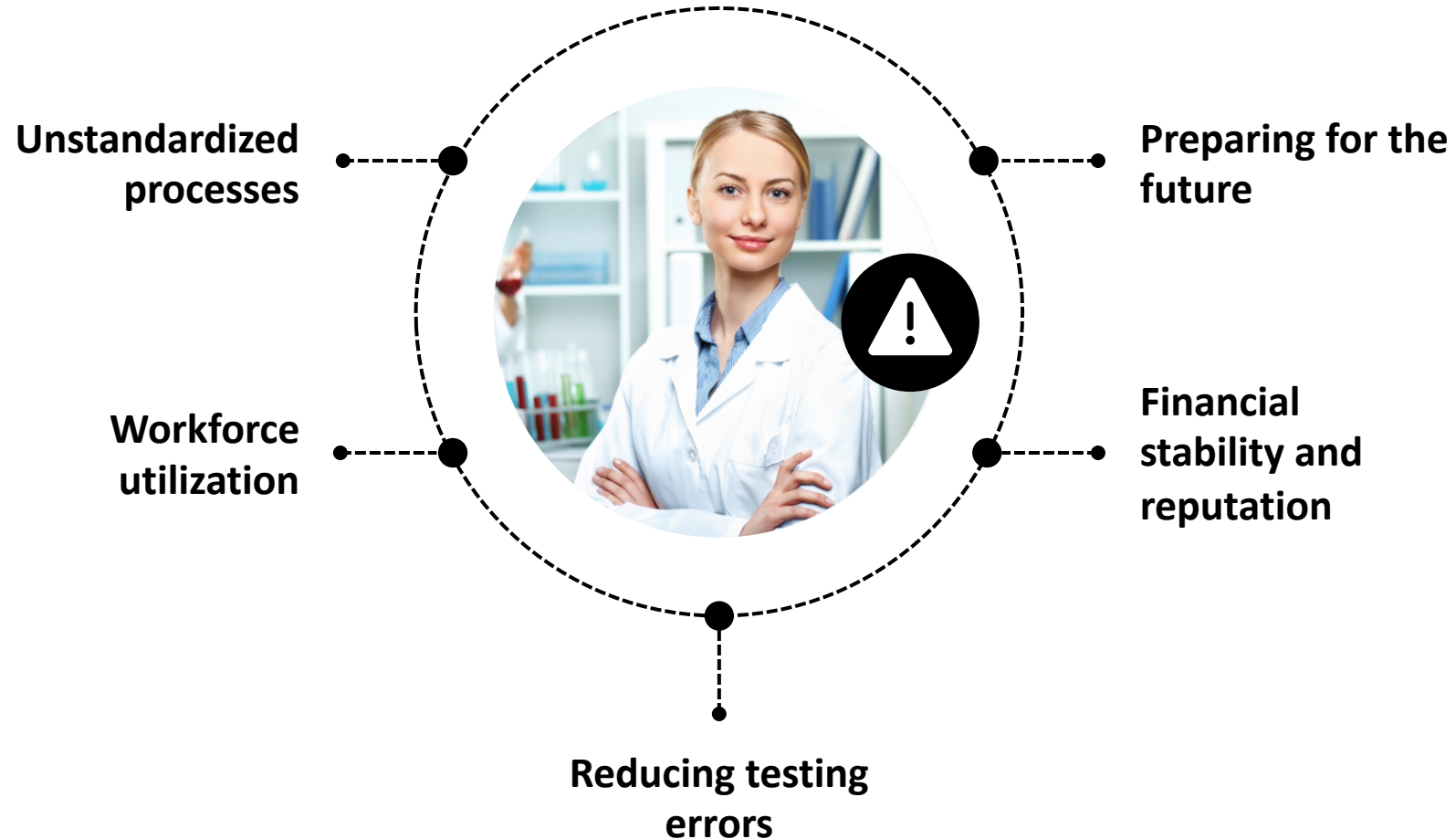
Improve
Process

Digital Transformation

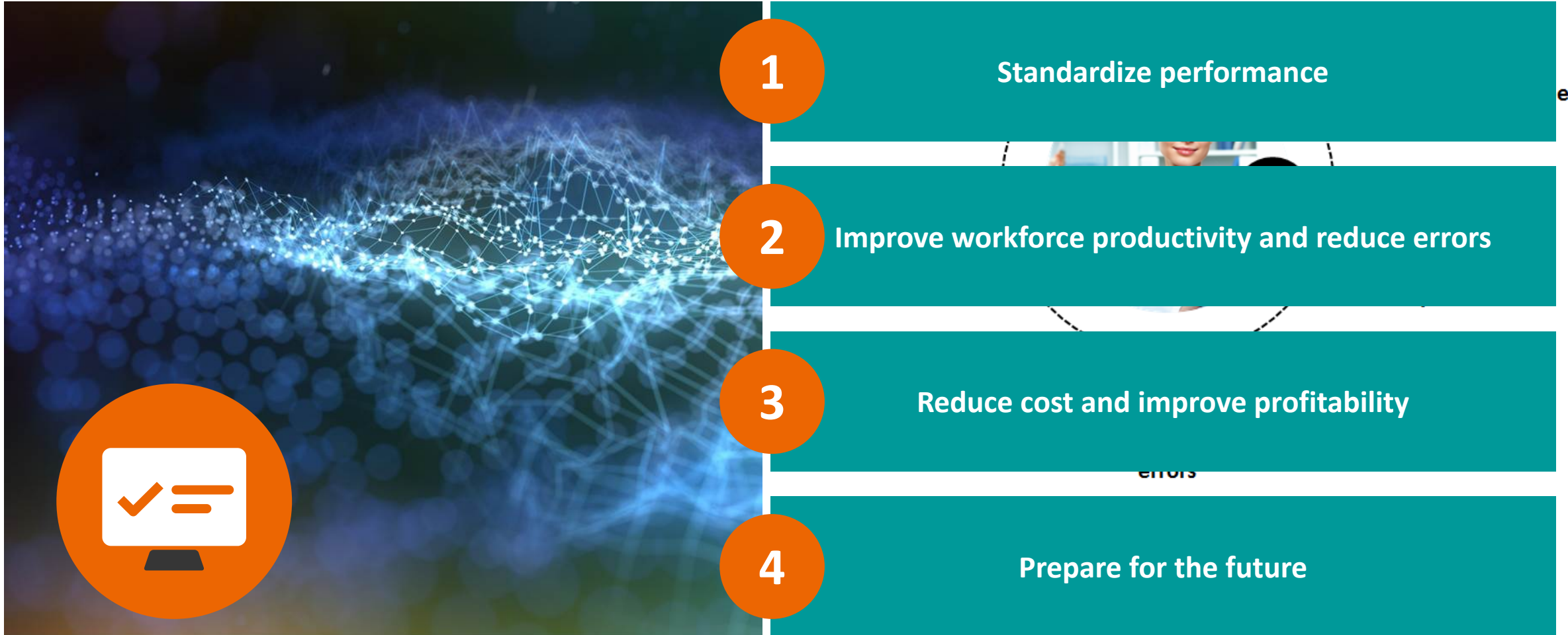
Digital Transformation requires new digital business capabilities to help the business deliver customer outcomes in entirely new ways.

Source: Five Myths of Digital Transformation, Forrester, July 2018

Yet many clinical laboratories are overwhelmed by other challenges and not focused on digital transformation



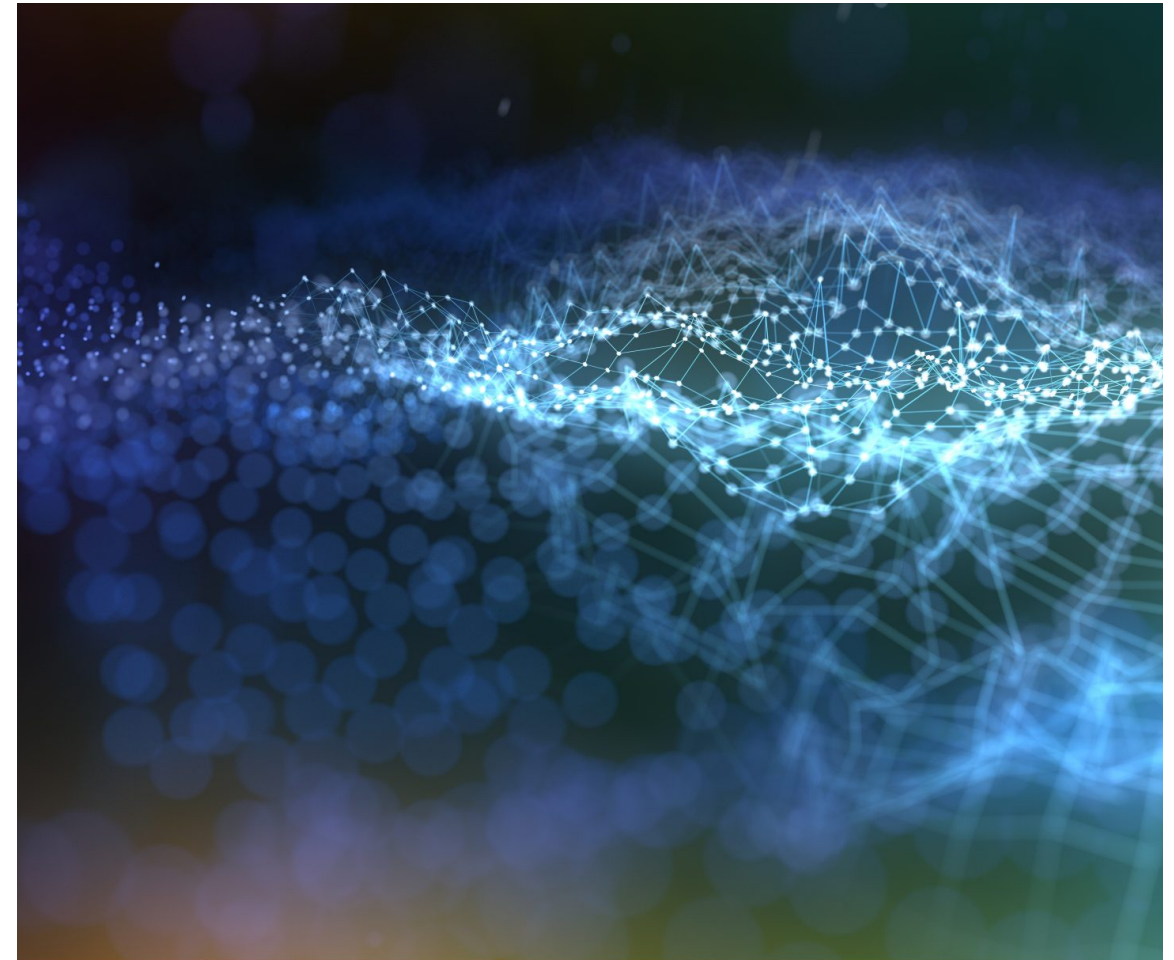
Readiness: Principal laboratories begin their digital transformation Begin addressing today's challenges and address these challenges



