



Message in a Bottle: How Performance Enables Sustainability for Tomorrow's Products

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Materials Sustainability Meets Performance
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There are so many buzzwords for sustainability



There are so many buzzwords for sustainability
... but what the hell does it even mean?



When in doubt, just ask “Alexa”



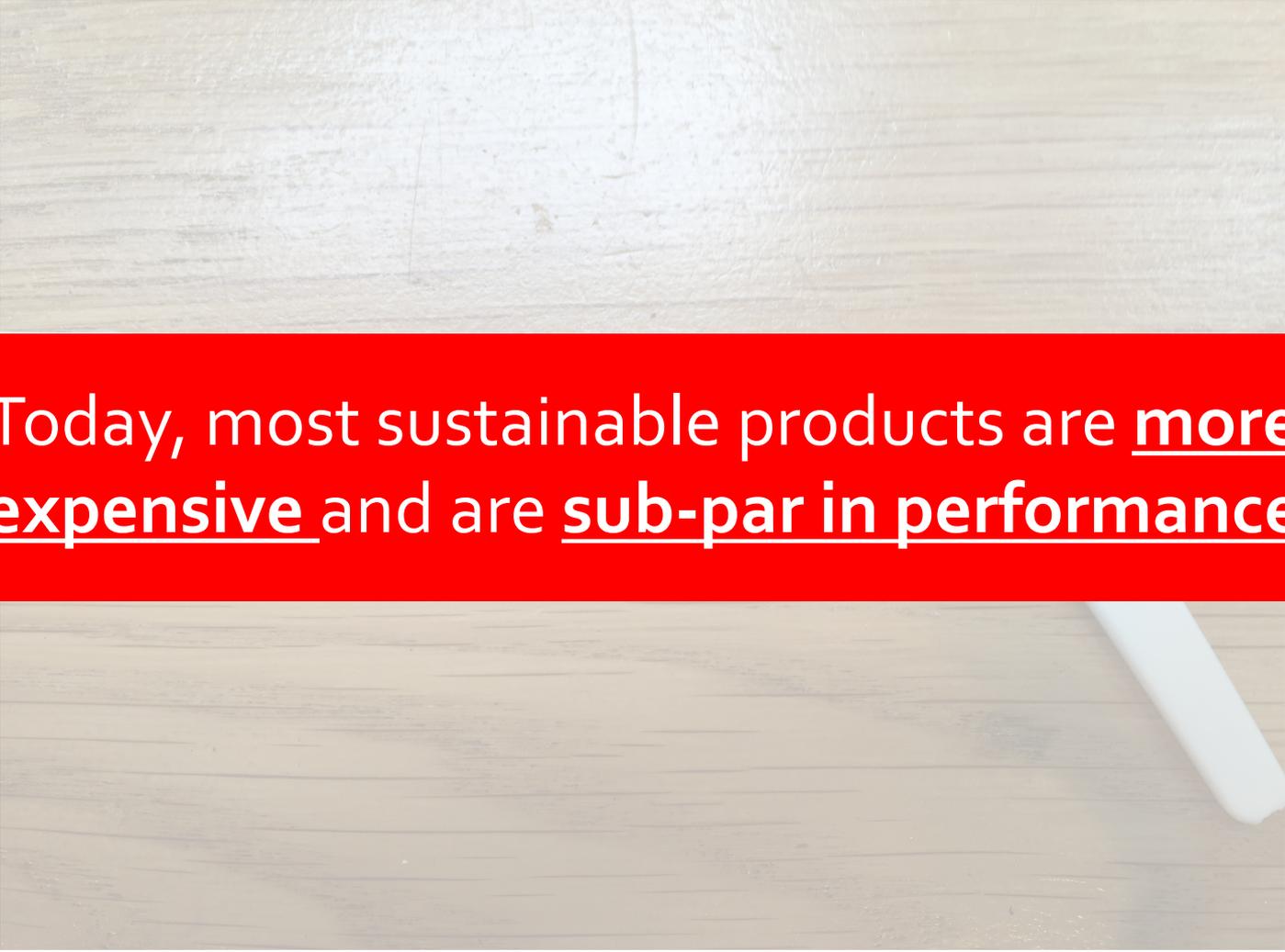
“Alexa, what does ‘sustainability’ mean?”



