Consumer Robotics

Qualcomm®

Dr. M. Anthony Lewis, Senior Director, Qualcomm

What is a consumer robot?

Consumer: a person who purchases goods and services for personal use.

Ergo: Consumer Robot- A robot for personal use by an individual

A broader definition includes robots that are

      Possibly owned by one individual or collective

      Possibly a robot shared by many individuals

      Possibly a robot as a service

Why is a consumer robot different than a traditional industrial robot?

Uncertain environment or environmental state-

Every environment is different- How do you test

Increased perceptual demands

Increased navigation capability

Safety- Pitch points, tip over

Power efficiency- Battery operated

Mass production- Mass assembly, quality control, non-trivial

Service model- Is a truck roll necessary?

Naïve users- Where is the on switch? Support costs

Cell phone technology can help with many issues

Uncertain environment or environmental state-

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Robots must understand their surroundings
Robots will be perceptually driven, requiring on-device, high performance perception

Cable Car

18th Street

Cafe

Taxi

Sarah M.

Robots are moving into the real world and need increased perceptual capabilities

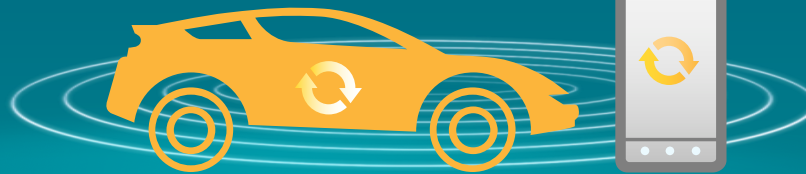Identify scenes   Identify objects   Identify text   Identify people

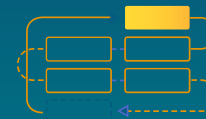Localization & mapping   Visual-Inertial Odometry

