An Apps Store for SME

Early Success is Possible

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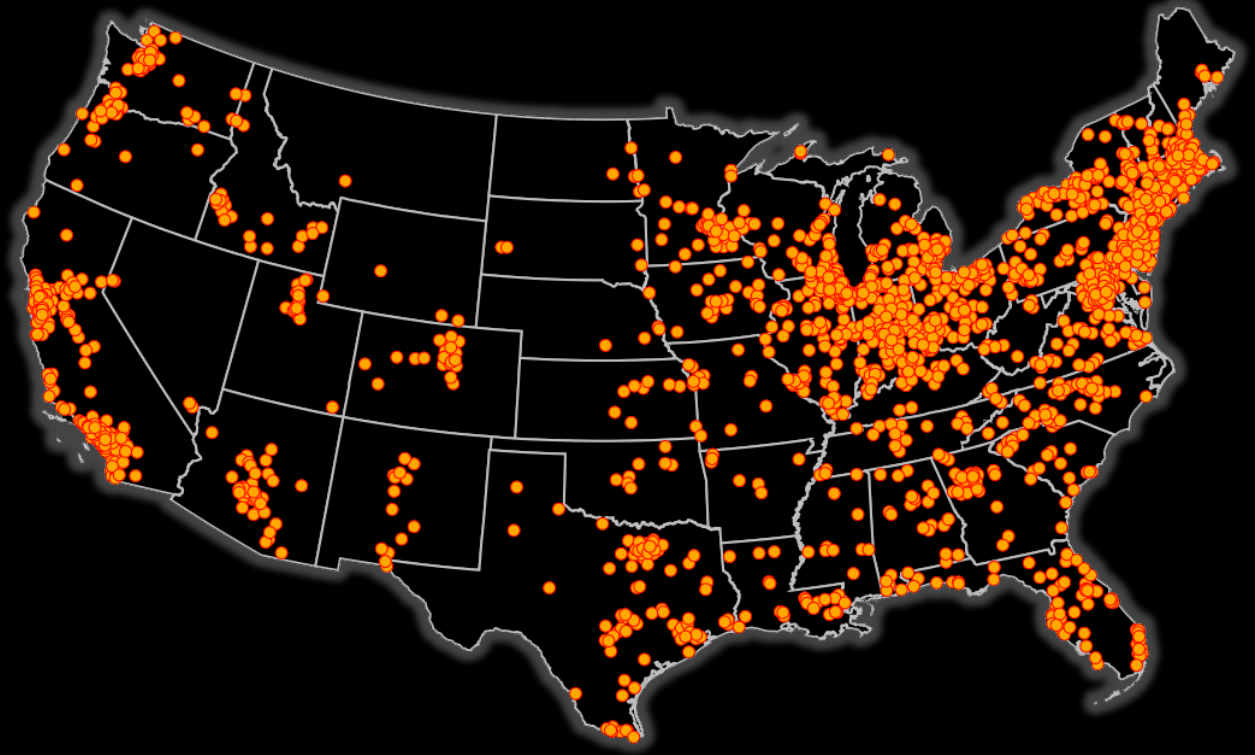
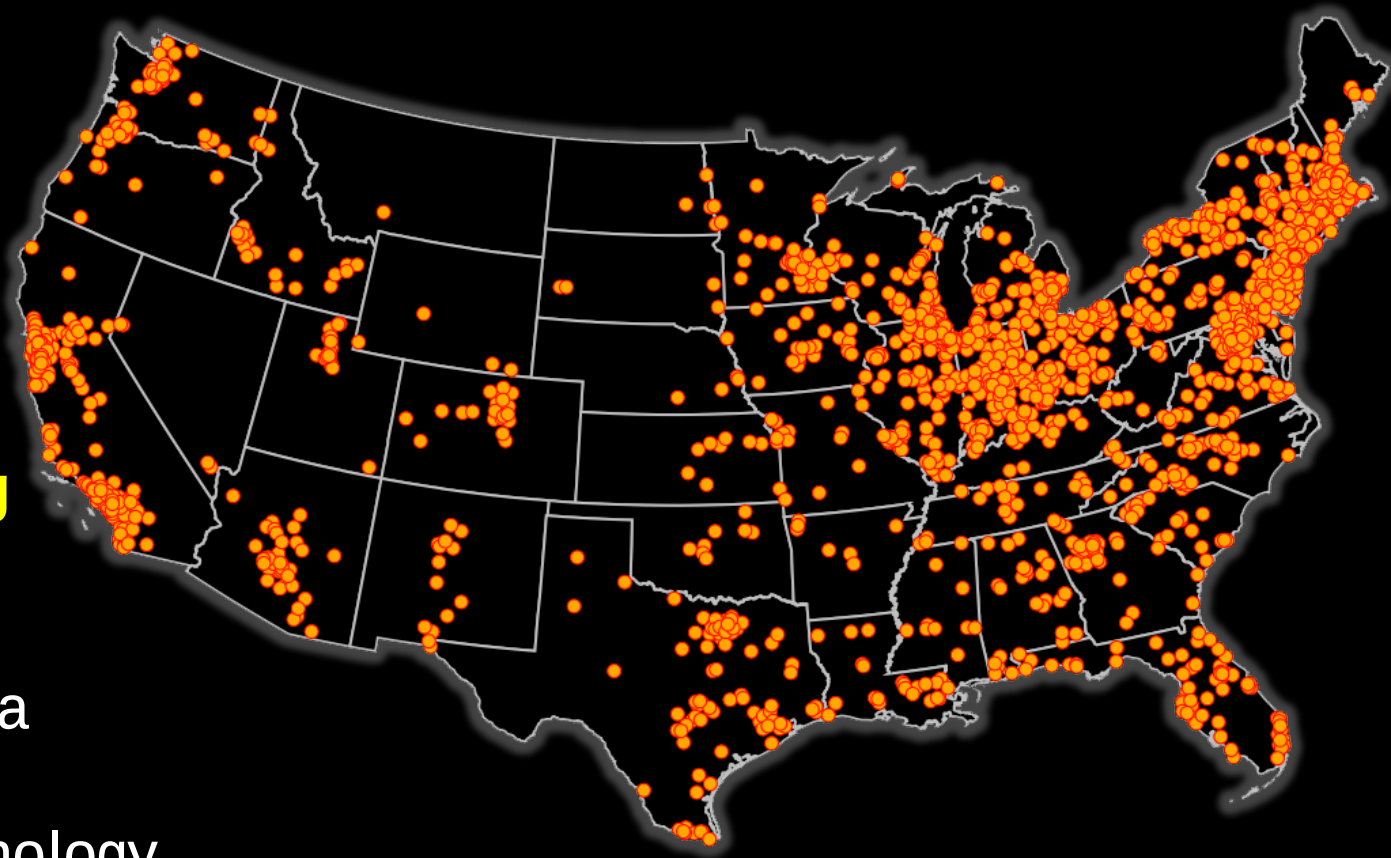
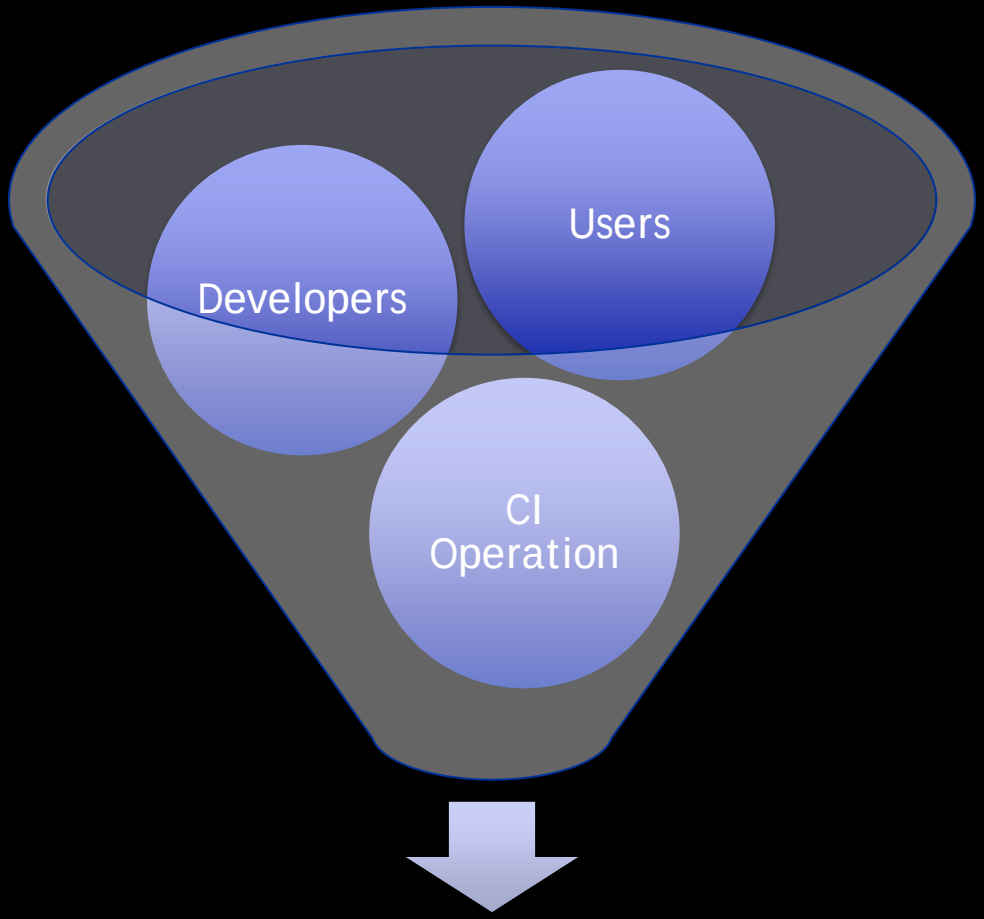


