

California Plug Load Research Center (CalPlug): Energy Efficiency Research at Calit2



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California Plug Load Research Center

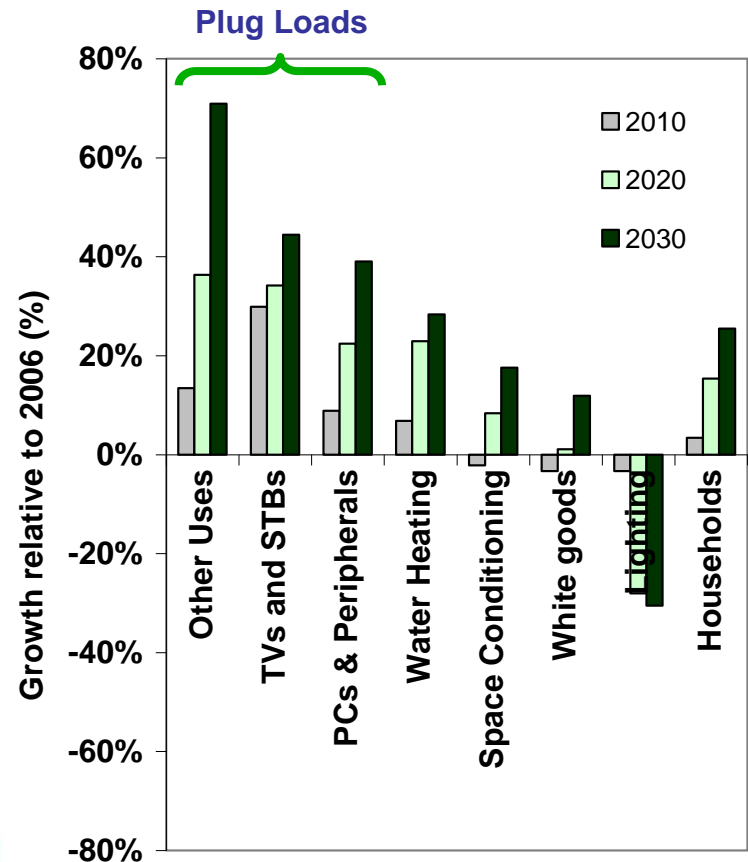
California Institute for Telecommunications and Information Technology

