

ENABLING SMALL AND MEDIUM MANUFACTURERS TO ADOPT SMART MANUFACTURING

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WHAT IS SMART MANUFACTURING?

The term “smart manufacturing” has been used to mean many things. When answering the following questions, please consider this definition:

Smart manufacturing integrates technologies to communicate data between people and machines *where* it's useful, *when* it's useful, and in the *form* that's useful.



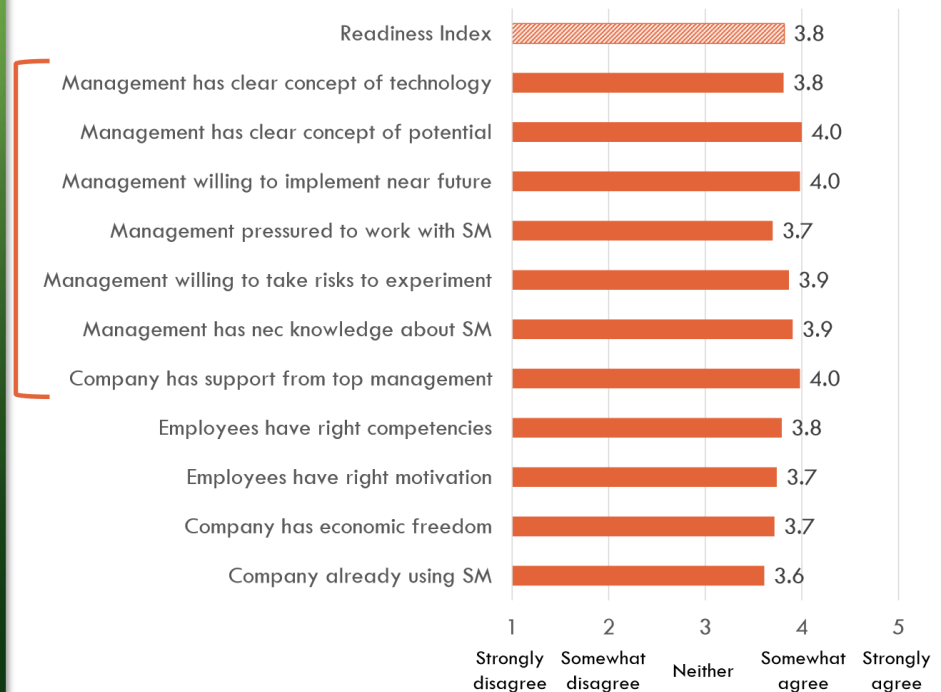
WHICH SMART SOLUTIONS ARE SMART FOR SMM?

- Small and medium manufacturers (SMMs) face higher barriers
- More research needed on the experiences of US SMMs
- UCI Smart Manufacturing in SMMs survey
 - Funded by the office of Energy Efficiency & Renewable Energy of the US Department of Energy as part of the *Smart Connected Workers in Advanced Manufacturing* project
 - With CESMII and NIST's Manufacturing Extension Partner Centers
 - Subsample: 54 owners and employees of SMMs (< 500 employees)
 - Readiness, drivers, and barriers
 - Plus: focus on specific tasks and technologies



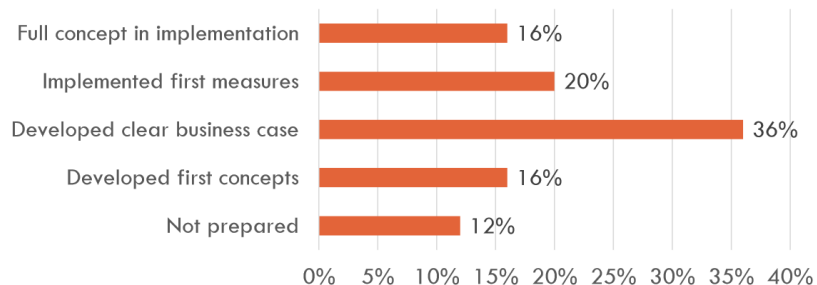
READINESS TO ADOPT SMART MFG

Do you agree or disagree that the following statements are true for your company?



