To encourage adoption you must

understand your customer
(and that might take some research)
Typical strategies

- Segment the target population

- Understand the differing user needs and motivations within the subpopulations

- Address those needs with appropriate features, services and price points
Photography business...

Digital Control

Advanced Amateurs

Proactive sharers

Just the basics

Photography

Conservative Sharers

OK for now

Too much trouble
In every category

... it is all about *Ease Of Use* ...

just at different thresholds
**SW tool users**

- **Early adopters**
  - follow technology, interested in new technology, tries new things (a little bit)

- **Mass market**
  - busy doing “real work”
  - new tools must
    - provide real value
    - do so “cost effectively”
Three dimensions

- Usefulness
- Usability
- Good long-term investment
  - ( + sociological, organizational dimension)
Usefulness

Reasonably accurate in its output

<table>
<thead>
<tr>
<th>Truth</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>False negative (FN)</td>
<td>False positive (FP)</td>
</tr>
<tr>
<td>It really is a bug</td>
<td>Says it’s a bug</td>
</tr>
<tr>
<td>True positive (TP)</td>
<td>Says it’s not a bug</td>
</tr>
<tr>
<td>True negative (TN)</td>
<td></td>
</tr>
<tr>
<td>It really is not a bug</td>
<td></td>
</tr>
</tbody>
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\[
\begin{align*}
\text{TP}/(\text{TP}+\text{FN}) &= \text{recall} = \text{sensitivity} = \Pr(\text{detect the bug} \mid \text{there is a bug}) \\
\text{TP}/(\text{TP}+\text{FP}) &= \text{precision} = \text{predictive value positive} = \Pr(\text{real bug} \mid \text{detected bug}) \\
\text{TN}/(\text{TN}+\text{FP}) &= \text{specificity} = \Pr(\text{no detection} \mid \text{no bug}) \\
\text{FN}/(\text{FN}+\text{TN}) &= \text{predictive value negative} = \Pr(\text{no bug} \mid \text{no detection})
\end{align*}
\]
There is experimental work to be done in measuring detection performance for a tool (and in comparing across alternatives).
Usefulness

- The tool must address an important defect area
  - reasonably frequently occurring
  - high value (difficult to find, high impact if not found)

- Some experiments with actual programmers and actual bugs would be helpful to characterize “bug importance”

  Experimental work here too.
Usefulness

- Performance
  - Time and space performance is consistent with the value obtained
  - Does it scale with project size
Usability

- Out of the box experience
  - Simple installation & configuration
    - self-contained?
    - relies on other tools that need installation first?
    - multi-platform?
  - “Obvious” to use
    - quick to provide first benefit?
    - self-explanatory to a novice?
  - Does it do enough? but not too much?
Usability

- Resource investment (time, learning, money)
  - small investment provides some gain
  - increasing investment provides increasing gain
  - Can I obtain benefit on a small part of a large project?
  - Do I have to convert my whole project to a new environment?
  - Can I use this within/alongside of an existing work process or IDE?
Usability

- Perspicuity
  - Is the output clear?
  - Do the results actually save work?
  - Do I have to redo work each time I reuse the tool? (e.g. can I check false positives just once)
Long-term investment

Is the investment in learning a new tool (or even paying for it) sound?

- continuing support, ongoing maintenance
- confidence in the work of the providing organization
- confidence in the longevity of the providing organization
...and all that is the first step

- There are also organizational, cultural, psychological, managerial reasons for adoption or non-adoption
- Individual tool vs. team tool vs. organizational tool

This is a separate, but worthwhile (and difficult) area of experimental computer science research.
Summary

- Developers will adopt tools... but ...
  - Pay attention to usefulness *to them*
  - Pay attention to usability *for them*
  - Pay attention to the investment cost *for them*

- And be aware of the subjective and organizational factors affecting adoption

- There is *research* to be done in understanding these factors for individual tools and in understanding tool adoption as a whole.