November 3, 2015

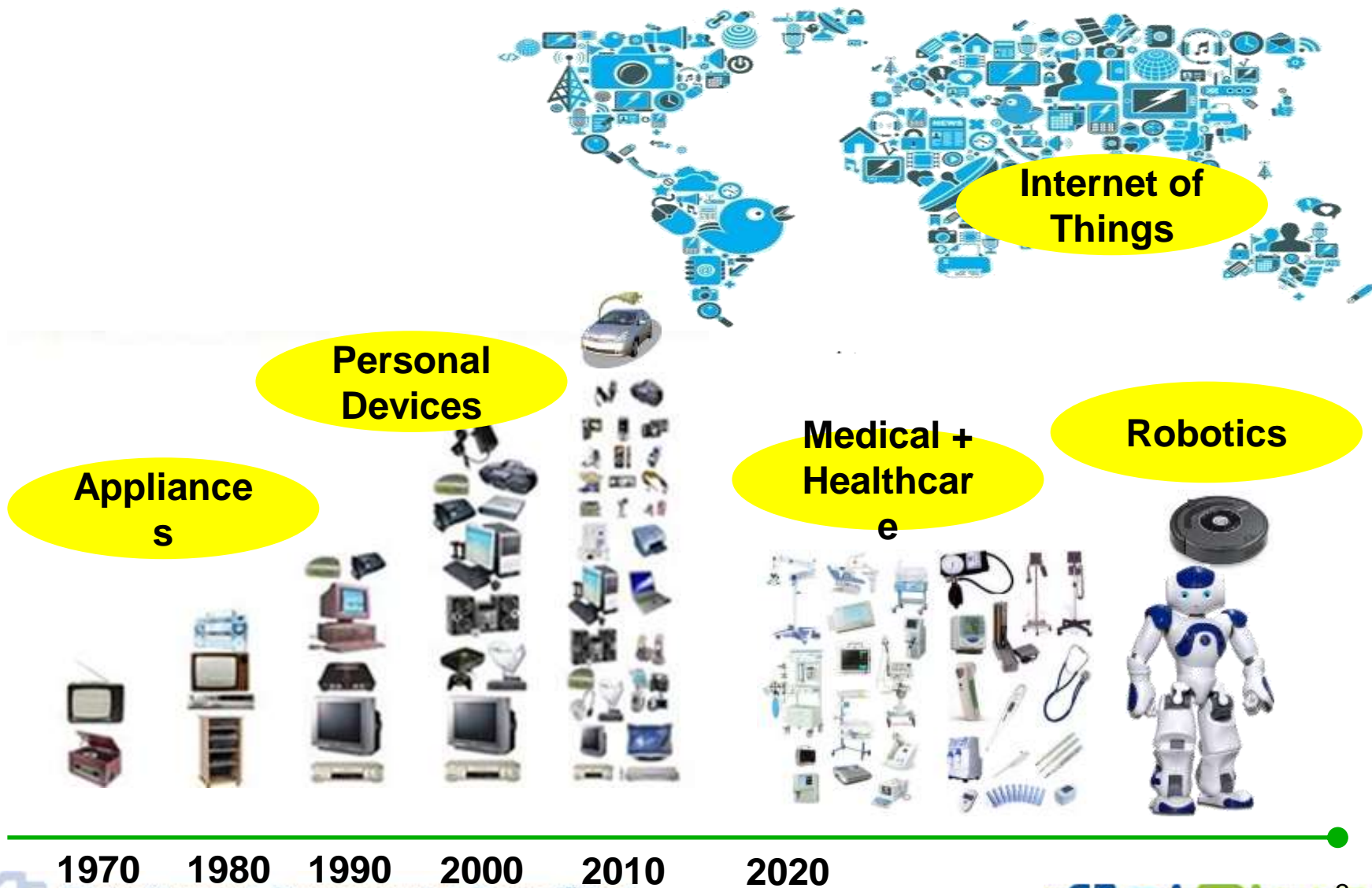
www.calplug.org

CalPlug Purpose

- **Help California and U.S. improve energy efficiency in appliances and electronic devices**
- **In the residential and commercial sectors**
- **Through research, demonstration, education**
- **About engineering, incentives, codes and standards, and user behavior**