6

Why fully on-device matters

Security and user privacy

Low Latency

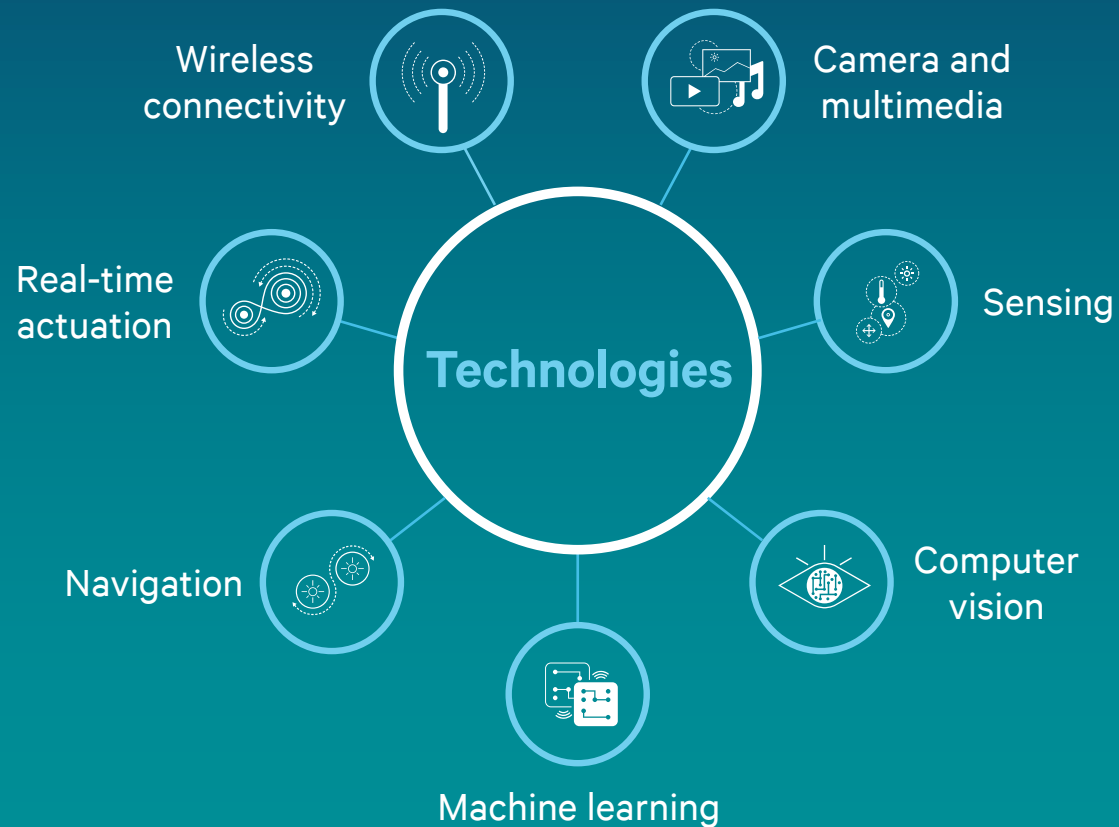Safety Critical

Efficient use of network bandwidth

Reliability

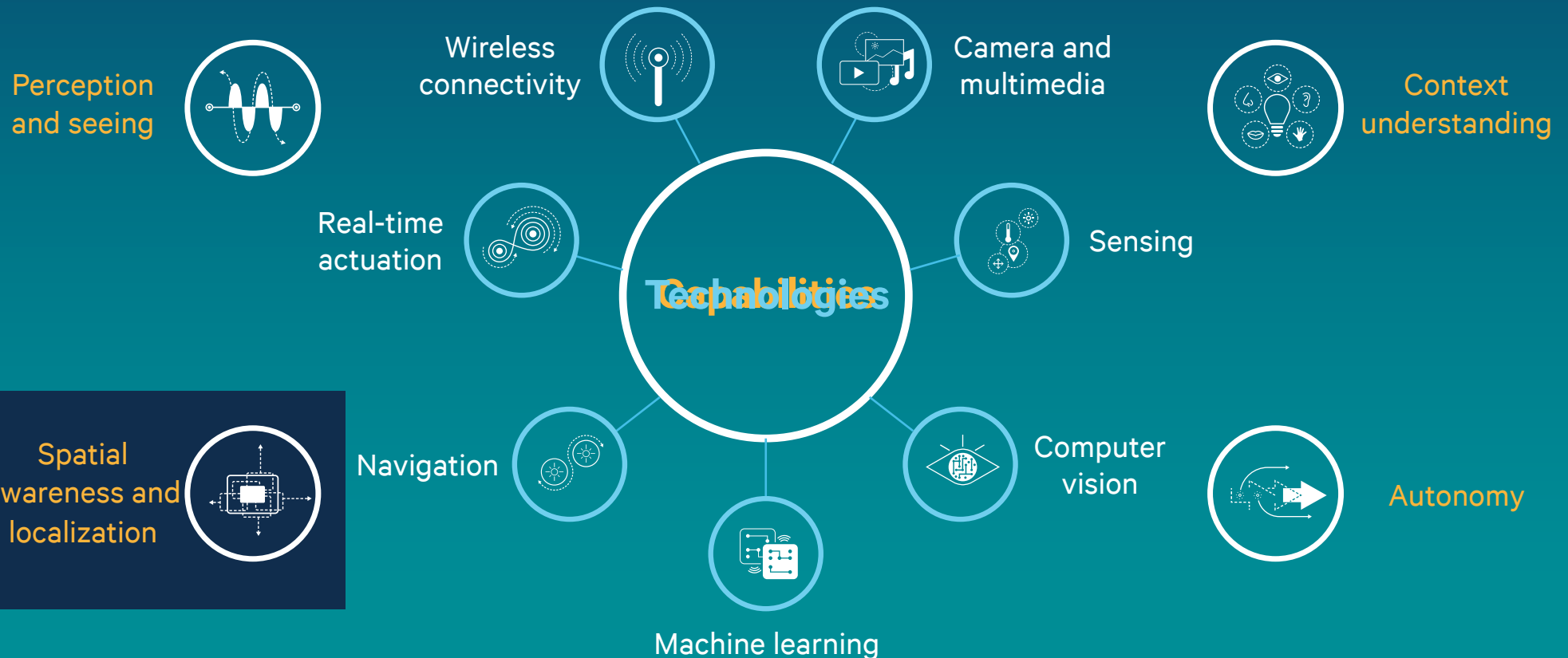**Process data closest to the source, complement cloud**

Qualcomm® technologies enable advanced robot capabilities

Bringing together essential innovations on a highly optimized heterogeneous compute platform