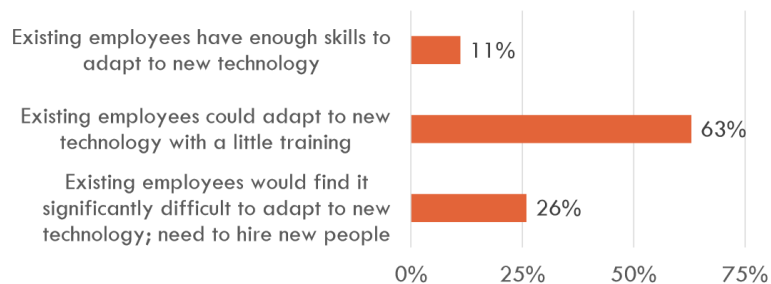
ADOPTION PROGRESS

How prepared is your company to introduce new technologies for smart manufacturing?



SKILL OF WORKERS

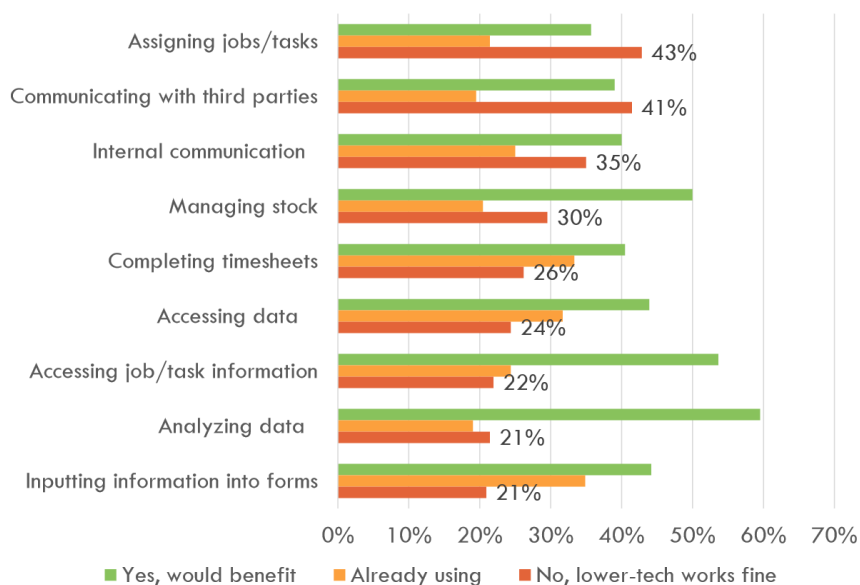
What best describes the skill level of the workers in your company?



WHEN TO USE SMART VS. WHEN LOW TECH IS FINE

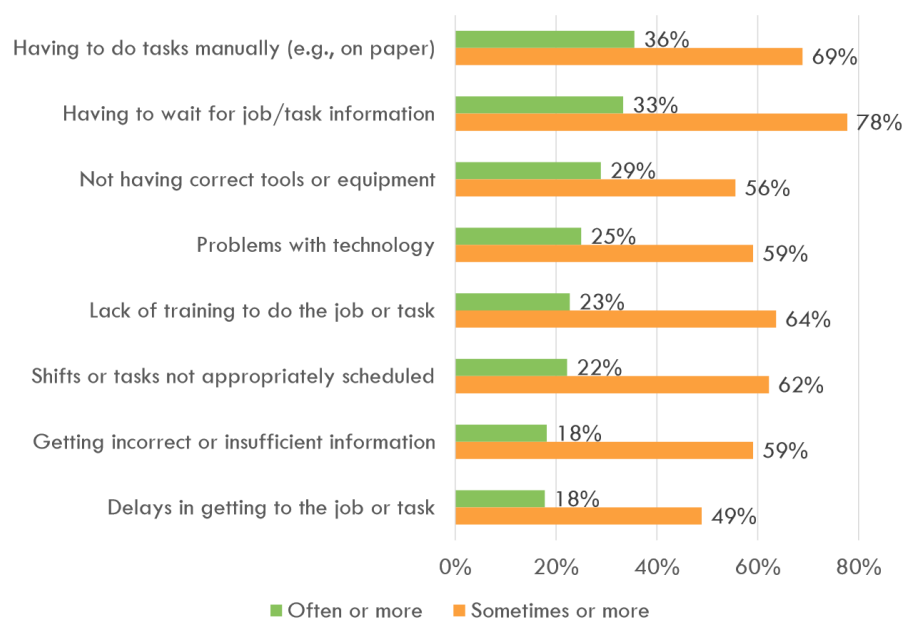
In some situations, it's easier to use traditional, lower-tech solutions, such as paperwork on clipboards, or manually checking readouts to make decisions. In other situations, these solutions are slow or unwieldy compared to newer technologies.

Do you think your company would benefit from adopting smart manufacturing solutions for any of the following tasks?