nanoHUB.org => manufacturingHUB.org

- What is nanoHUB?
- Workforce Development
- Industry Impact
- **Understanding Users**
- Success Criteria
- HUBzero Technology



Requirements



Vibrant and Impactful VO

Imagine these Users

Faculty Member

Researcher
(not M&S developer)

Student

Faculty Member / Instructor

- Full teaching load
- Research group
- Preps lectures for next week / tomorrow
- Teaches concepts – not input decks!
- Little / no dedicated IT support
- Time for new tasks: 11pm-2am

Student

- Full class and/or research load
- No software experience
- No modeling and simulation exp.
- Needs to learn concepts
- Needs to develop intuition

Researcher (not computational developer)

- Experimentalists:
  - Guidance
  - Intuition development
  - Trends – not necessarily quantitatively
  - Narrow search space
  - Optimization
- Computational Researchers:
  - Entry into related field
  - Exploration of concepts and designs
  - Optimization

Requirements

- No Installation:
  - No experience, no privileges, no time
- No Manuals
  - Think: Rental Car
- No one month s/w training
  - Think: midnight – 2am
- Immediate access / instant feedback
  - 1/3 of nanoHUB users => 1 day! – but happy!
- Visualize and compare results

Users => Requirements

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Engineer at SME

- 30 employees, 2 – 4 engineers
- Fights fires for production
- IS the (sole) IT support
- Has some modeling experience
- Has no HPC experience
- Time for new tasks: 11pm-2am
- Needs guidance – trends
- Narrow design space / optimize

Requirements

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HUB HPC

- User Performance focused
- Instant Access
- Supercomputer access as needed
- Large Cloud access as needed
- Integrated data management
- Visualize and compare results
- Secure access

PADRE
Industrial Tool - Bell Labs

Files: Double Gate MOSCap

Input file:

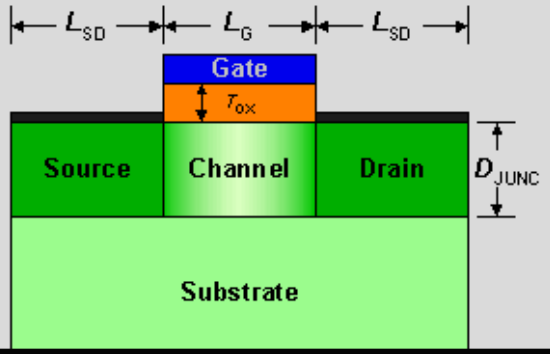
```
$ Mesh Specification
mesh      rect nx=3 ny=41
y.m       n=1   l=0 r=1
y.m       n=10  l=0.002 r=0.8
y.m       n=21  l=0.032 r=1.25
y.m       n=31  l=0.062 r=0.8
y.m       n=41  l=0.064 r=1.25
x.m       n=1 l=0 r=1
x.m       n=3 l=1 r=1
$ The y.m nodepoints and distance are inputs
$ The x.m parameters are static

$ Regions specification
region    num=1 ix.l=1 ix.h=3 iy.l=1 iy.h=10 name=sio2 INS
region    num=2 ix.l=1 ix.h=3 iy.l=10 iy.h=31 name=silicon SEMI
region    num=3 ix.l=1 ix.h=3 iy.l=31 iy.h=41 name=sio2 INS

$ Electrodes specification
elec      num=1 ix.l=1 ix.h=3 iy.l=1 iy.h=1
elec      num=2 ix.l=1 ix.h=3 iy.l=41 iy.h=41

$ Doping specification
dop reg=2 p.type conc=1e+18 uniform
$ doping can be p.type or n.type (two options), conc is a parameter to

$ Contact specification
contact all neutral
contact  num=1 n.polysilicon
contact  num=2 n.polysilicon
```