Residential and Commercial Plug Loads

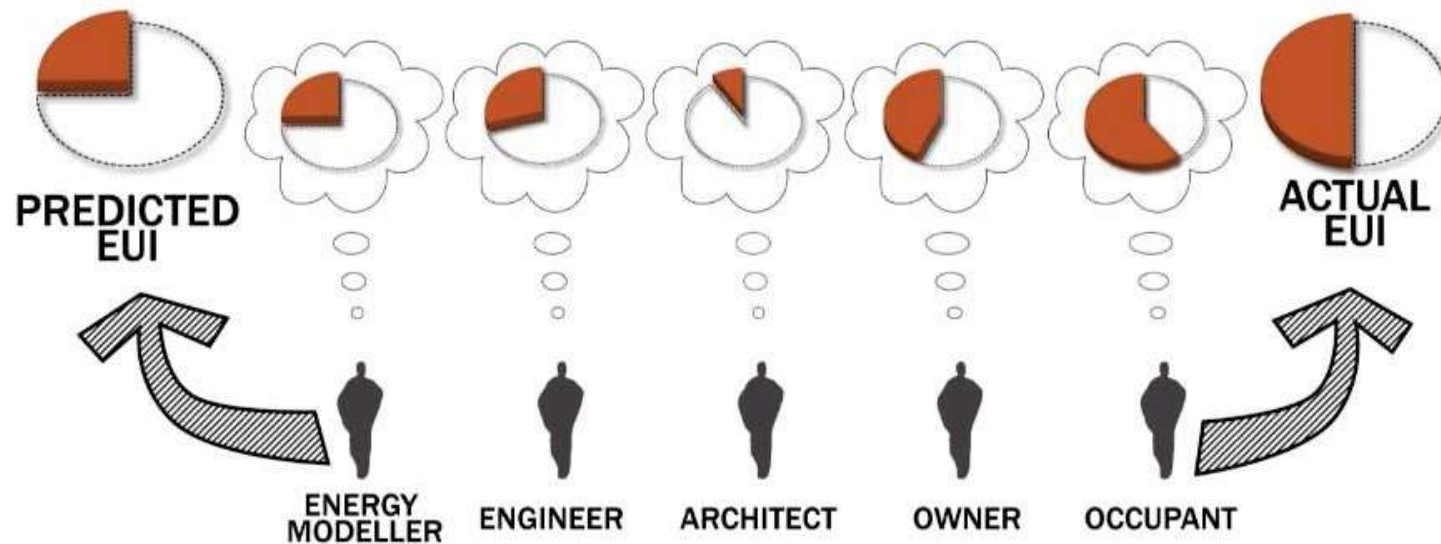


1970 1980 1990 2000 2010 2020
Creating Connections. Powering Innovation. Boosting Efficiency.

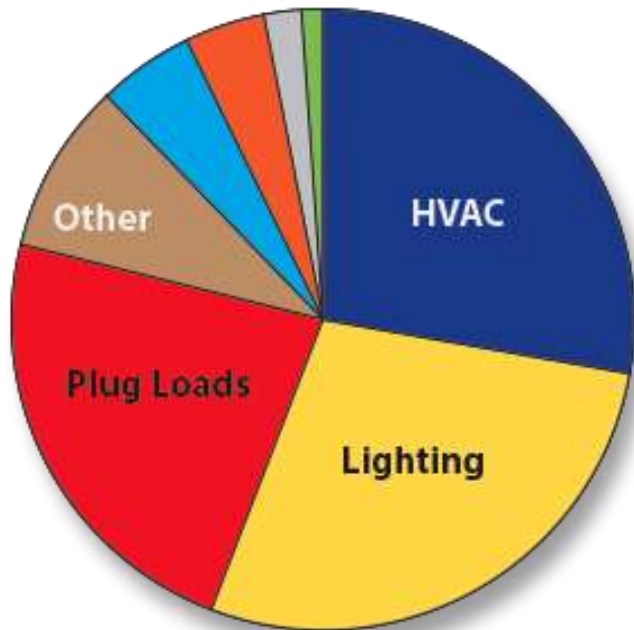
Energy Management Prediction

ENERGY USE

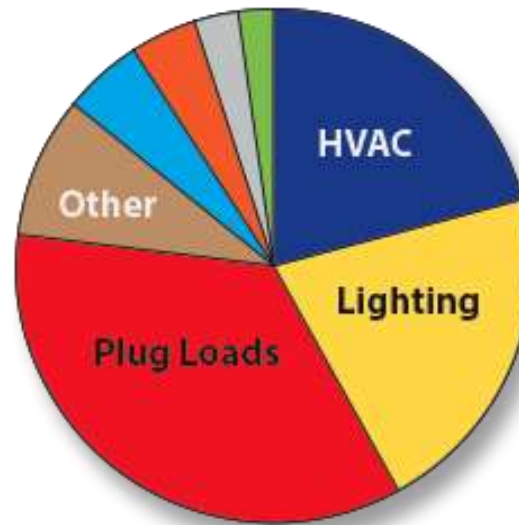
PREDICTED vs. ACTUAL



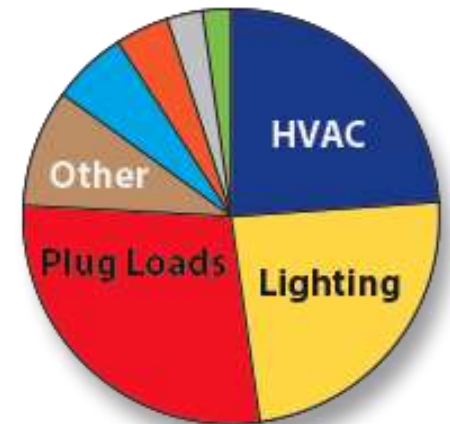
Why investigate plug loads?