Four steps to digital transformation

1

Standardize performance



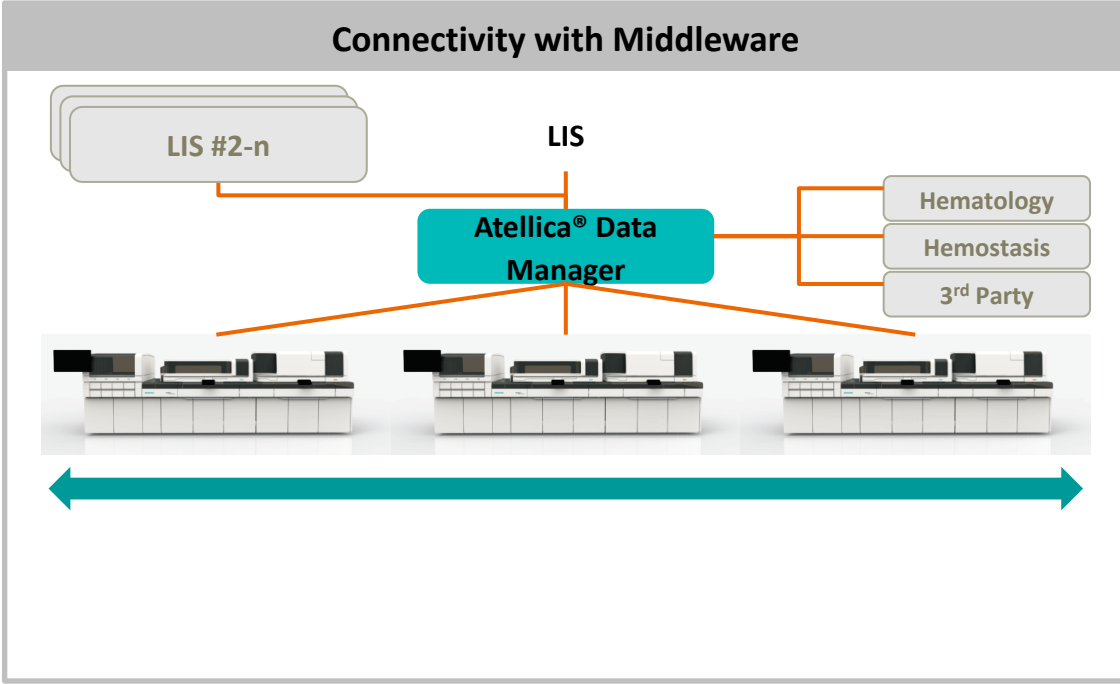
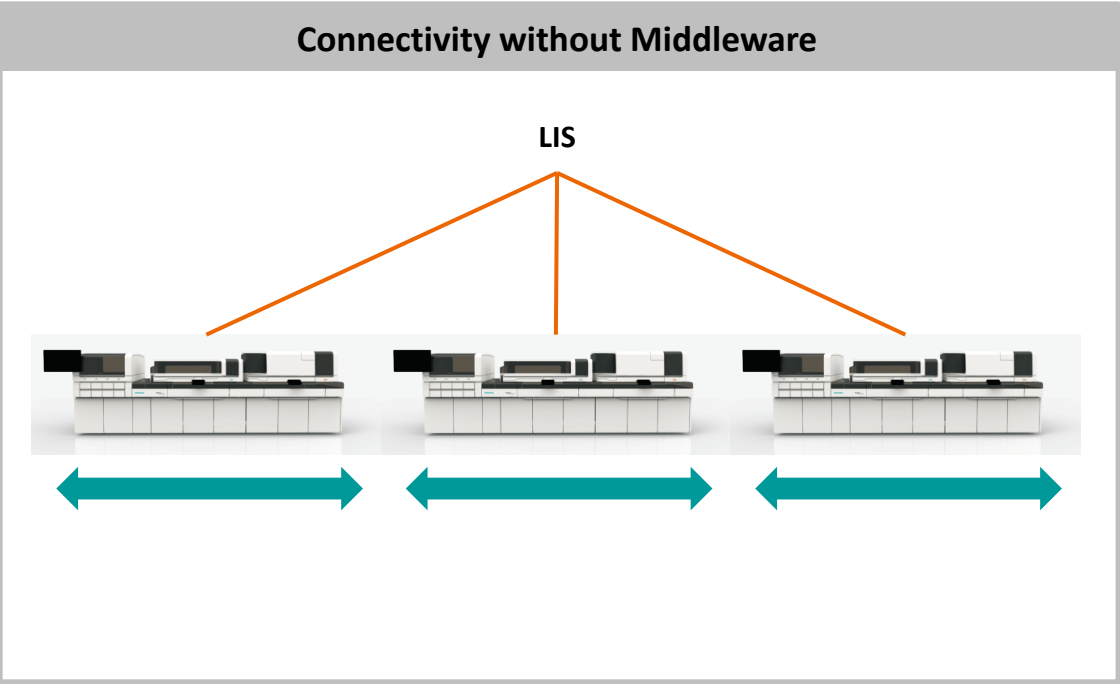
Variability in TAT performance impacts patient care

75% of physicians agree that fast TAT is directly linked to patient satisfaction.



Source: Siemens Healthineers study, “The Value of In Vitro Diagnostic Testing” (2017)

Centralize data management across your diagnostics network to standardize performance



Centralize data management across analyzers, disciplines, and sites.

Example: Data management

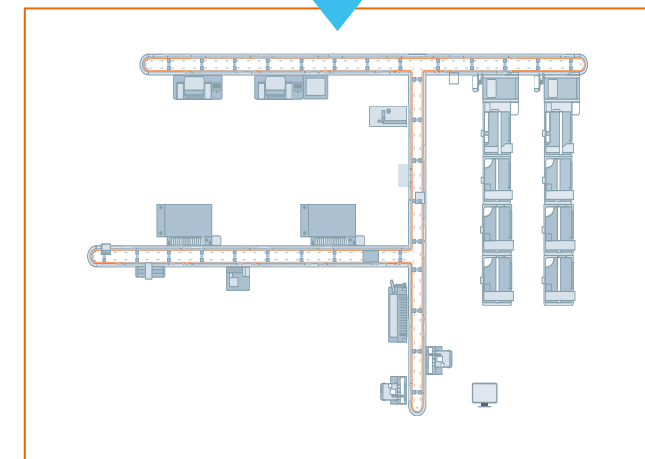
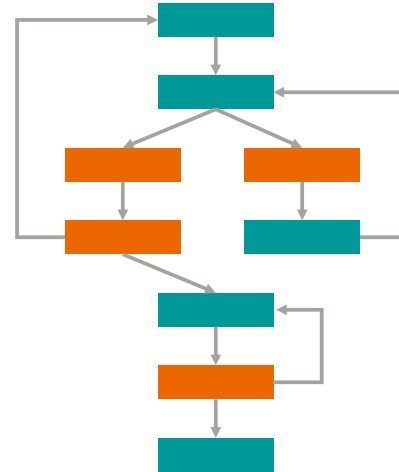
Bringing control and simplicity to drive intelligent sample management