Structural Properties | Model | Voltage Sweep

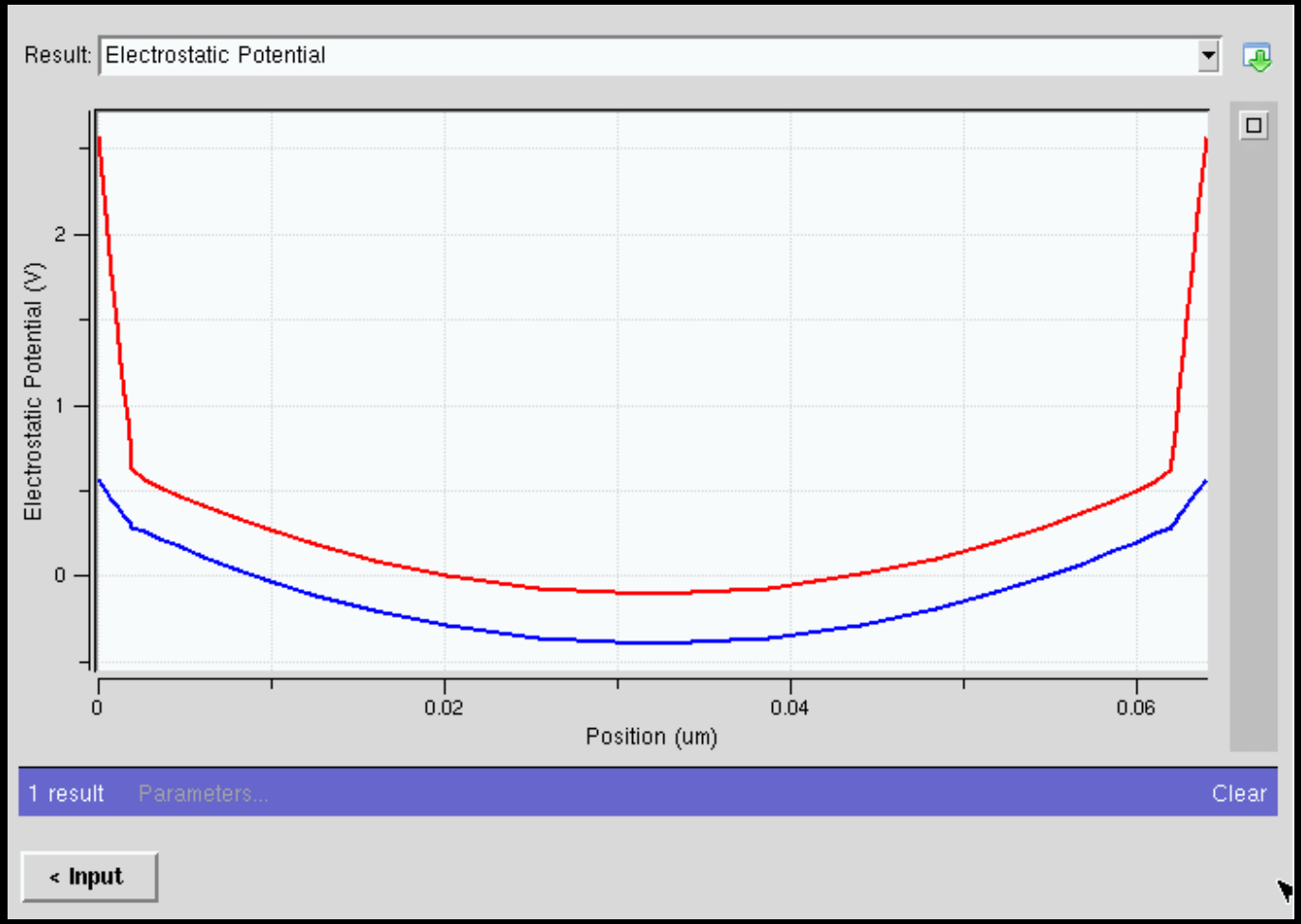
Device Type: MOSFET n-type

Doping Profile: Uniform Doping Density

Source/Drain Length:	50nm
Source/Drain Nodes:	15
Channel Length:	100nm
Channel Nodes:	20
Oxide Thickness:	2nm
Oxide Nodes:	5
Junction Depth:	21nm
Junction Nodes:	20
Substrate Thickness:	68nm
Substrate Nodes:	25
Device Width:	1000nm



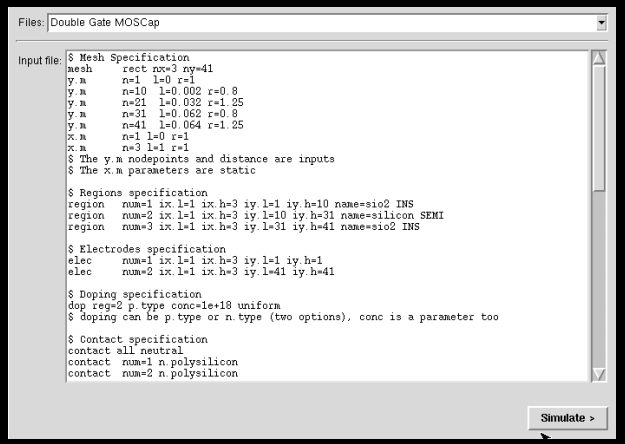
Design Alternatives: Intuitive Result Comparison