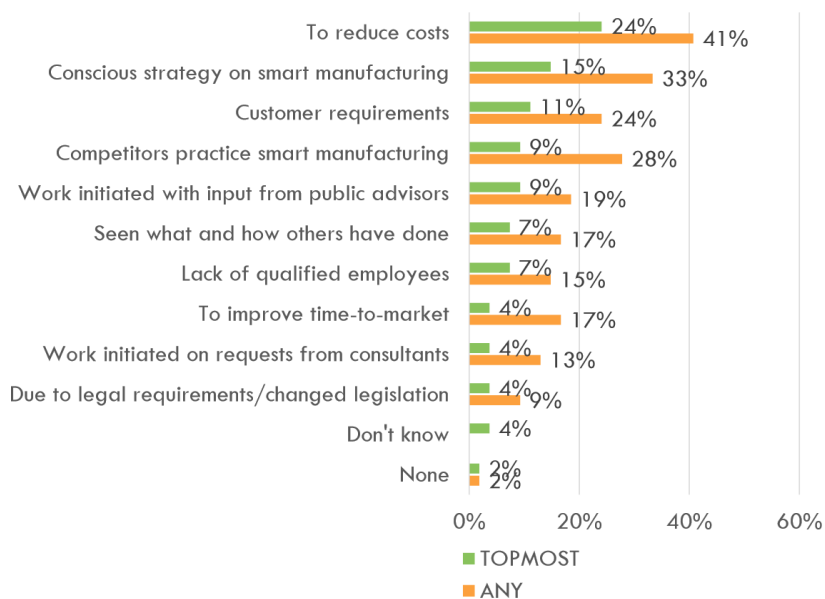
WASTE STREAMS: PROBLEMS THAT SMART MFG COULD SOLVE

How often does your company face significant productivity issues due to the following problems? (always, often, sometimes, rarely, never)



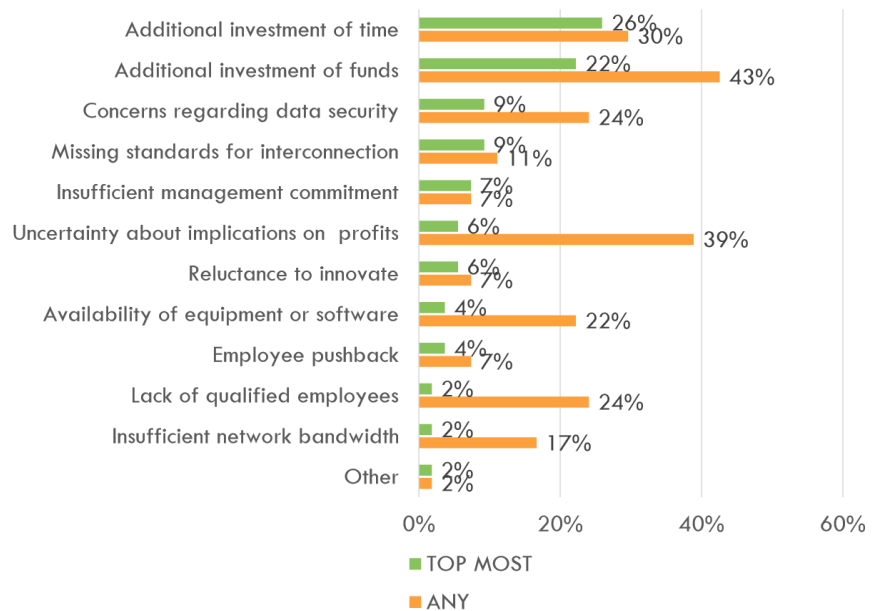
WHAT IS DRIVING SMART MFG ADOPTION

What do you think are the most critical factors driving your company to implement smart technologies? (up to three; prompted for 'topmost')



WHAT IS HOLDING SMMS BACK FROM ADOPTING SMART MFG

What are the most critical barriers involving implementing smart technology and smart production processes in your company? (up to three; prompted for 'topmost')