Pre-analytical



Data Management System

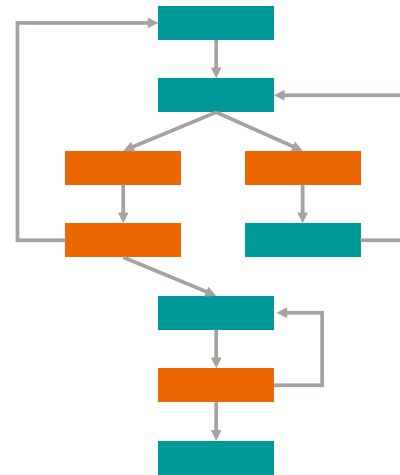
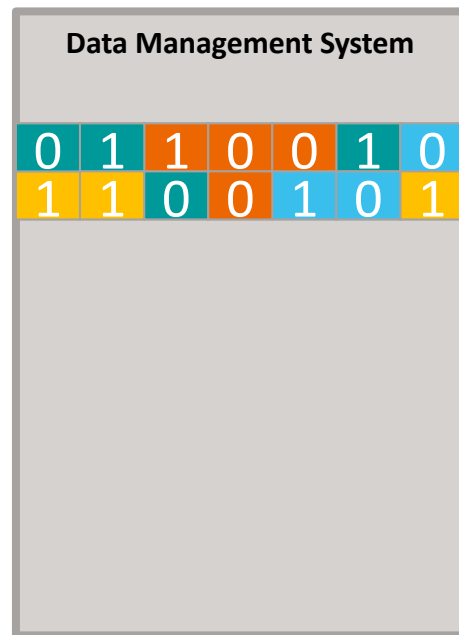
0	1	1	0	0	1	0
1	1	0	0	1	0	1
1	0	1	1	0	0	1
0	1	1	0	0	1	0
1	0	1	1	0	0	1
0	1	1	0	0	1	0
1	1	0	0	1	0	1
1	0	1	1	0	0	1
0	1	1	0	0	1	0
1	0	1	1	0	0	1



Example: Data management

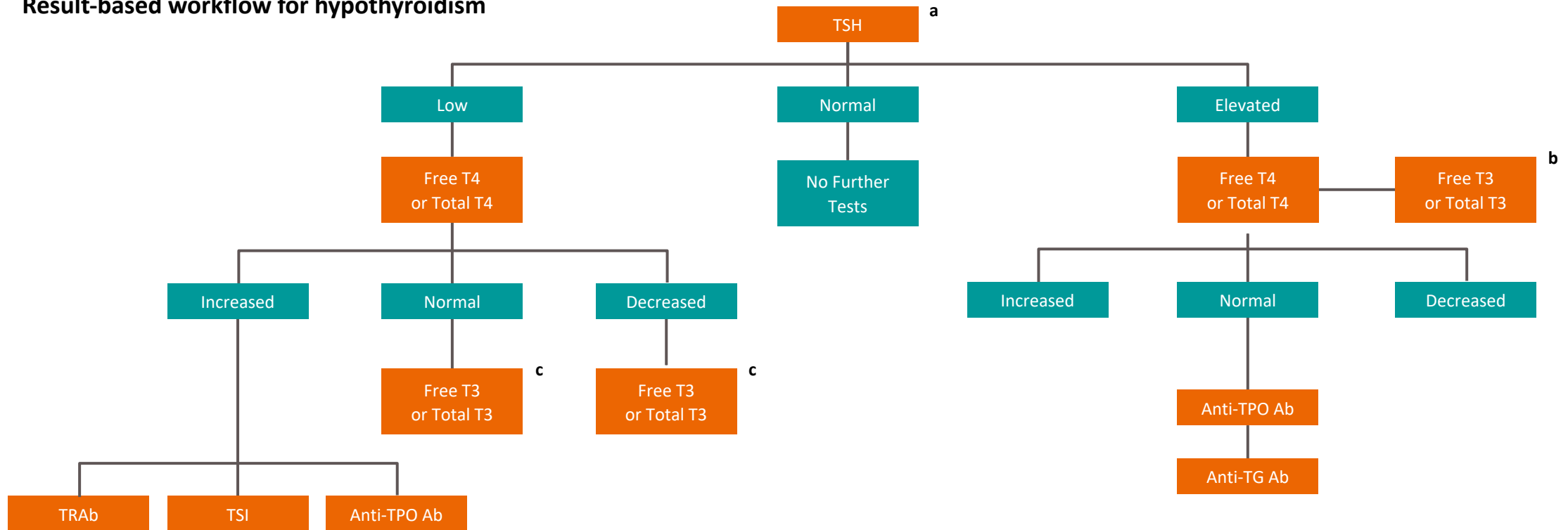
Bringing control and simplicity to drive intelligent workflows

Post-analytical



Implement workflow rules to standardize performance

Result-based workflow for hypothyroidism

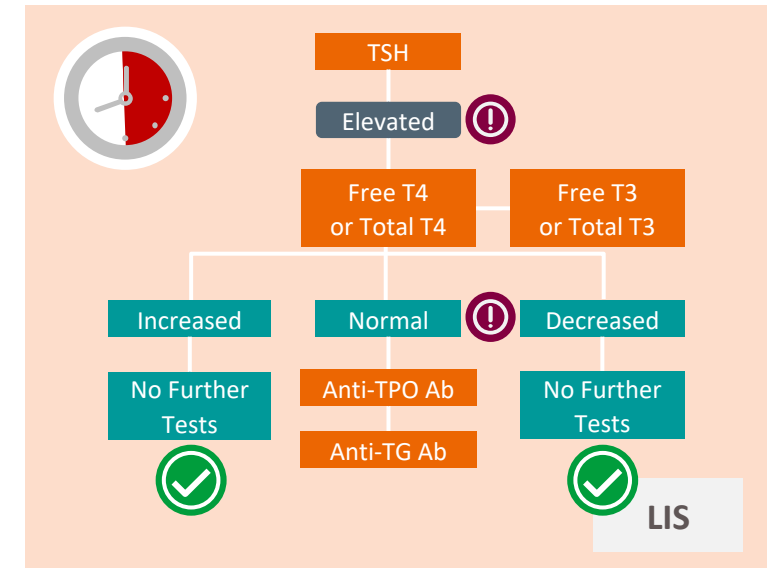
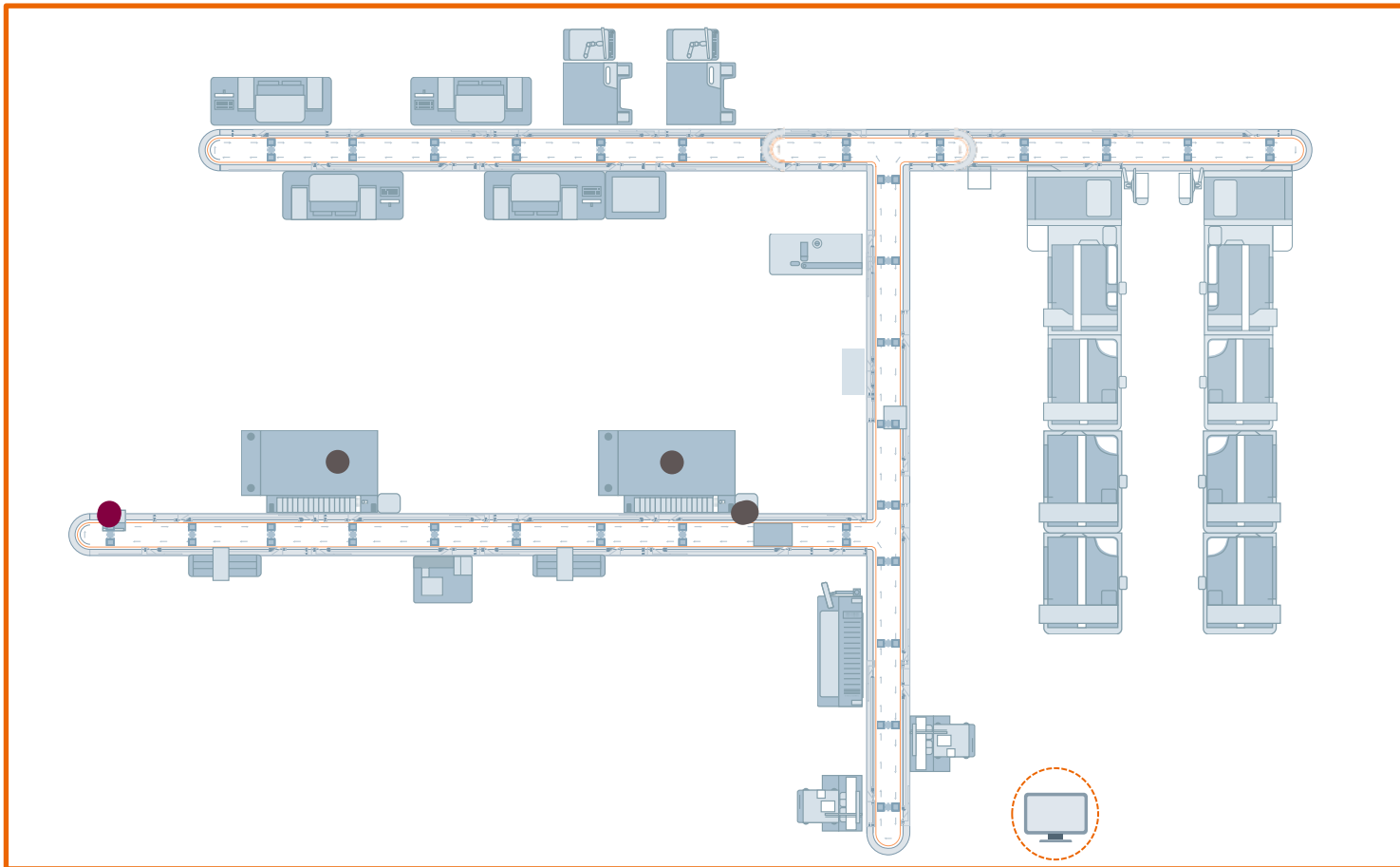


Workflow management rules
enforce Standard Operating Procedures or published guidelines for key workflows or disease pathways.