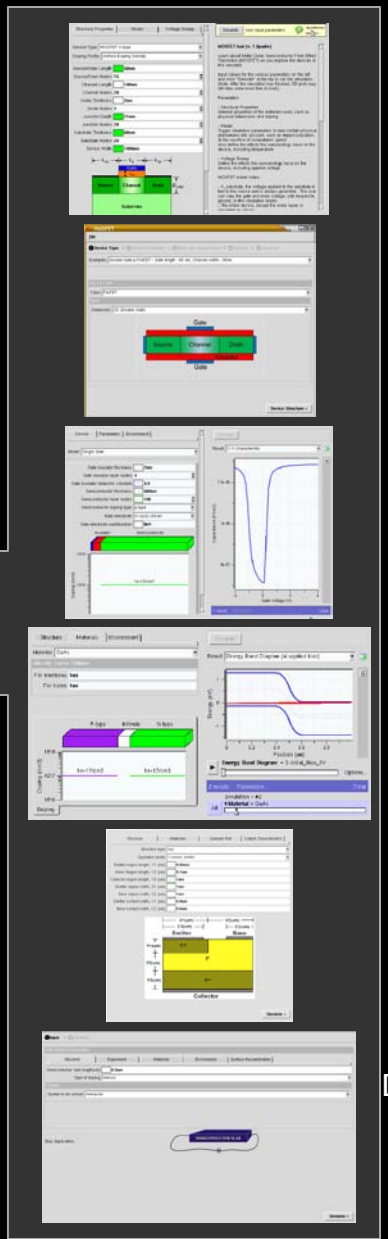


Impact of Reduced Tools

945 Users,
41,285 jobs

6,649 Users,
104,282 jobs





MOSFET:
2,715 Users,
38,000 jobs

MUGfet:
240 Users,
3,600 jobs

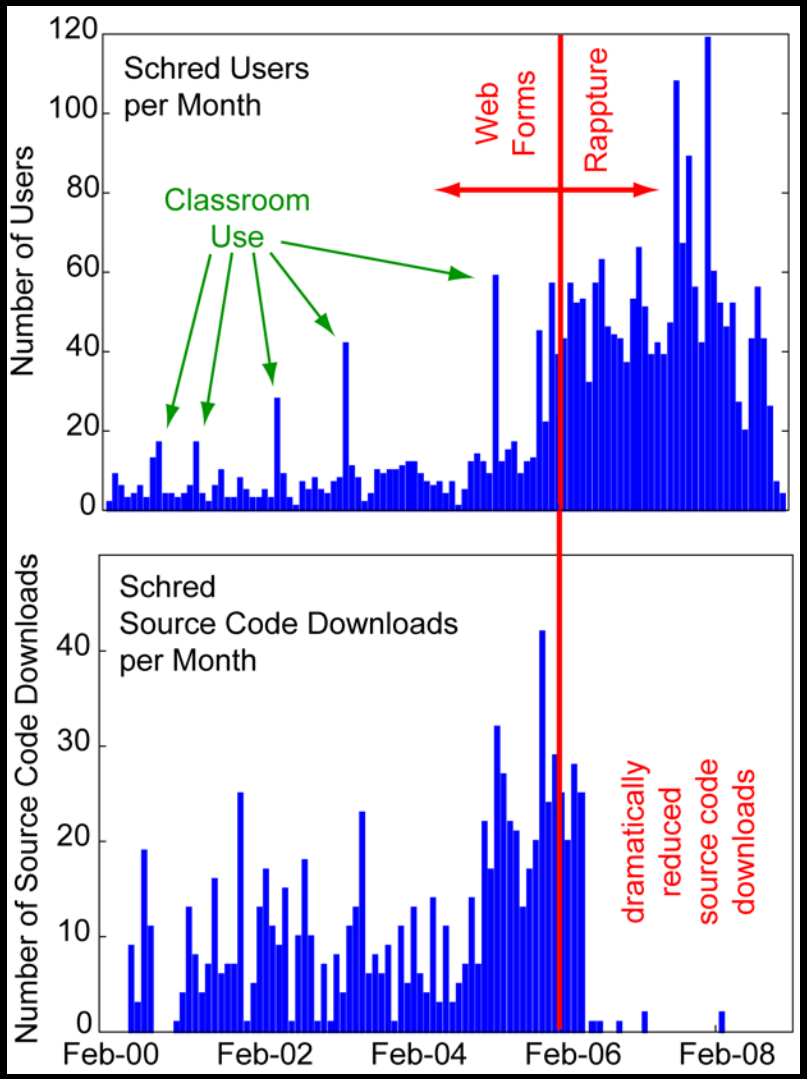
MOSCAP:
1,694 Users,
18,000 jobs

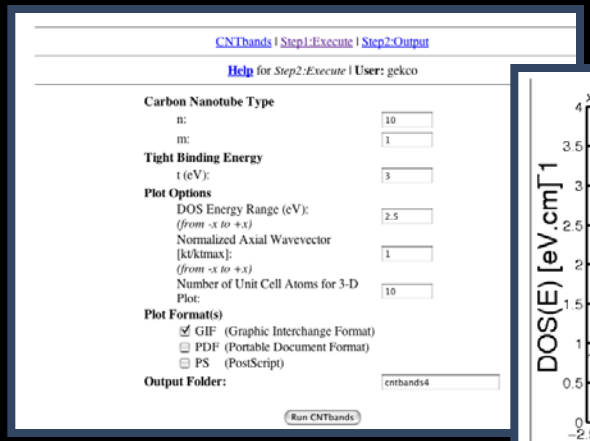
PN junction:
3,563 Users,
33,000 jobs

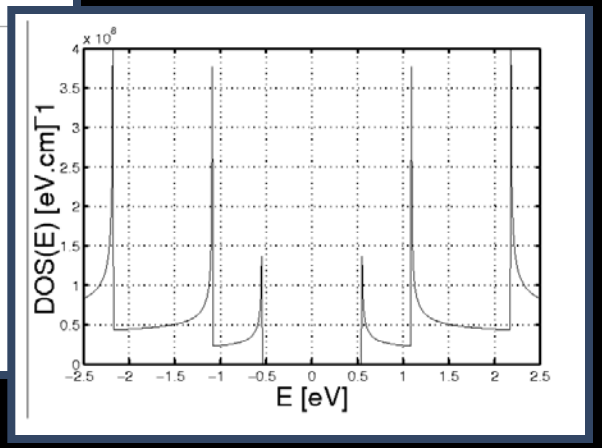
BJT:
557 Users,
3,000 jobs

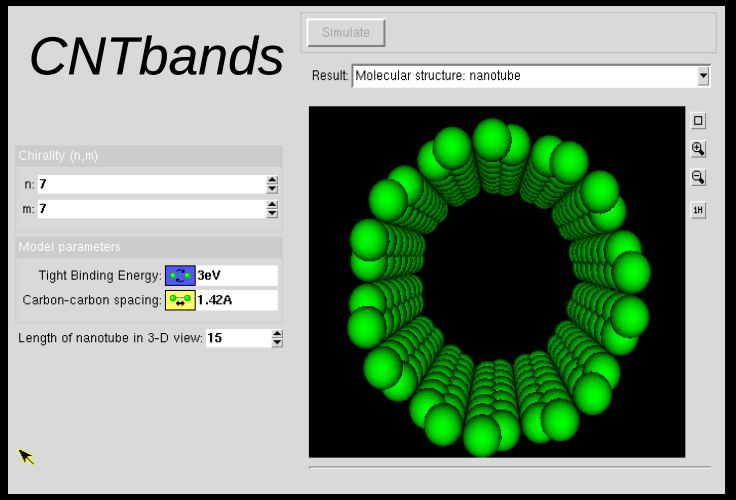