Standard Commercial Building



**Standard Commercial Building
High Efficiency Design
~50% Below Standard**



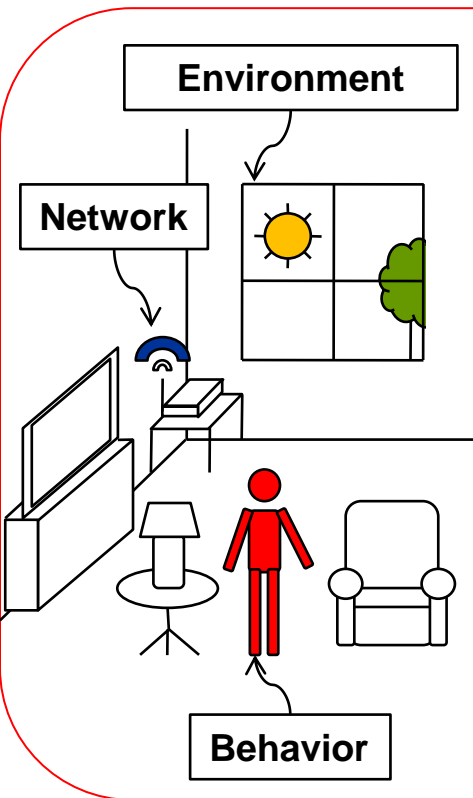
**Standard Commercial Building
High Efficiency Design
+
Optimized Plug Loads
~60% Below Standard**

Integrated Design Associates (IDeAs), San Jose, Ca, 2014

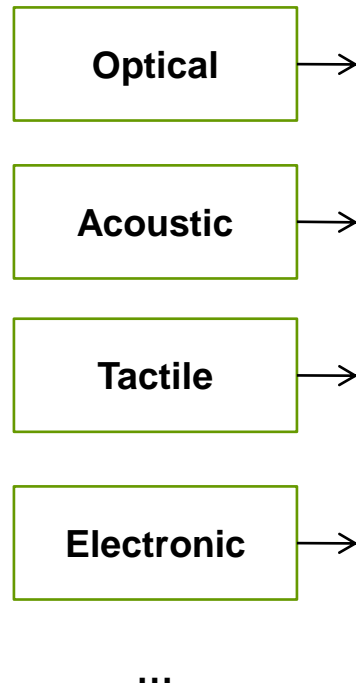
How can we make a difference?