^a If laboratories are unable to identify those specimens that specifically require the measurement of both serum TSH and FT4, then it would be prudent to measure serum TSH and FT4 on all specimens rather than embark on a firstline serum TSH strategy^{2,2} Screening for Thyroid Dysfunction, UK Guidelines for the Use of Thyroid Function Tests 2006.
^b TSH-secreting pituitary adenomas and selective pituitary resistance to thyroid hormone, that will be overlooked by serum TSH measurement alone; serum FT4 and FT3 concentrations should also be measured when these conditions are suspected,⁴ Laboratory Testing Strategies, ATA Guidelines.
^c To confirm or rule out thyrotoxicosis. NACB Guideline: Laboratory Support for the Diagnosis and Monitoring of Thyroid Disease, Laurence M. Demers, PhD, FACB and Carole A. Spencer, PhD, FACB.

Example: Workflow Management

Standardized Operating Procedures for diagnosing hypothyroidism



Key

- Capped/unspun
- Capped/spun
- Uncapped/spun
- Sealed
- Desealed

Digitalization has transformed diagnostic testing

University of Michigan best practices



“The HBsAg and HIV antibody testing algorithms are implemented in our Siemens CentraLink Data Management System to process these test orders with virtually no technologist intervention. **Using the algorithms, the CentraLink System generates any necessary repeat test orders and selects the appropriate interpretation for reporting.**”

Sue Stern, Administrative Healthcare Manager
Chemical Pathology, University of Michigan Hospital



The outcomes achieved by the Siemens Healthineers customers described in this presentation were achieved in each customer's unique setting. Since there is no typical hospital, and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that others will achieve the same results.

Best Practices

- 1. Automation of tasks previously performed manually**
 - Automated repeats, dilutions, add-ons
 - Algorithms for infectious-disease testing
- 2. Autoverification to streamline results reporting**
- 3. Fewer blood draws**
(leveraging total lab automation)

Impact of Automated Intelligence



Reducing Errors

73% reduction in errors



Improving Turnaround Time

43% improvement in TAT



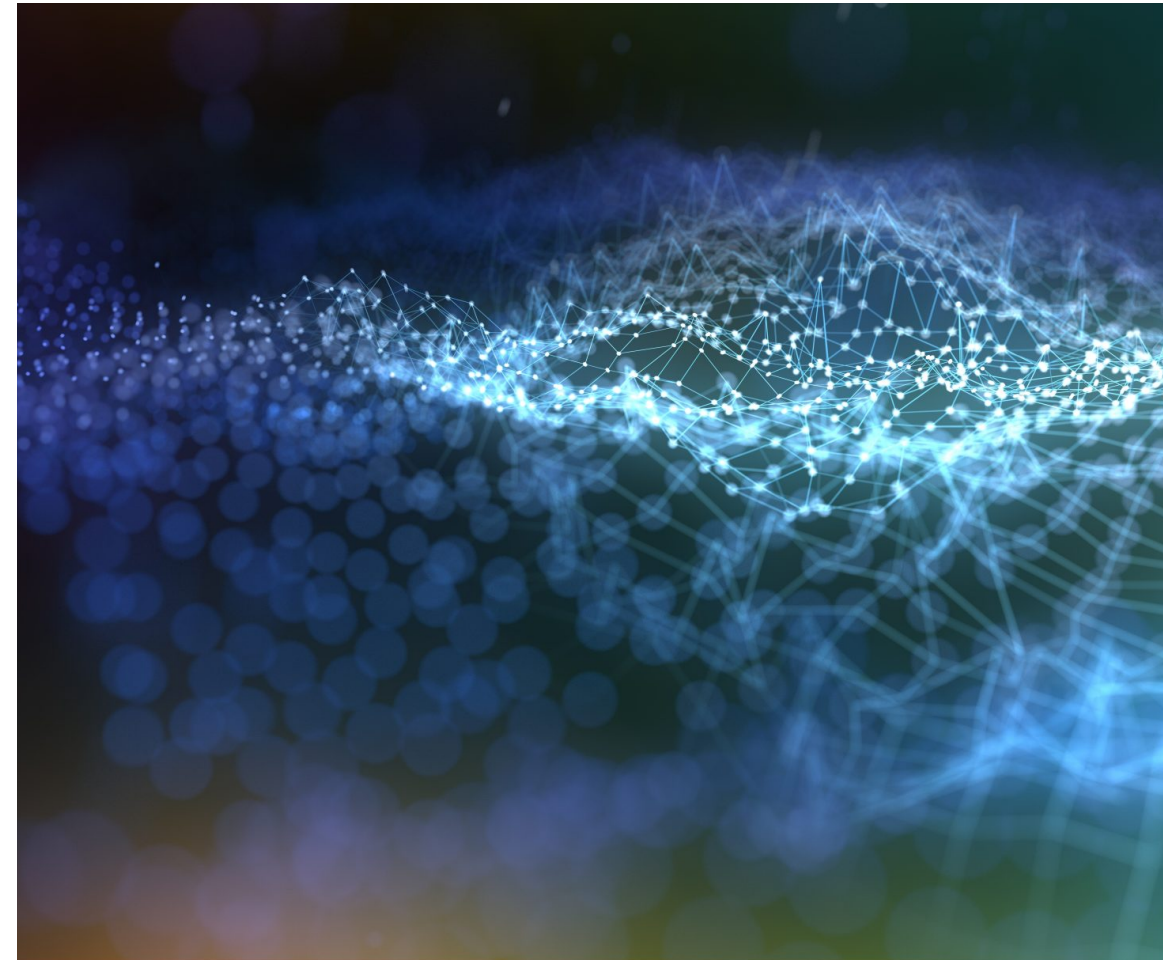
Increasing Capacity

97% increase in volume to 8 million tests per year

The outcomes achieved by the Siemens Healthineers customers described in this presentation were achieved in each customer's unique setting. Since there is no typical hospital, and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that others will achieve the same results.

Four steps to digital transformation

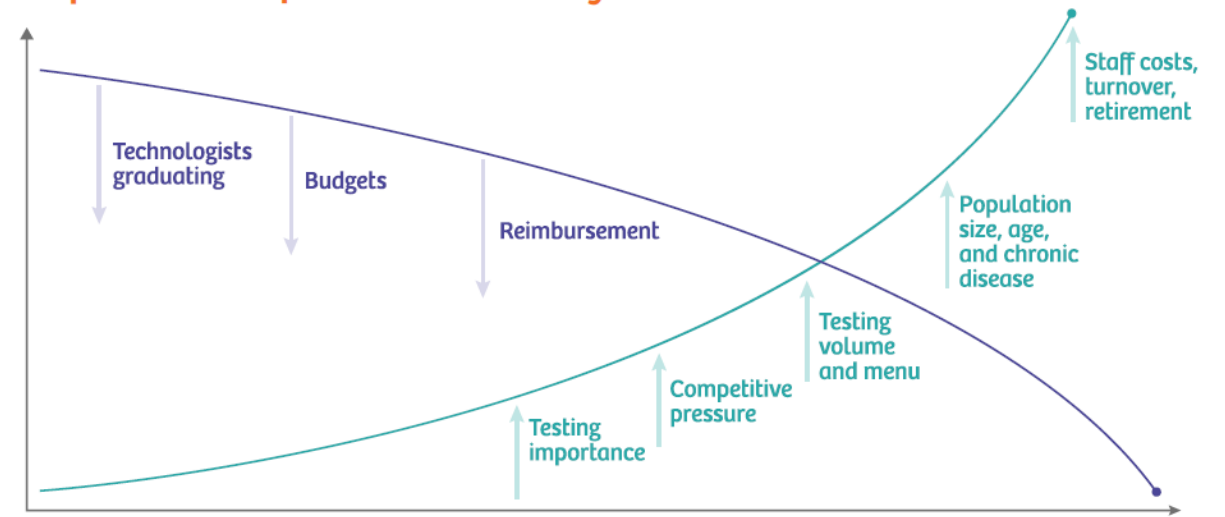
2 Improve workforce productivity and reduce errors



Increasing pressures on workforce impact productivity and quality of service

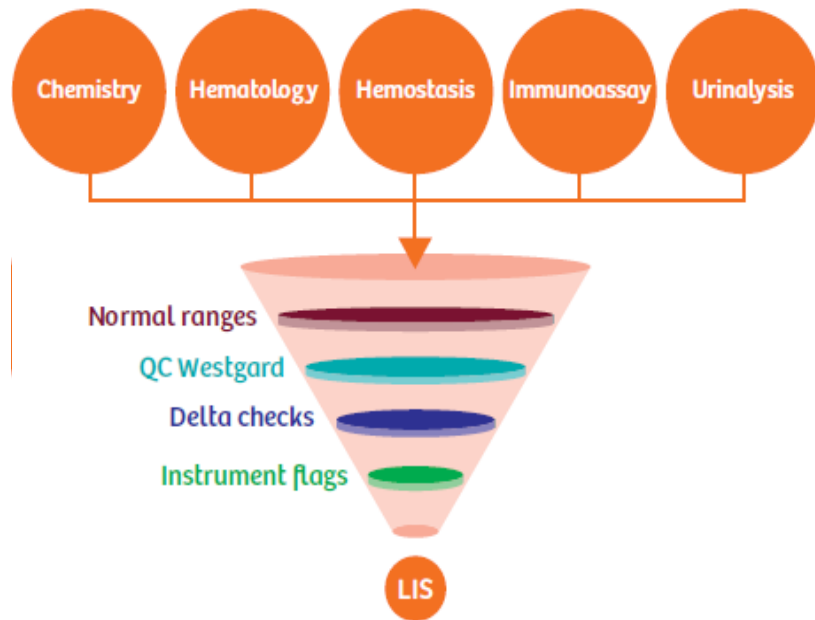
Laboratory staffing has a direct relationship to error rates, mortality, and patient outcome.