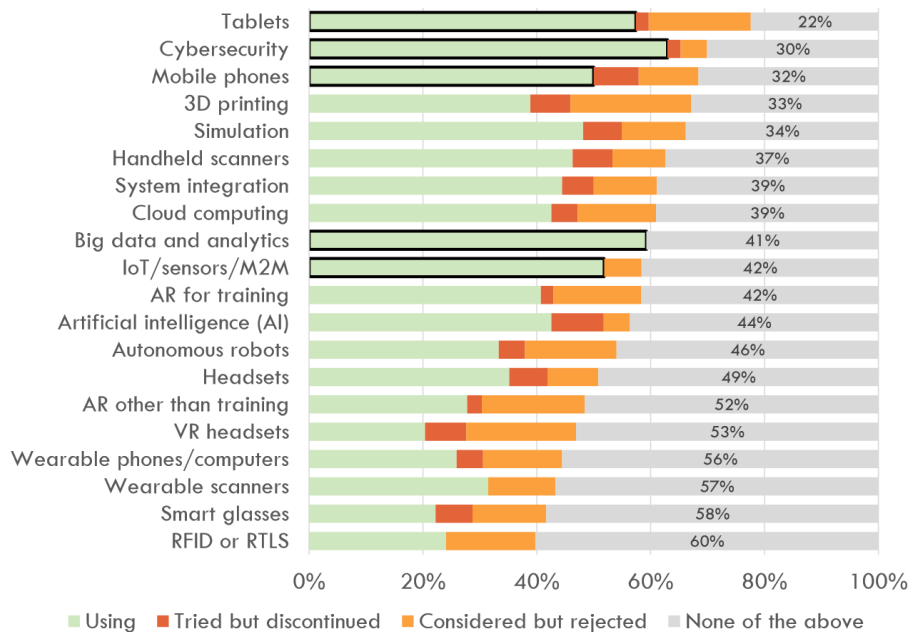


SPECIFIC SMART MFG TECHNOLOGY TYPES

- ☐ Tablets
- ☐ Mobile phones
- ☐ Handheld scanners
- ☐ Wearable scanners
- ☐ Wearable mobile phones/computers
- ☐ Smart glasses
- ☐ Headsets
- ☐ Virtual reality (VR) headsets
- ☐ Augmented reality (AR) for training
- ☐ Augmented reality (AR), purposes other than training
- ☐ Internet of Things / sensors / M2M (machine to machine) communication
- ☐ Cloud computing
- ☐ Cybersecurity
- ☐ Big data and analytics
- ☐ Simulation
- ☐ Artificial intelligence (AI)
- ☐ Autonomous robots
- ☐ Radio-frequency identification (RFID) and/or real-time locating system (RTLS)
- ☐ Additive manufacturing (e.g., 3D printing)
- ☐ Horizontal and vertical system integration

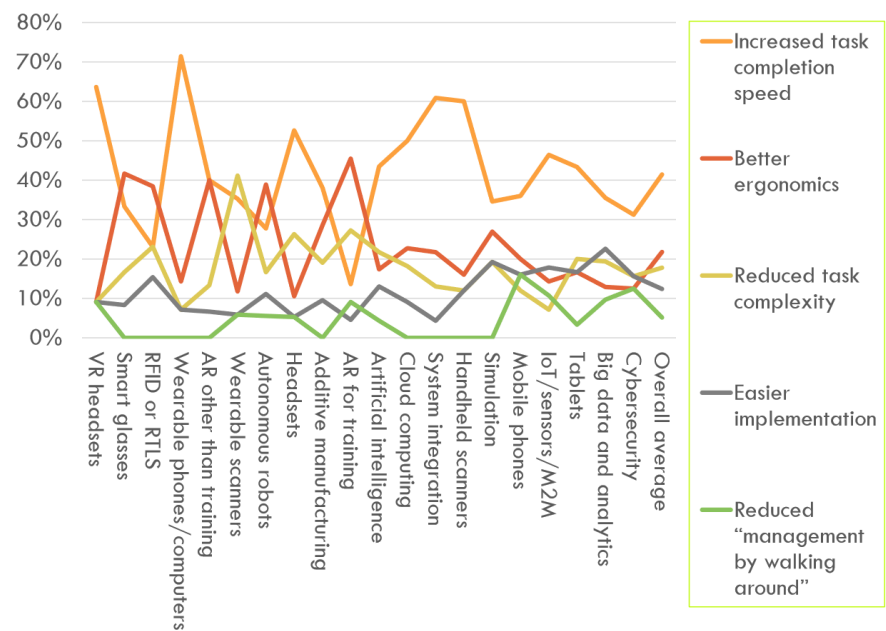
USAGE OF TECHNOLOGY TYPES

Does company use as part of a smart manufacturing solution... OR implemented but later discontinued use because you experienced problems... OR seriously considered implementing but decided not to because you expected problems?