Sustainability sounds great and gives all the right “feels”



But, reality is harsh and this is what “sustainable” products look like today



Today, most sustainable products are more expensive and are sub-par in performance

If we take Coca-Cola's Plant Bottle example, the project highlights a classic "sustainability pitfall"

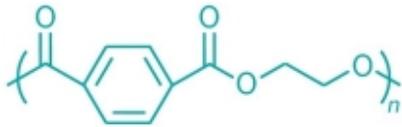
Coca-Cola



Coca-Cola first focused on its “drop-in” approach by replacing PET with 100% bio-based PET

Coca-Cola

Drop-in



Polyethylene terephthalate (PET)



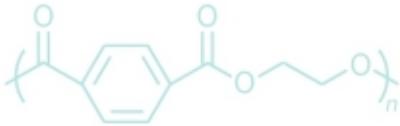
TORAY
Innovation by Chemistry



Shifting to 100% bio-based PEF justifies higher costs with higher performance

Coca-Cola

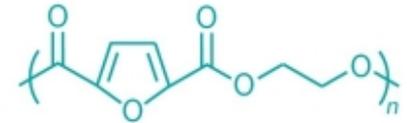
Drop-in



Polyethylene terephthalate (PET)



Improvement



Polyethylene furanoate (PEF)



avantium





Consumers don't really care
about sustainability and won't
pay a premium for it

So what are the strategies to consider?

Improve **performance** of your product

Improve the **process** to make your product

Consumer-facing companies leverage performance to enable sustainability for new products

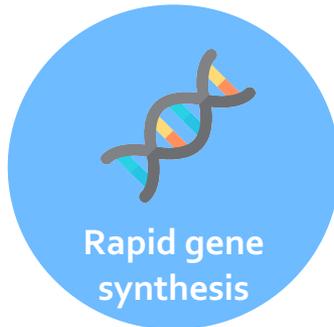


How about rethinking the way we make our products today?



Improve **how** you make your product

C&M companies can leverage existing infrastructure for flexible, on-demand, and distributed production



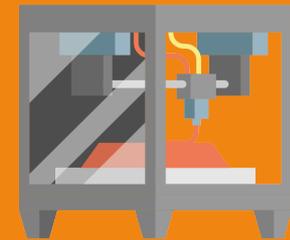
The digitization of synthetic biology enables a service-based business model for biomanufacturing



Design

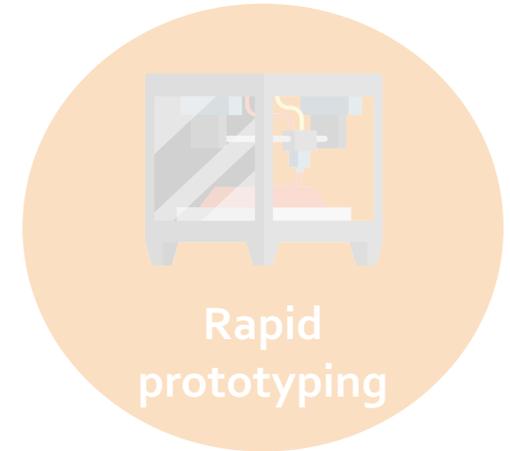
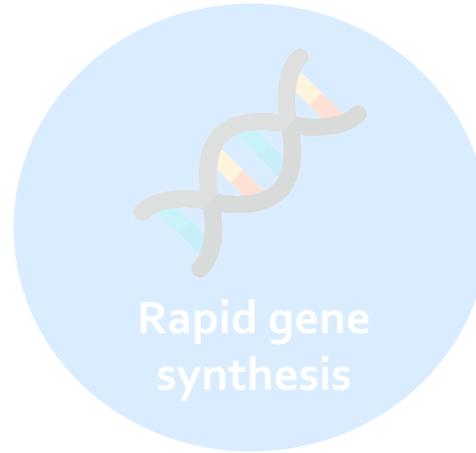


Rapid gene synthesis



Rapid prototyping

Tools that leverage artificial intelligence and cloud computing to accelerate strain/product design



New gene synthesis technologies that drive down cost and time for synthesizing DNA