Macro Trends Driving the Need to Improve Workforce Productivity

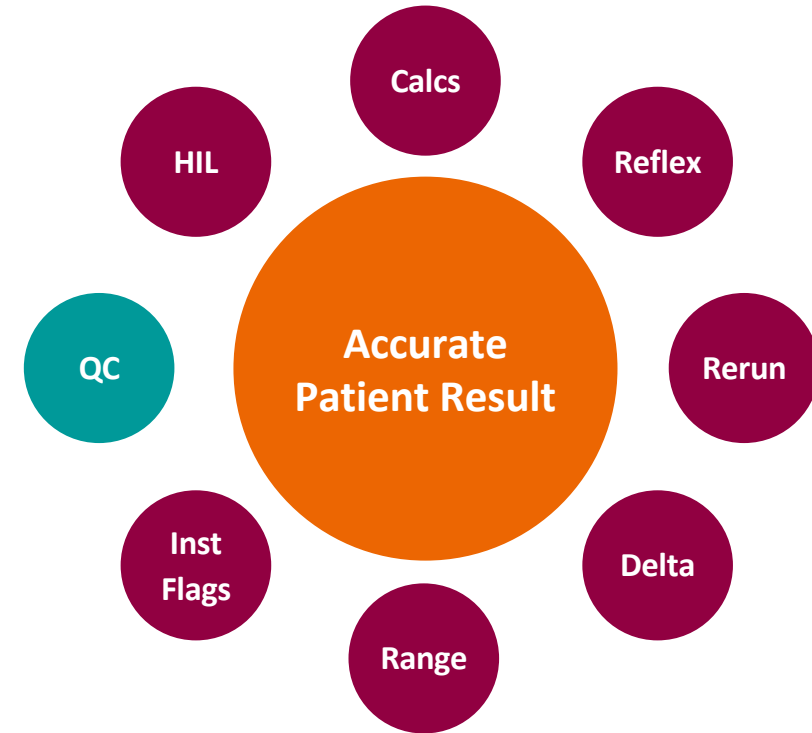


Source: Asian Pacific Journal of Tropical Biomedicine. Challenges of a negative work load and implications on morale, productivity and quality of service delivered in NHS laboratories in England. (2014)

Automate decision-making to improve workforce productivity and reduce human error



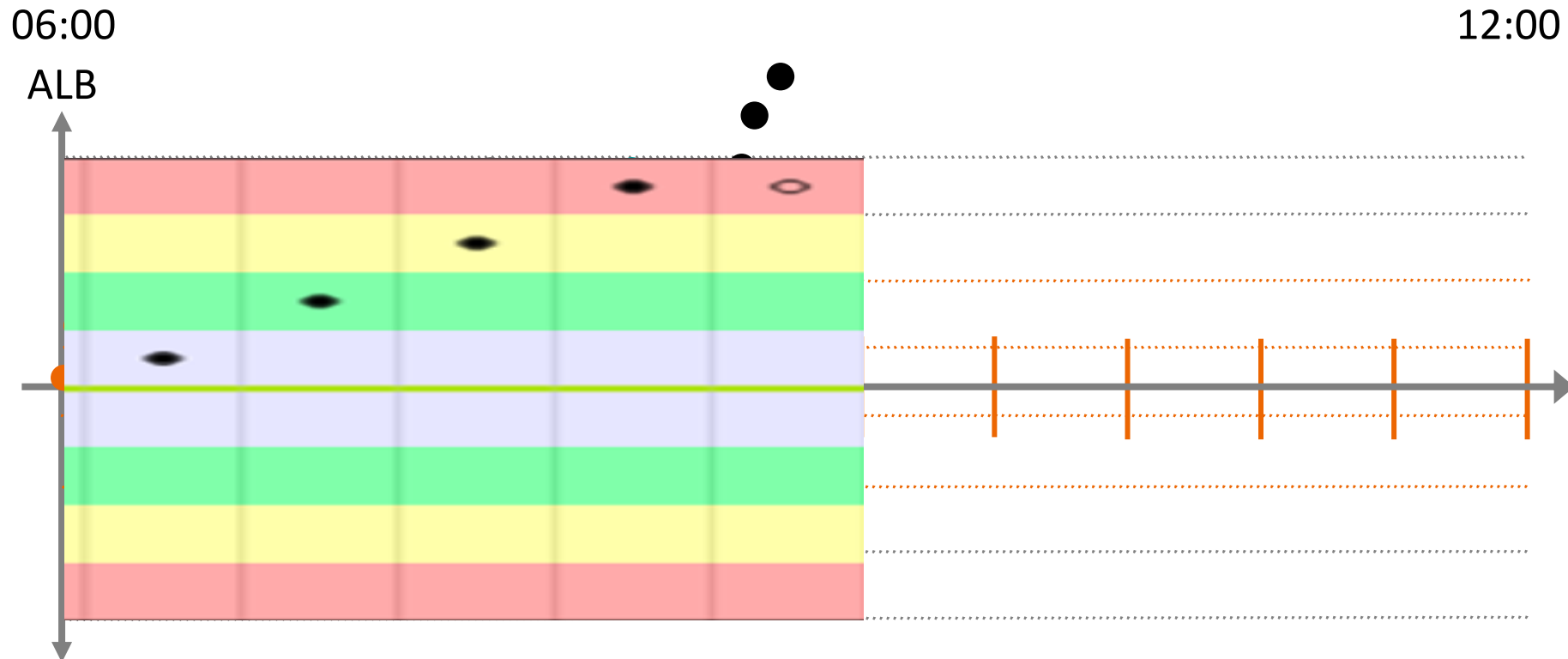
Implement **Autoverification** rules to hold, flag, or release results in special or complex circumstances.



Integrate **Quality Control** into the workflow process to find assay issues and stop autoverification in real-time.