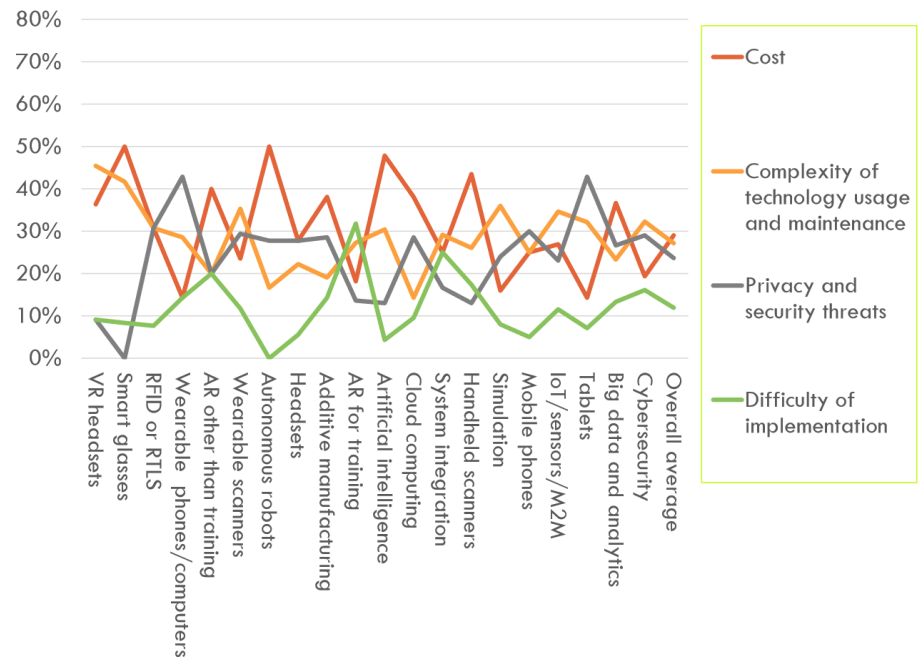
PROS OF TECHNOLOGY TYPES

Based on your experiences, what is the most significant "pro" of the following technologies?



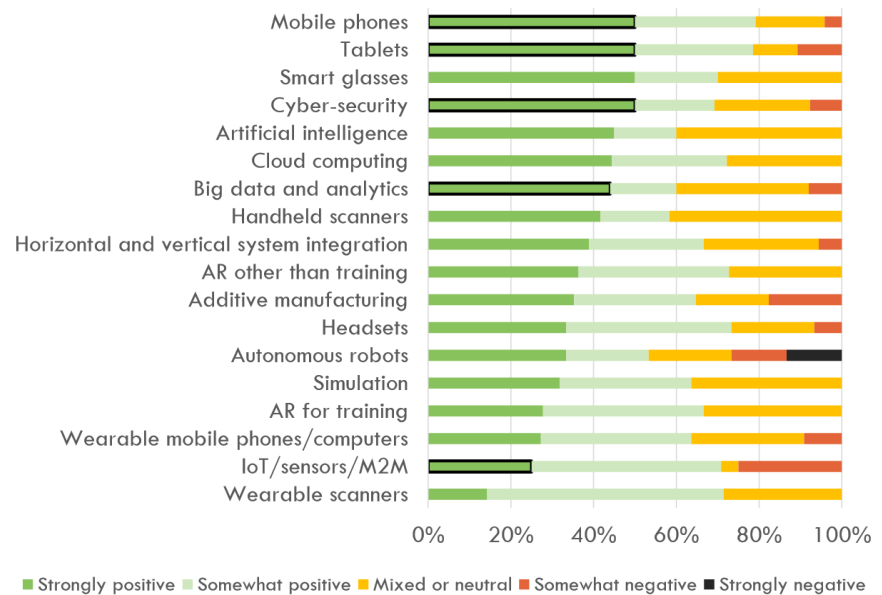
CONS OF TECHNOLOGY TYPES

Based on your experiences, what is the most significant "con" of the following technologies?



WORKER REACTIONS TO TECHNOLOGY TYPES

Overall, how did most workers in your company react to implementing the following types of smart technology?



TAKE-AWAYS

- SMMs face challenges with adopting smart manufacturing solutions
 - Negotiating cost and time
 - Limited readiness
 - Worker response
- Focus on *tailored* solutions
 - Address the problems they most need to solve
 - Pros and cons vary across specific technologies
 - Inroads with accessible options: tablets, mobile phones, cybersecurity, data analysis, IoT

QUESTIONS AND COMMENTS WELCOME

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