Drift-Diffusion:
721 Users,
7,400 jobs

Importance of a good GUI



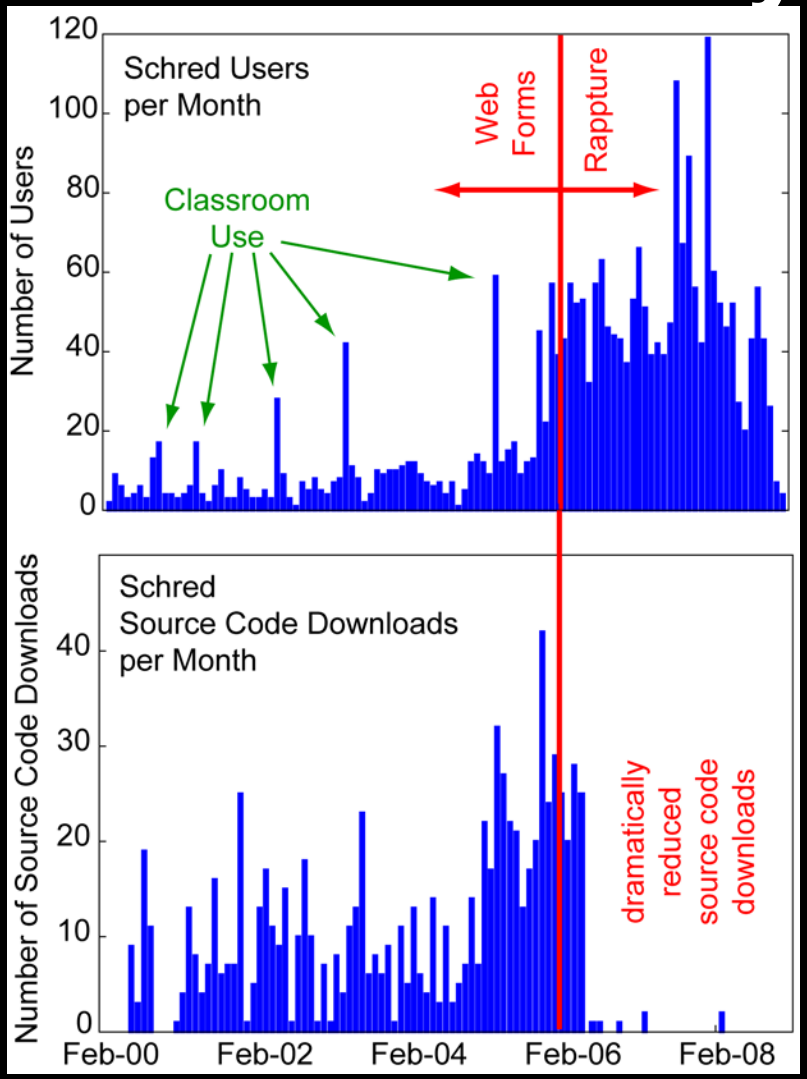






Same behavior across all similar converted tools

Balancing Usability and Capability



nanoHUB

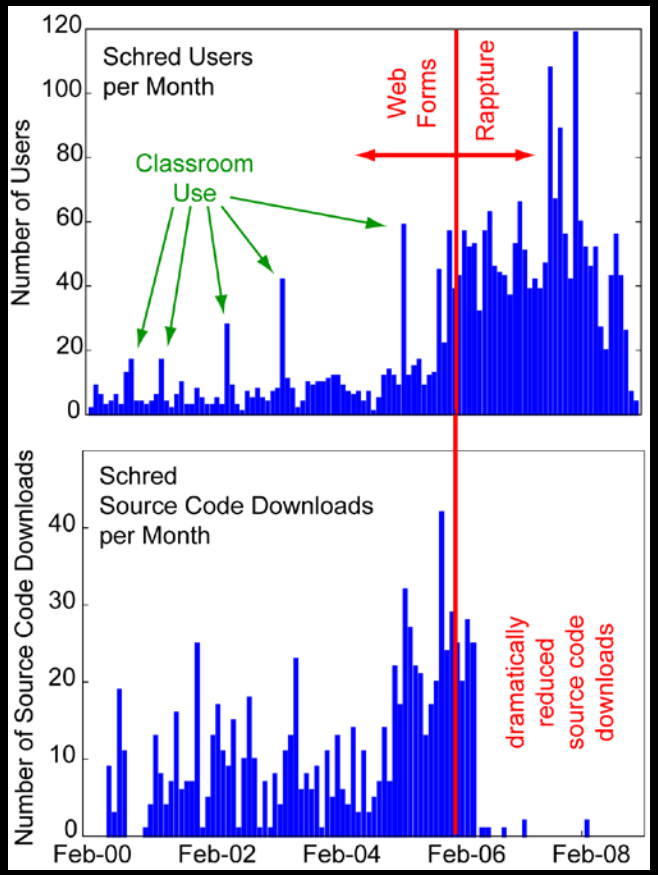
iPhone / iPad

User Requirements

- No software installation
  - Because not allowed or no experience or time
- No Manuals
  - Think: using a Rental Car
- Minimal time to learn
  - No time in already busy schedule
- Immediate access / instant feedback
- Visualize and compare results

Key Insights

- Developed success criteria
  - Need “consultants” to support / refine tools
- Usability is critical
  - Simplified user interfaces for reduced problems
  - Integrated visualization
  - Easy answers to “What If ?” questions
  - Remote installation – runs in browser



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