Example: Integrated quality control

Use of patient moving averages to hold results upon trends

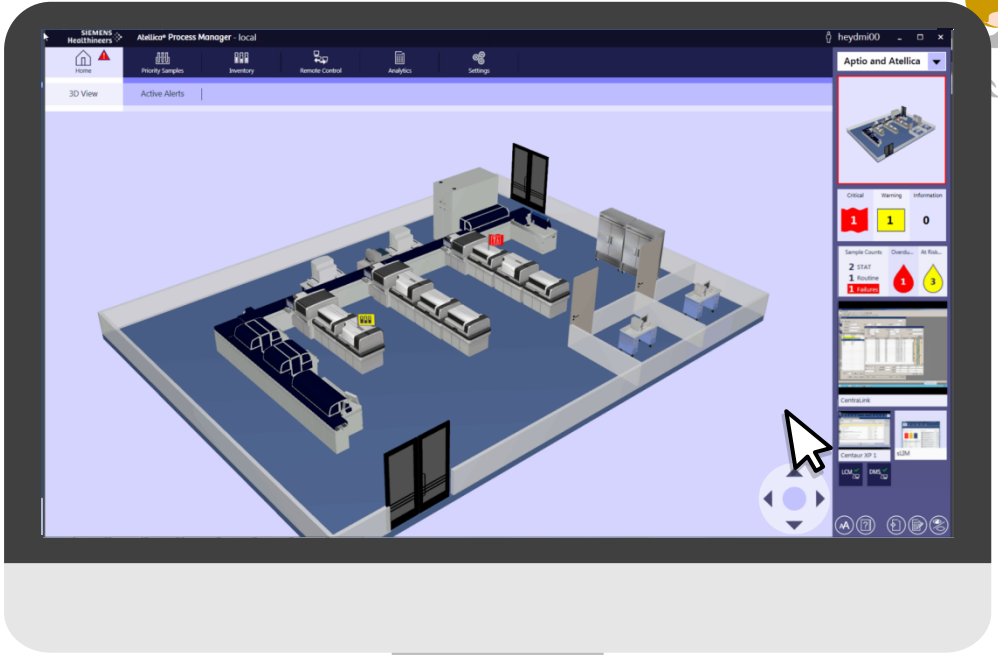


Example: Data management

Use of patient moving averages to hold results upon trends



Centralize oversight to increase workforce productivity



View real-time process status

Remotely control systems

View multiple zones



Higher Priority tasks

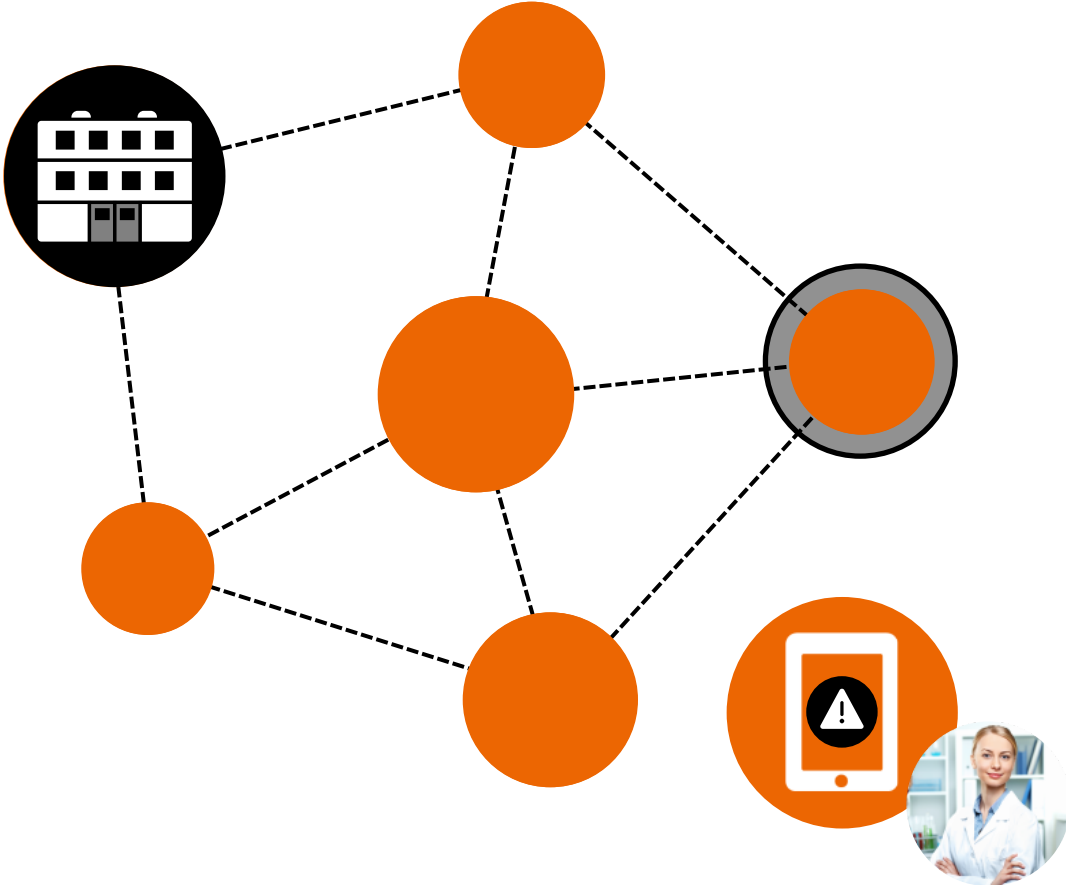
Centralize oversight to identify and resolve errors



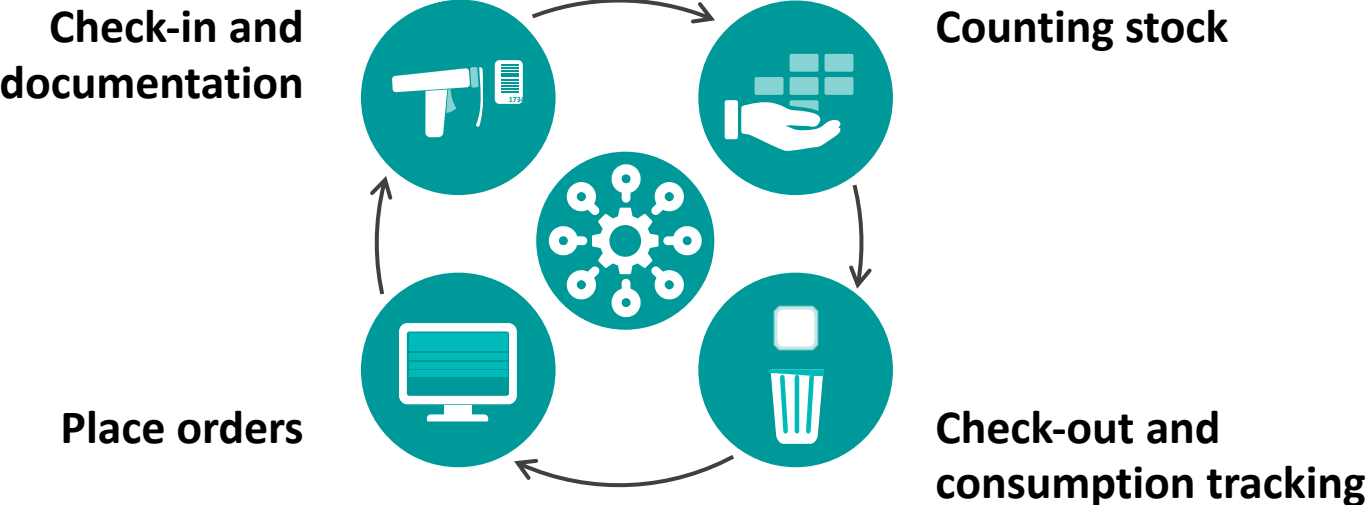
View real-time process status

Remotely control systems

View multiple zones



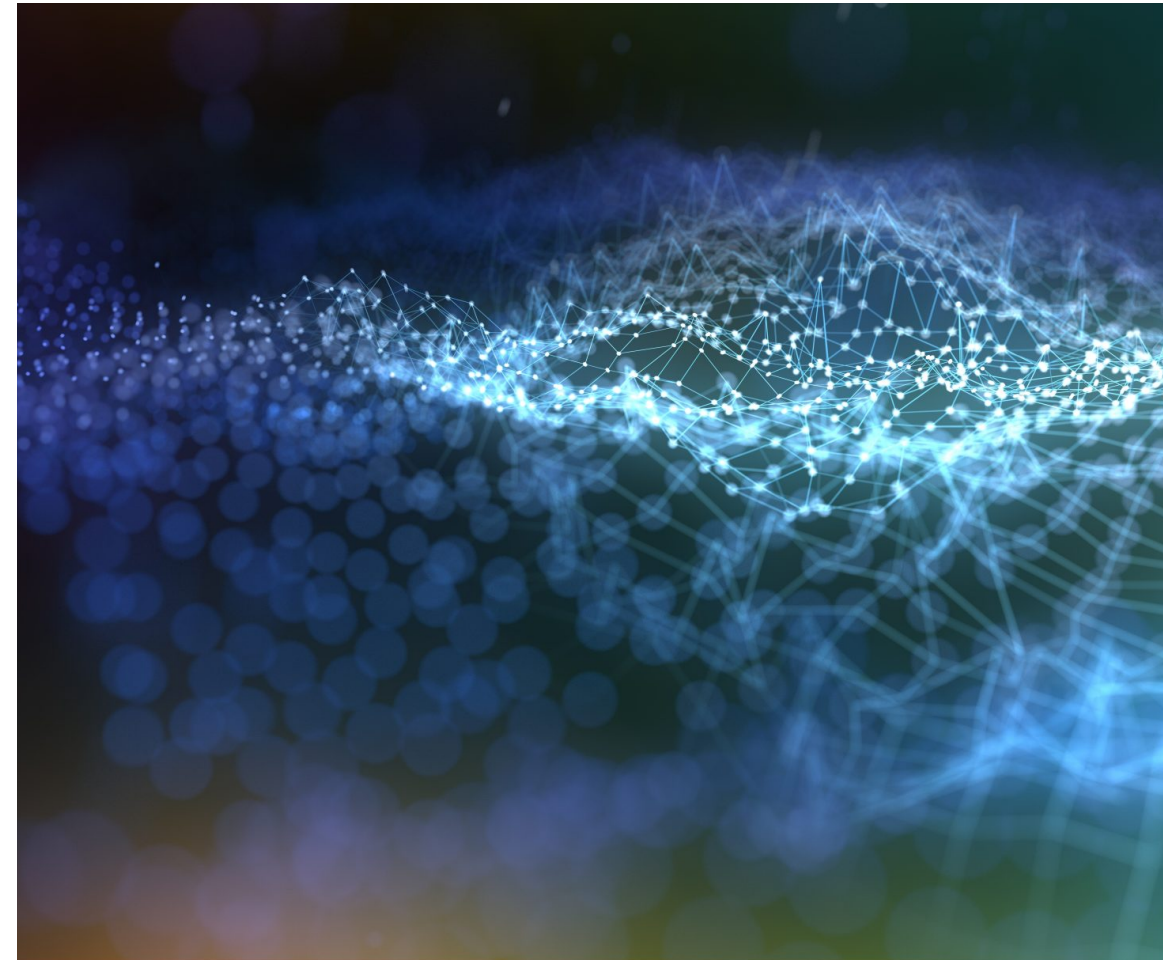
Automate inventory workflow to improve productivity and reduce waste



Automate inventory management tasks and optimize inventory order levels to reduce waste.