Design



Rapid gene synthesis



Rapid prototyping



Automated strain engineering that enable rapid prototyping organisms



Design



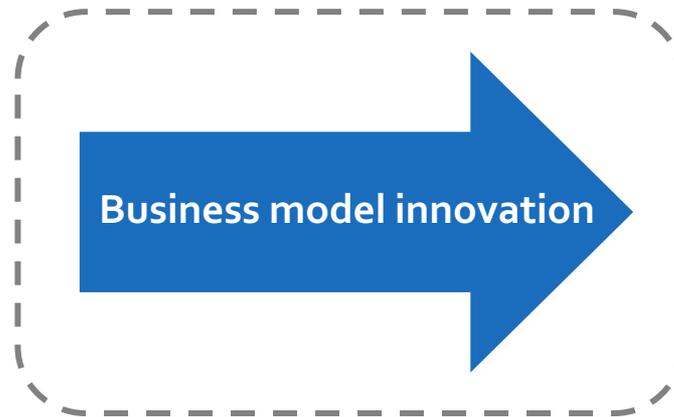
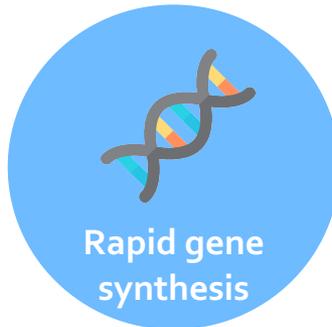
Rapid tooling



Rapid
prototyping



Business model innovation is key to rethink “business-as-usual” for C&M companies