The Role of Behavior in Energy Savings

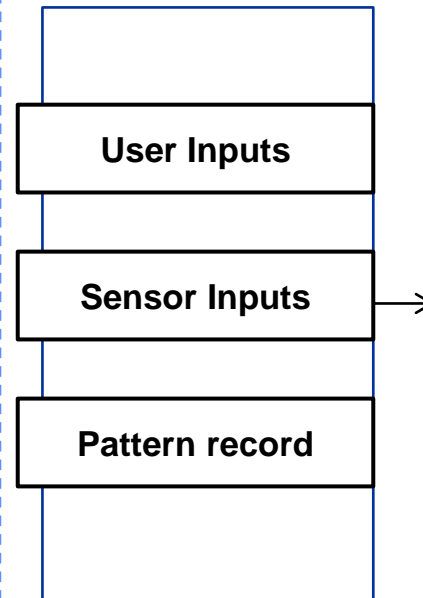
Electricity Usage Context



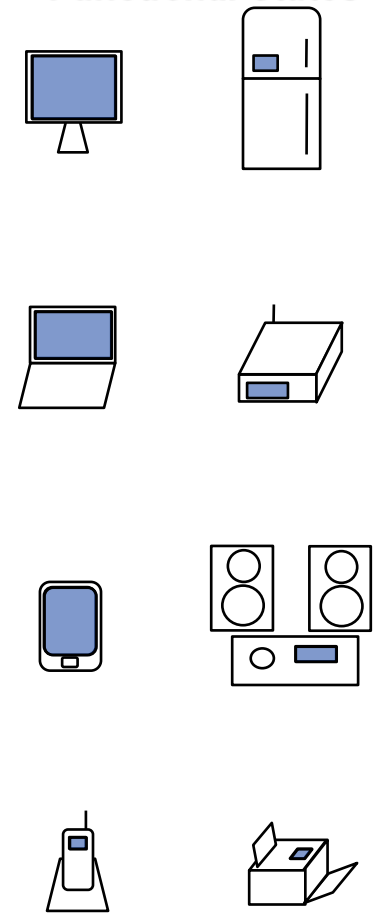
Sensing



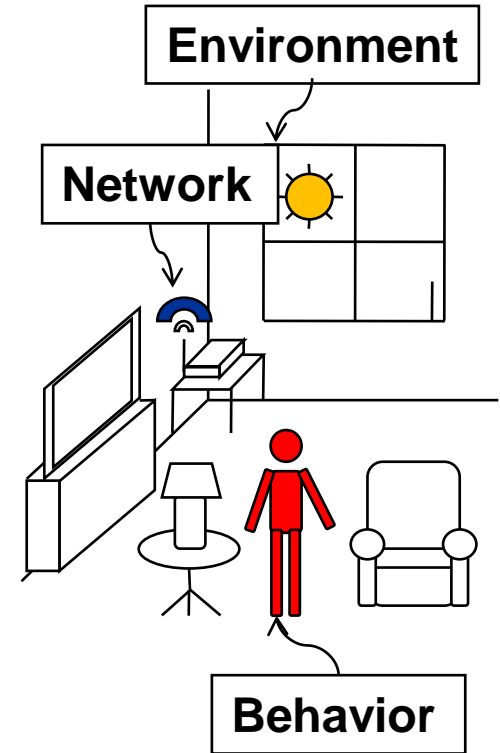
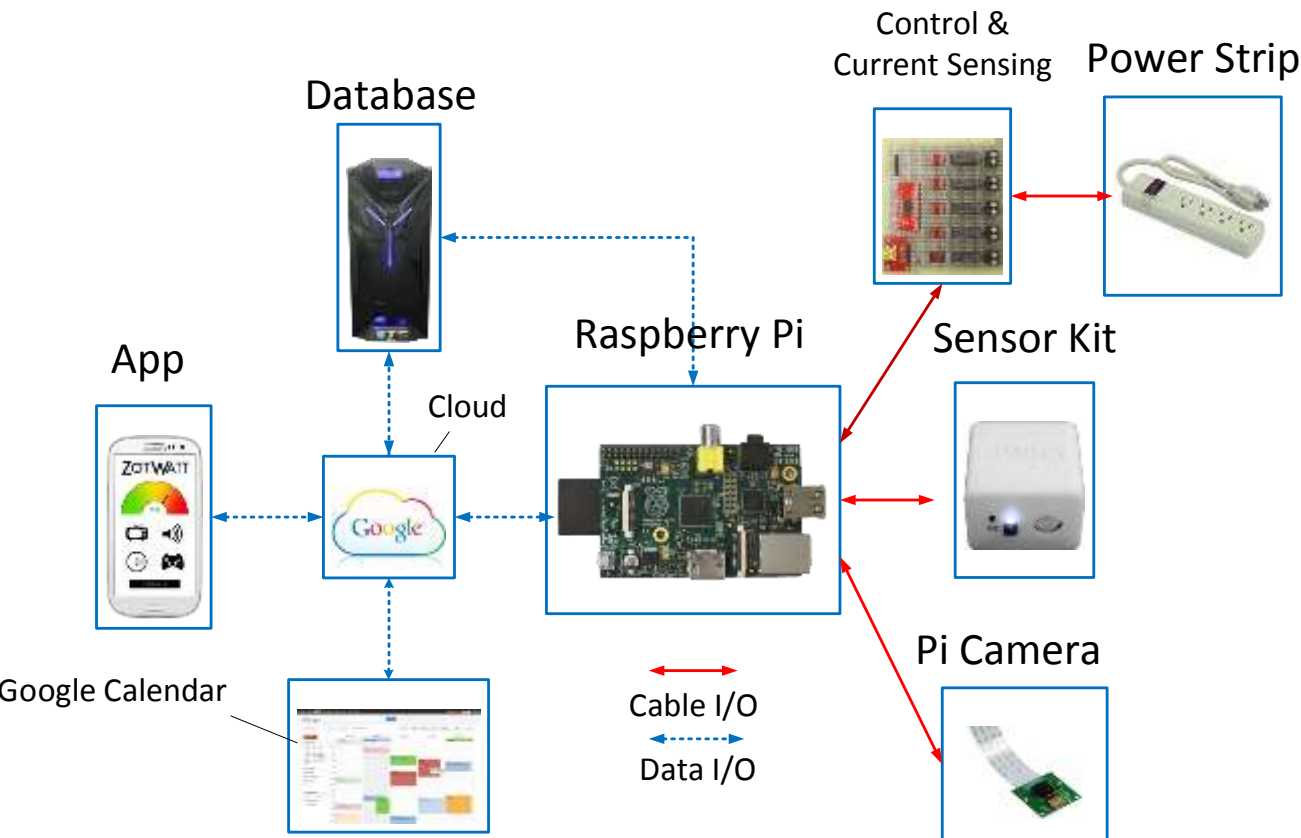
PEF Management