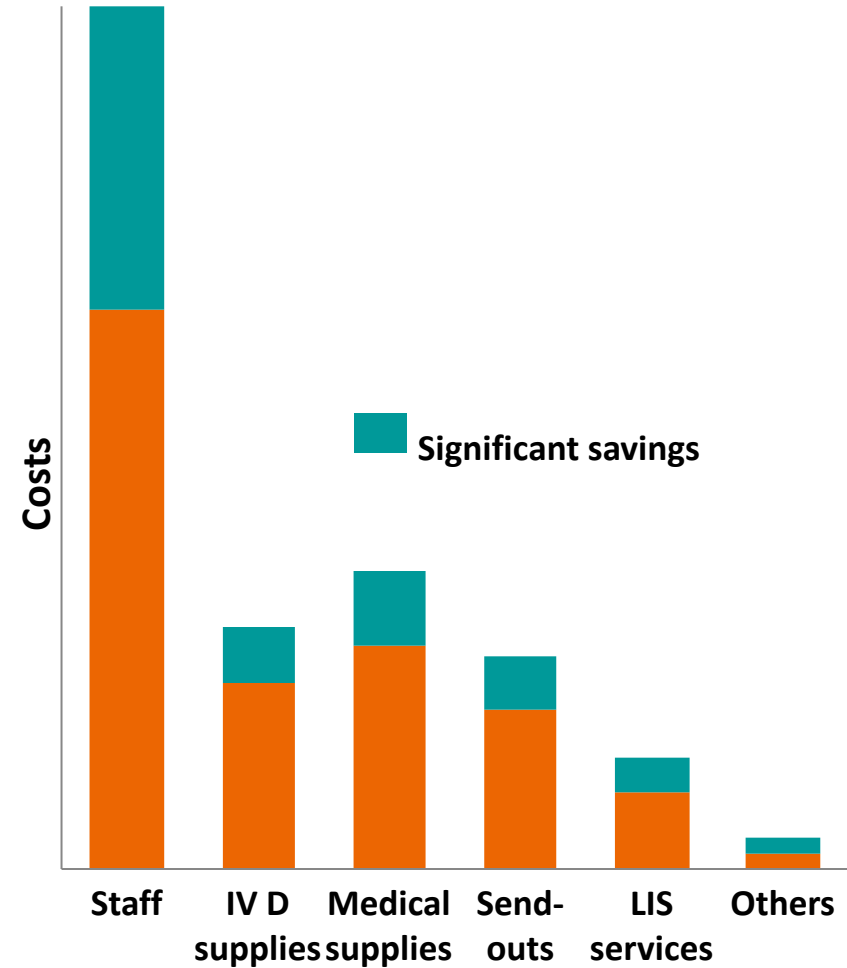
Four steps to digital transformation

3 Reduce cost and improve profitability



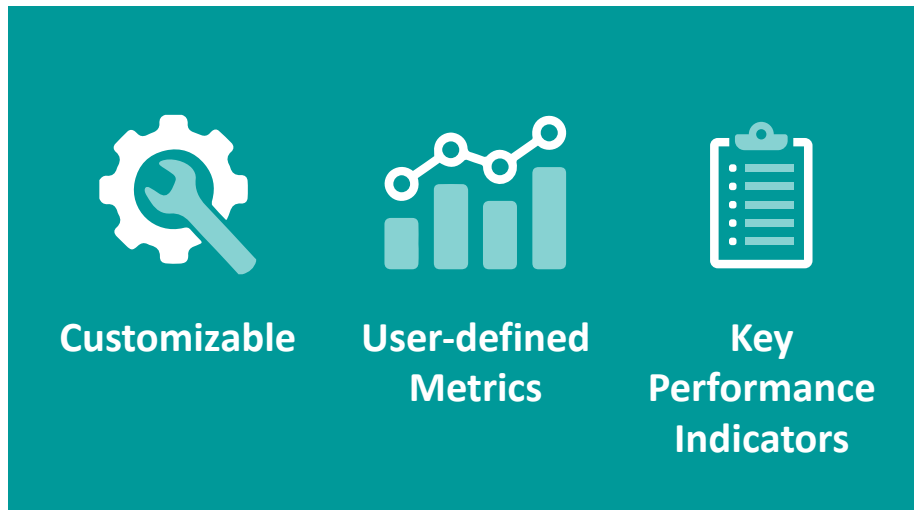
Poor visibility to KPI performance impacts financial stability and puts reputation at risk

Labs spend ~50% of operating budget on staffing, yet 35% of processes are inefficient.



Source: Murphy Leadership Institute. Eliminating wasteful work in hospitals improves margin, quality and culture (2003)

Leverage analytics to get visibility into trends impacting operational costs



Real-time data



Analytics provide visibility to Key Performance Indicators like TAT, system productivity, reagent utilization, and more.

Example: Analytics and business intelligence capabilities

SIEMENS Healthineers Atellica® Process Manager - local Level2

Home Priority Samples Inventory Remote Control Analytics Settings

Save APM 2.0 Demo v2

No selections applied

Problem Samples

Sample Errors by Time

Sample Error Count by Error Description

Sample Error Count by System/Patient Location

Description Legend:

- Cap Type Inconsistent with Tests
- Error During Sampling
- Head Down Failure
- Inconsistent Test Orders
- No Request or SID Mismatch (Analyzer ...)
- Output Rack Missing or Full
- Prepare Not Executed due to Analyzer not ...

Sample Error Listing

Date	Time	Sample ID	Error Code	Error Description	System	Patient Location
7/2/2016	19:16	-	I04	Inconsistent Test Orders	Unknown	H1-CCU
7/18/2016	21:32	-	I04	Inconsistent Test Orders	Unknown	H1-CCU
7/4/2016	02:57	-	I04	Inconsistent Test Orders	Unknown	H1-ER
7/4/2016	04:26	-	I04	Inconsistent Test Orders	Unknown	H1-ER
7/8/2016	05:59	-	I04	Inconsistent Test Orders	Unknown	H1-ER
7/8/2016	08:08	-	I04	Inconsistent Test Orders	Unknown	H1-ER

Selected Filters:

Analytics Example

Monitor TAT performance in real-time to avoid costly penalties and deliver predictable turnaround times

Gain TAT transparency



Receive TAT performance reports

Ensure predictable turnaround times



*TAT rules can be customized to measure from time of test order or receipt in lab. Can measure up to time of test result or release to LIS.



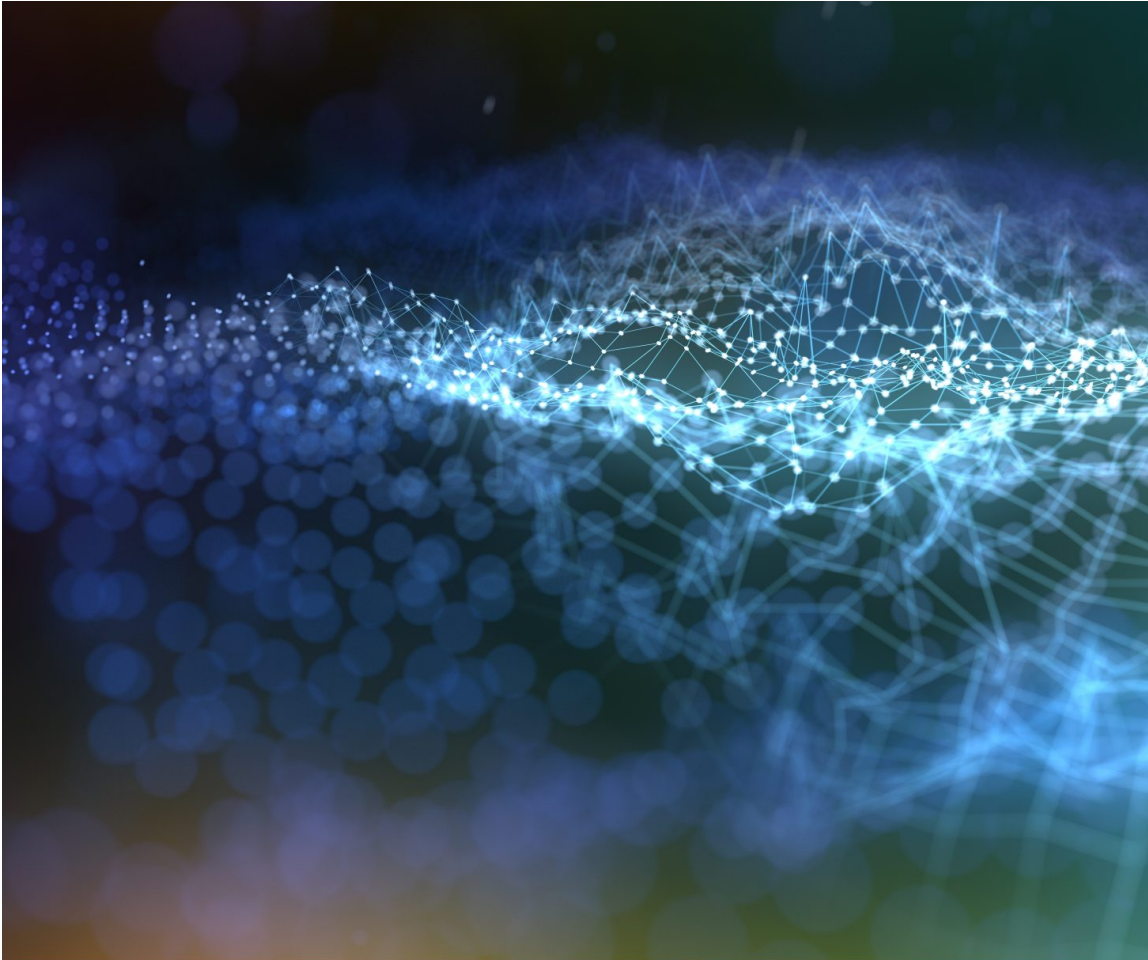
*“As a supervisor, Atellica Process Manager helped me **understand and reassess the department’s workflow and improve upon it.** Based on data I gather from the analytics report, it has helped me **standardize workflow [and] monitor and achieve our TAT goal.**”*