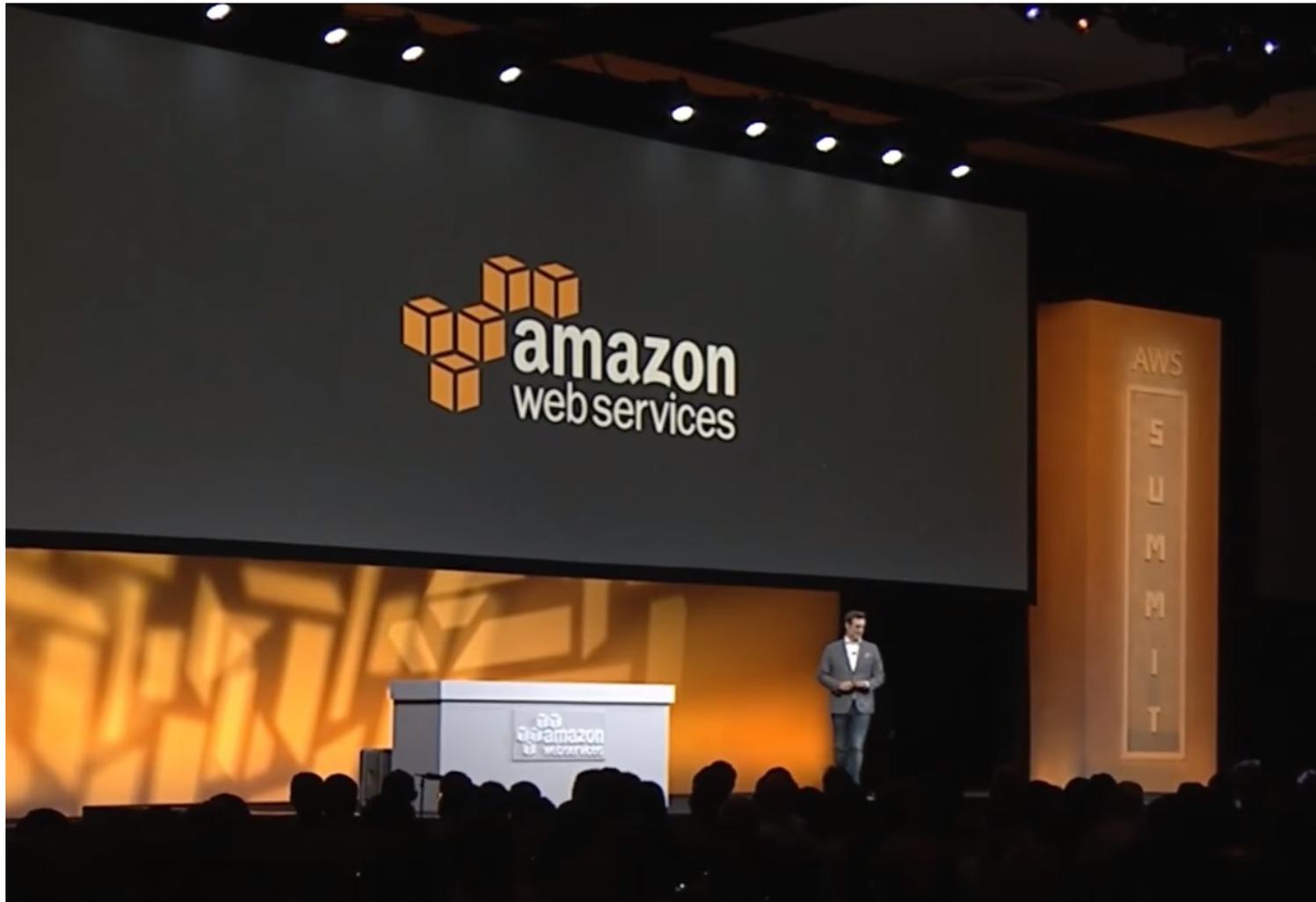


Amazon creates Amazon Web Services (AWS), a cloud based infrastructure-as-a-service (IaaS) platform

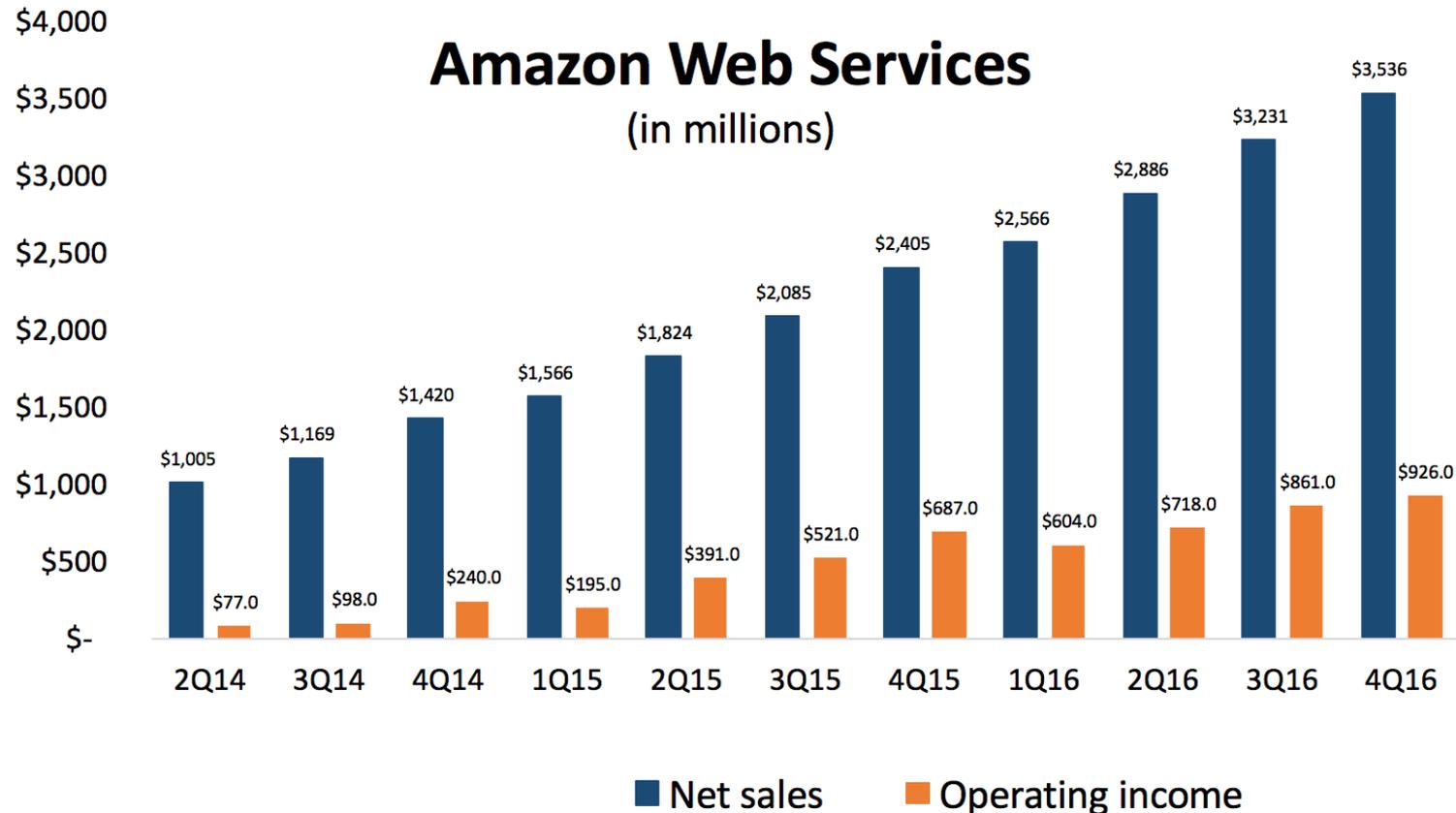


AWS on-demand cloud computing platform saves upfront capital expenses and enables scalability