Wireless connectivity

Camera and multimedia

Real-time actuation

Technologies

Sensing

Navigation

Computer vision

Machine learning

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Context understanding

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Sensing

Technologies Capabilities

Spatial awareness and localization

Navigation
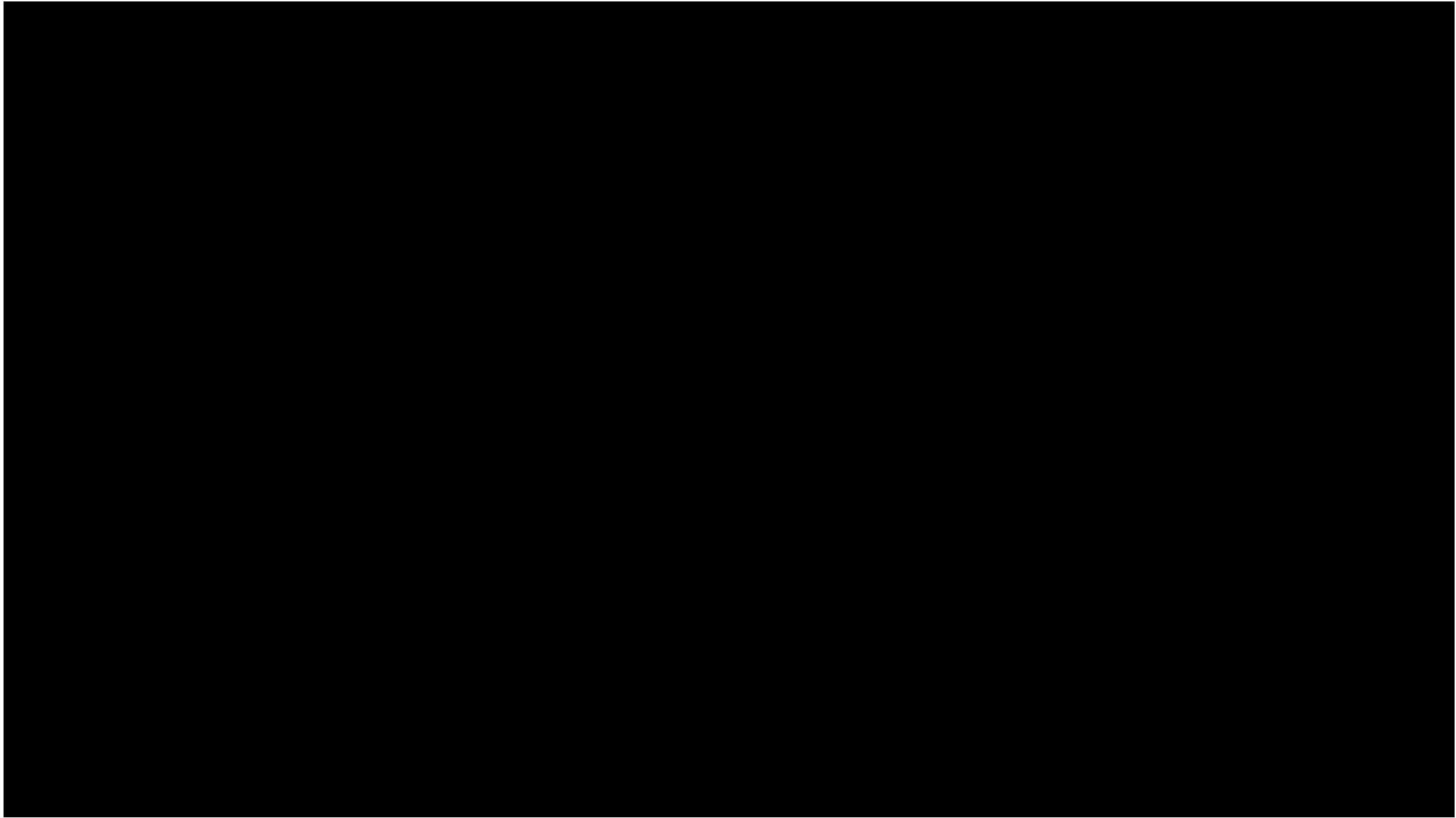
Computer vision

Autonomy

Machine learning

11

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13
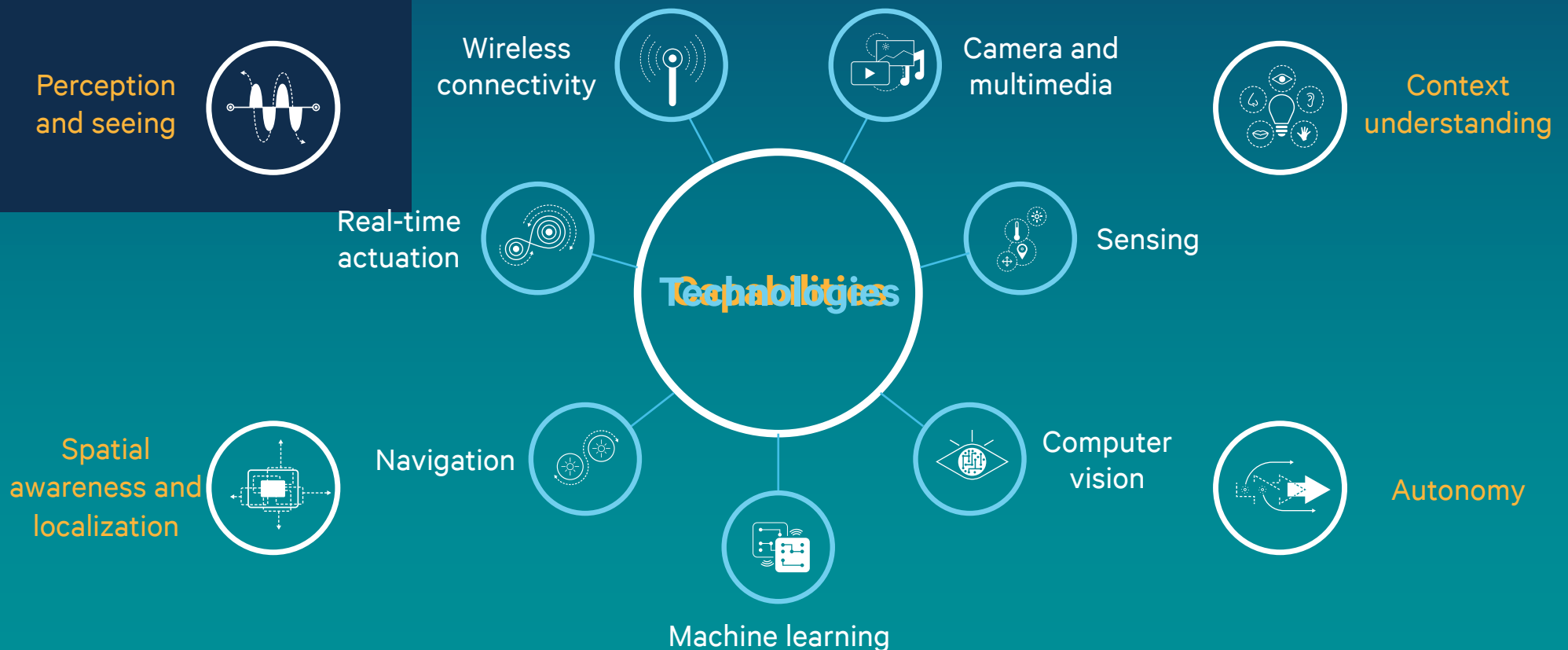
Model of rational consumer robotics purchases

A proposal for model of consumer purchase decisions

Cost is not the sole consideration in the purchase of consumer goods.

    Luxury cars can cost $50K +

We must take into account to additional factors:

    Value creation + Utilization

U: Utilization

V: Value creation per unit time

E: Operational expense per unit time

C: acquisition cost

R: Break even time (in years). 0.5, 1.0 etc.

Conjecture: R=1 is a reasonable value of current robots

$$R > \frac{(V-E)U}{Cost}$$

Proposed model of rational
Consumer purchasing behavior

Example Consumer Vacuum Cleaner

Consumer Vacuum:

  $15 hour value creation

  $ 1 hour a week utilization

  R = 1

  => Cost < $780

$$R > \frac{(V-E)U}{Cost}$$

Proposed model of rational
Consumer purchasing behavior

Hourly value creation is capped by cost of house keeper.

Discussion...

Example Robotic Chef

Robotic chef:

    $15 hour value creation

    $ 1 hour day utilization

    R = 1

    => Cost < $5475

$$R > \frac{(V-E)U}{Cost}$$

Proposed model of rational
Consumer purchasing behavior