Jonathan Sy Tan
*Chemistry and Immunochemistry
Testing Supervisor
Columbus Regional Health*

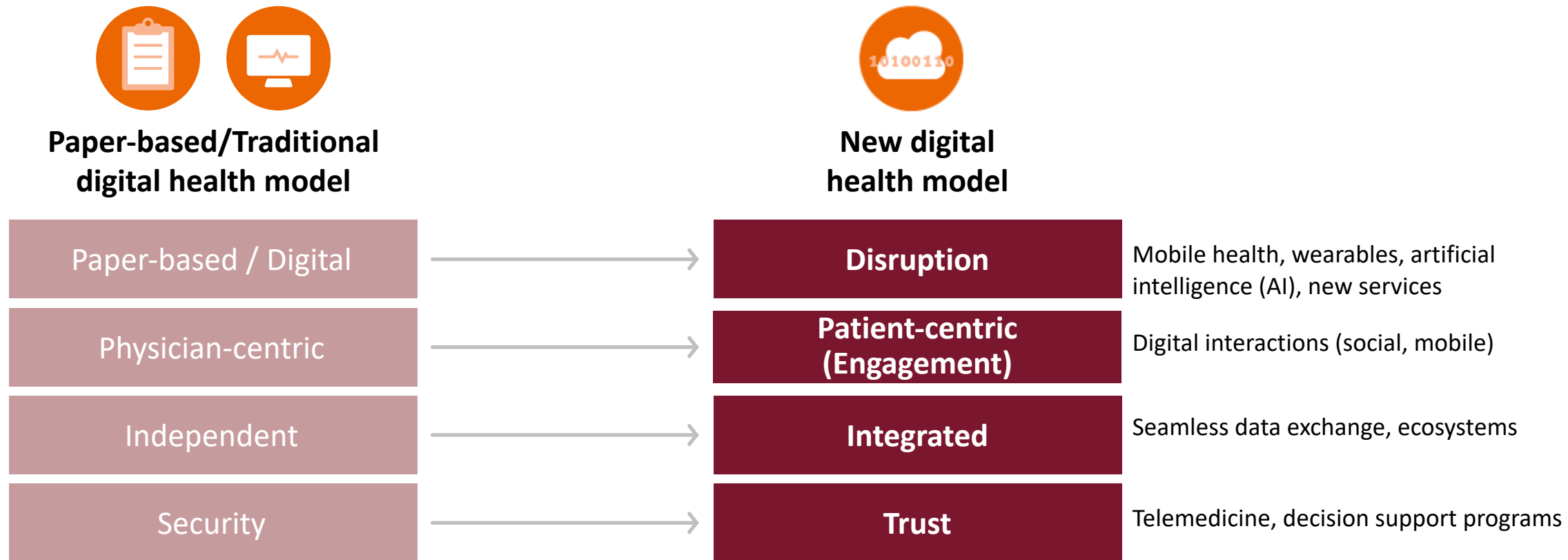
Four steps to digital transformation

4

Prepare for the future



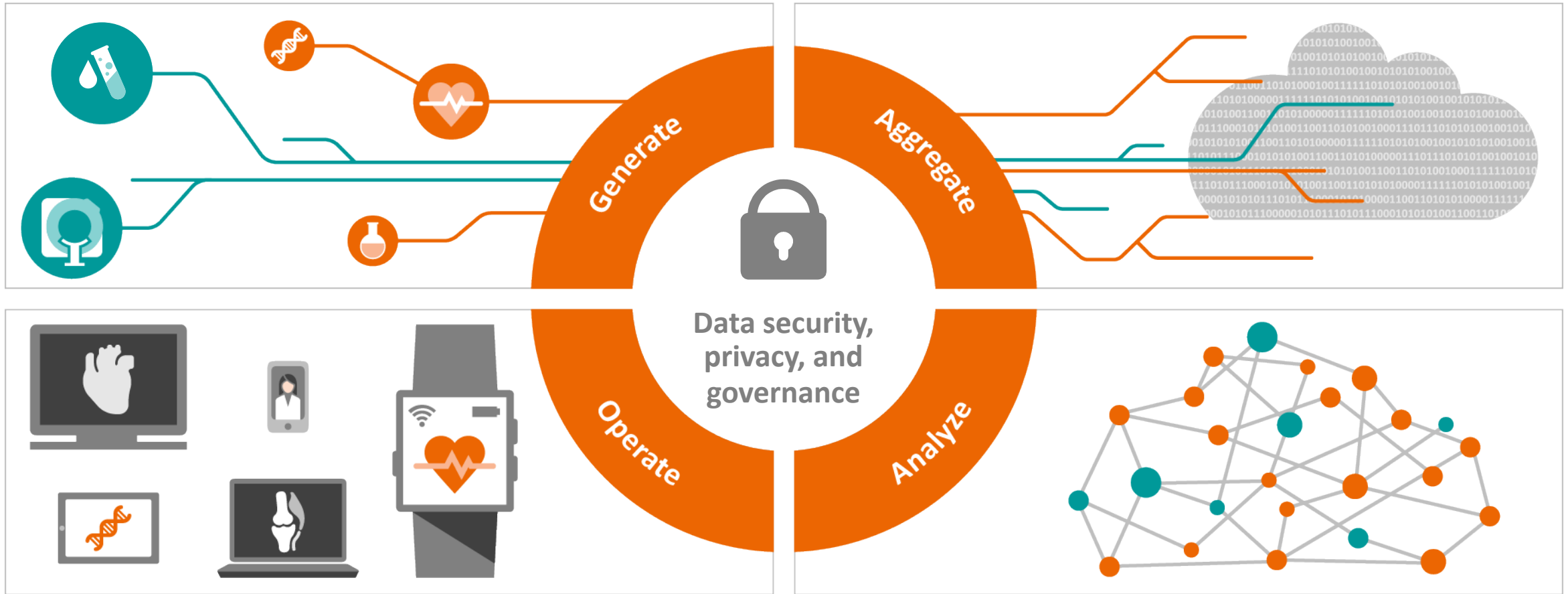
New digital health model will change care delivery



Source: The Digital Healthcare Leap, Digital health in emerging markets, PWC, February 2017
<https://www.pwc.com/gx/en/issues/high-growth-markets/assets/the-digital-healthcare-leap.pdf>

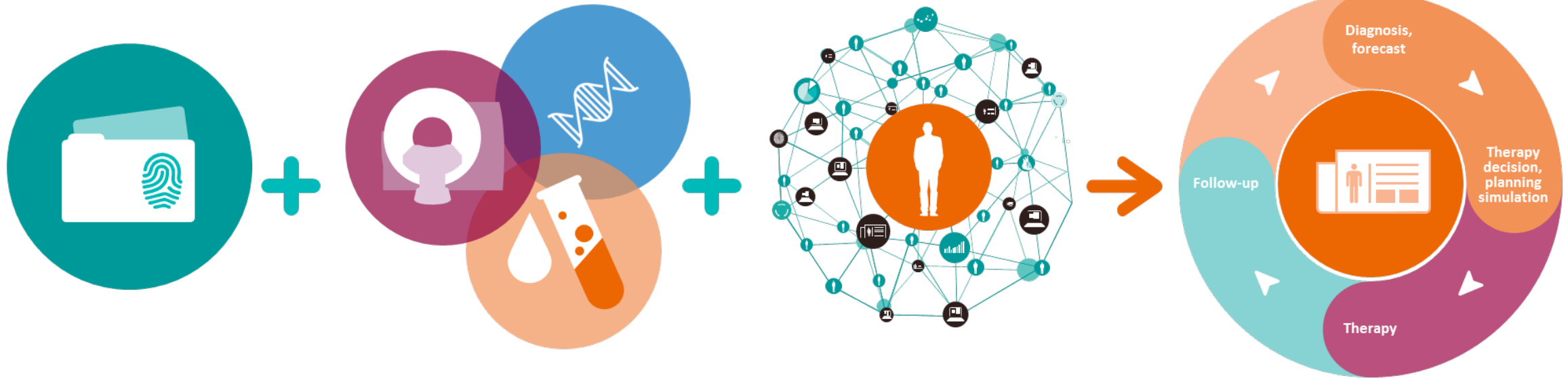
Example: Integrated ecosystem

Adopt a digital platform that reaches beyond the lab



Example: AI and decision support

Integrate data for optimal diagnosis and treatment decision



Historical patient data from EMR

Current in-vivo and in-vitro biomarkers incl. omics

Real-time correlation to reference data and population cohorts

Personalized diagnostics and treatment decision

Addressing today's lab challenges and moving toward digital transformation

Digital Capabilities

Benefits

Centralize data management
Implement workflow rules

1

Standardize performance

Automate decision-making
Centralize oversight
Automate inventory workflow

2

Improve workforce productivity and reduce errors

Leverage analytics
Monitor TAT performance in real-time
Optimize inventory ordering

3

Reduce cost and improve profitability

Patient engagement solutions
Adopt a digital platform that reaches beyond the lab
AI and Decision Support

4

Prepare for the future



Jennifer Sanderson

US Marketing Manager, Informatics

Siemens Healthineers Laboratory Diagnostics
Tarrytown, NY