Plug Load Devices and Functional States



Personal Energy Footprint Management

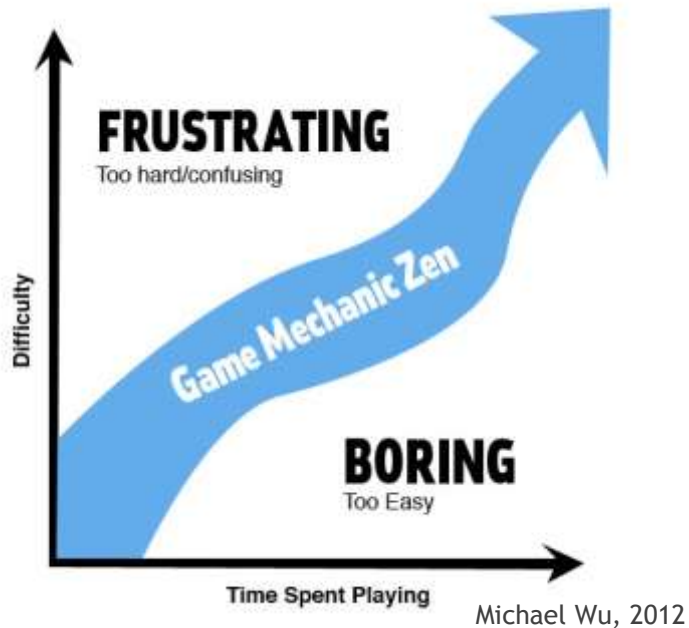


Power Savings Through Education

Can we improve energy savings with visibility?

Can we gamify energy savings?

Energy-Champion: an elementary and middle school classroom v. classroom energy saving challenge



Studies indicate that providing households with contextualized feedback and targeted energy-saving tips holds the potential for large scale energy savings, in the range of 4-12% (Ehrhardt-Martinez et al 2010).

Power Savings Through Education



Conclusions

- Research on plug loads is a relevant (and complicated) target for improving energy efficiency
- Behavioral based power management is an effective way to save power from plug-loads, paradigm for IoT implementation
- Visibility and education are fun and practical ways to save energy

Conclusions

Thank You!

Conclusions

Questions?