Amazon launches AWS in 2006 as a quiet side-business

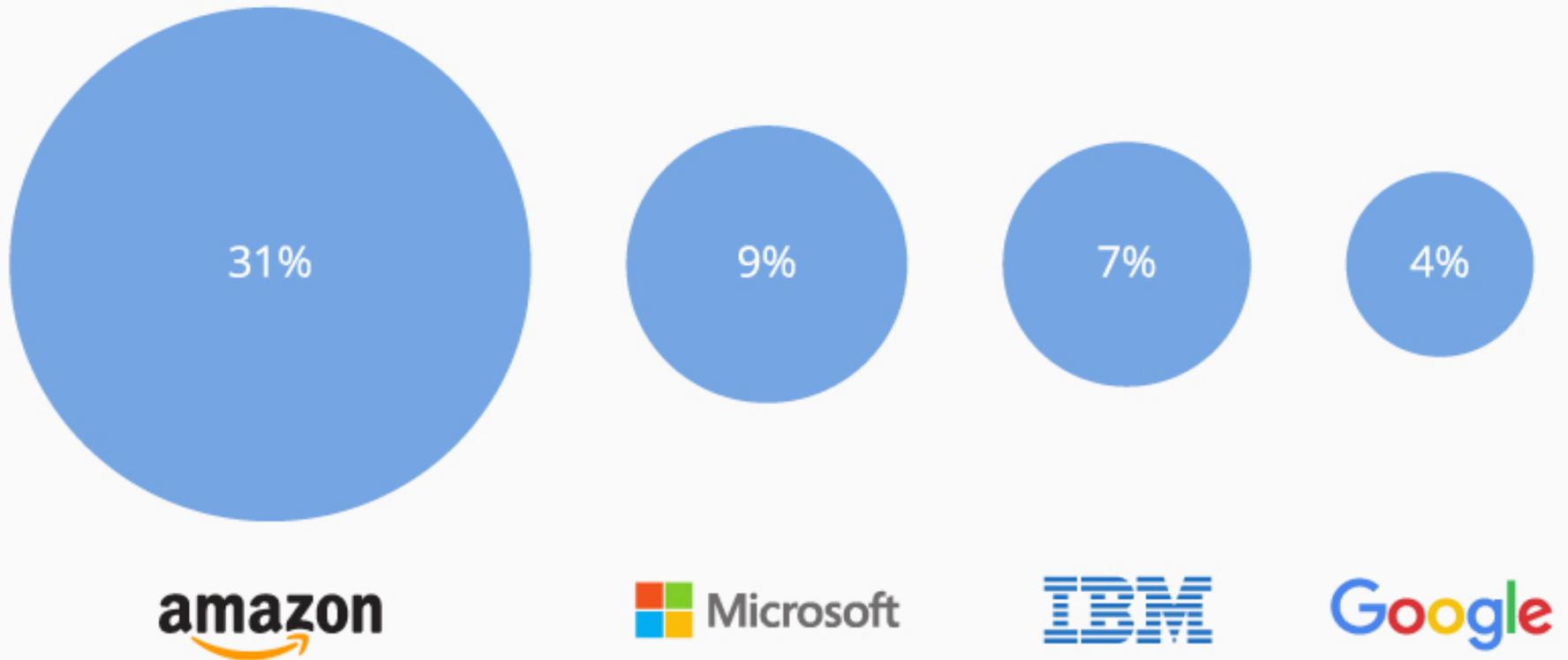


AWS contributes \$12 billion in 2016 sales and is Amazon's most profitable division



AWS 2016 sales: ~\$12 billion

AWS creates a new market and dominates the cloud IaaS/PaaS industry today



AWS drives side revenue, allowing Amazon to experiment in new products/services



And we already see this IaaS/PaaS business model emerging in biomanufacturing



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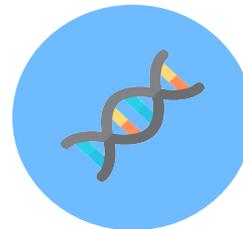
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Amyris gives a glimpse to the future of biomanufacturing





Winners in the sustainability race
will focus on **improved
performance and manufacturing**



Thank you



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