Assuming the robotic chef could do food prep, cooking and clean up

Discussion...

Example Rosie

Suppose a robot could do everything a human could and worked 30 hours a week. How much would someone pay for it?

V= $15

E= (20 %)

U = 30 hours week.

$\Rightarrow$ Cost of a Rosie is : $18720 dollars

$\Rightarrow$ For and R value of 1

$\Rightarrow$ In principle R also reflect the risk in the acquisition. So, new products will have a lower R value and the R value will increase with time.

$$R > \frac{(V-E)U}{Cost}$$

Proposed model of rational
Consumer purchasing behavior

Ideas for realizing Rosie

Increase U: Share Rosies- A Rosie in an apartment building shared by 4 or more apartment: cost should be 60K or higher.

Increase R :Rosie as integrator of islands of automation

Stand a lone "robotics devices" are leveraged

By Rosie- Wash dishes, a stove that can cook,

Automated dicing machines for food preparation,

Robotic vacuum cleaners, Clothes folding machine.

Rosie's job is then to move things

From point A->B from one island to another: Reduce acquisition uncertainty

$$R > \frac{(V-E)U}{Cost}$$

Proposed model of rational
Consumer purchasing behavior

Implications

Creating move value is hard

Higher utilization models may be the easier

Low value but constant use (Smart Speakers)

Robots with multiple users (Educational robots)

Robotic waiters, concierge etc.

Improve R by educating consumer, influential early adopters, etc.

$$R > \frac{(V-E)U}{Cost}$$

Proposed model of rational
Consumer purchasing behavior

Thank you

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