The New ABCs of Research

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Distinguished University Professor,
Dept of Computer Science
Founding Director (1983-2000),
Human-Computer Interaction Lab

Member, Institute for Advanced Computer Studies

Photo: BK Adams
Interdisciplinary research community
- Computer Science & Info Studies
- Psych, Socio, Educ, Jour & MITH

www.cs.umd.edu/hcil
vimeo.com/72440805
Designing the User Interface

- Guidelines & Theories
- Input devices & strategies
  - Keyboards, pointing, voice
  - Direct manipulation
  - Menus, forms, commands
- Output devices & formats
  - Windows, color, sound
  - Text, tables, graphics
  - Instructions, messages, help
- Social Media
- Visualization
- Design
- Search

http://bit.ly/1T5UGn0
Sixth Edition: 2016
Spotfire: Retinol’s role in embryos & vision
10M - 100M pixels: Large displays
16M pixels: My New Workstation
100M-pixels & more
1M-pixels & less

Small mobile devices
The New ABCs of Research (Oxford, 2016)

Guide for
Junior researchers

Manifesto for
Senior researchers
Academic administrators
Business leaders
Funding agencies

www.cs.umd.edu/hcil/newabcs
The New ABCs of Research

Context          Guiding Principles          Lifecycle Strategies          New Knowledge

Immense Problems
The New ABCs of Research

- Context: Immense Problems
- Guiding Principles
- Lifecycle Strategies
- New Technologies
- New Knowledge
The New ABCs of Research

Context: Immense Problems, New Technologies, Raised Ambitions

Guiding Principles

Lifecycle Strategies

New Knowledge
ABC Principle

Applied & Basic Combined

Combining applied with basic research produces more rapid progress in both
Blending Science, Engineering & Design produces higher-impact research
Science, Engineering, Design

https://books.google.com/ngrams
Scientist, Engineer & Designer

NY Times articles

http://chronicle.nytlabs.com/
The New ABCs of Research

Context

- Immense Problems
- New Technologies
- Raised Ambitions

Guiding Principles

- Applied & Basic Combined

Lifecycle Strategies

- Science, Engineering & Design

New Knowledge
The New ABCs of Research

Context

Immense Problems

New Technologies

Raised Ambitions

Guiding Principles

Applied & Basic Combined

Science, Engineering & Design

Lifecycle Strategies

Choose actionable problems: civic, business & global priorities

New Knowledge
The New ABCs of Research

Context

- Immense Problems
- New Technologies
- Raised Ambitions

Guiding Principles

- Applied & Basic Combined

Lifecycle Strategies

- Choose actionable problems: civic, business & global priorities
- Apply observation, intervention & controlled experiments

New Knowledge

Science, Engineering & Design
The New ABCs of Research

Context

Immense Problems

New Technologies

Raised Ambitions

Guiding Principles

Applied & Basic Combined

Science, Engineering & Design

Lifecycle Strategies

Choose actionable problems: civic, business & global priorities

Apply observation, intervention & controlled experiments

Form teams with diverse individuals & organizations

New Knowledge
The New ABCs of Research

Immense Problems

New Technologies

Raised Ambitions

Guiding Principles

Applied & Basic Combined

Science, Engineering & Design

Lifecycle Strategies

Choose actionable problems: civic, business & global priorities

Apply observation, intervention & controlled experiments

Form teams with diverse individuals & organizations

Test ideas & prototypes with realistic interventions

New Knowledge
The New ABCs of Research

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- Raised Ambitions

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- Applied & Basic Combined
- Science, Engineering & Design

Lifecycle Strategies
- Choose actionable problems: civic, business & global priorities
- Apply observation, intervention & controlled experiments
- Form teams with diverse individuals & organizations
- Test ideas & prototypes with realistic interventions
- Promote adoption & assess impact

New Knowledge

Guiding Principles

Lifecycle Strategies

New Knowledge
The New ABCs of Research

Context: Immense Problems, New Technologies, Raised Ambitions

Guiding Principles: Applied & Basic Combined, Science, Engineering & Design

Lifecycle Strategies:
- Choose actionable problems: civic, business & global priorities
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New Knowledge: Solutions, Theories
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**New Knowledge**
- Solutions
- Theories
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<th>Context</th>
<th>Guiding Principles</th>
<th>Lifecycle Strategies</th>
<th>New Knowledge</th>
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Form teams with diverse individuals & organizations
The New ABCs of Research

Context: Form teams with diverse individuals & organizations

Guiding Principles

Lifecycle Strategies

New Knowledge

Form teams with diverse individuals & organizations
Teamwork is the New Norm

Percentage of publications by more than one author

Cooke & Hilton (Eds), Enhancing the Effectiveness of Team Science
http://www.nap.edu/catalog/19007/enhancing-the-effectiveness-of-team-science
Teams: Guidelines

• Formation
  1. Choose those with previously successful collaborations
  2. Create balanced teams: skills, age, gender, personality,…
Teams: Guidelines

• Formation
  1. Choose those with previously successful collaborations
  2. Create balanced teams: skills, age, gender, personality,…
  3. Ensure collaboration readiness
     • Willing/eager to work in teams
     • Fluent with technology
     • Experienced in working remotely
Teams: Guidelines

• Formation
  1. Choose those with previously successful collaborations
  2. Create balanced teams: skills, age, gender, personality,…
  3. Ensure collaboration readiness
    • Willing/eager to work in teams
    • Fluent with technology
    • Experienced in working remotely
  4. Recruit experienced leadership
Teams: Guidelines

- Management
  5. Define goals & roles clearly
  6. Make explicit statements of who does what by when
Teams: Guidelines

• Management
  5. Define goals & roles clearly
  6. Make explicit statements of who does what by when
  7. Practice good communication: listening, speaking, writing, etc.
  8. Hold regular & open discussions
  9. Use effective brainstorming strategies: diverge then converge
Teams: Guidelines

• Management
  5. Define goals & roles clearly
  6. Make explicit statements of who does what by when
  7. Practice good communication: listening, speaking, writing, etc.
  8. Hold regular & open discussions
  9. Use effective brainstorming strategies: diverge then converge
  10. Provide adequate administrative resources & services
Books: Teamwork


<table>
<thead>
<tr>
<th>Dimension</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversity</td>
<td>Homogeneous</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>Disciplinary Integration</td>
<td>Unidisciplinary</td>
<td>Transdisciplinary</td>
</tr>
<tr>
<td>Team or group size</td>
<td>Small (2-10)</td>
<td>Mega (1000s)</td>
</tr>
<tr>
<td>Goal alignment</td>
<td>Aligned</td>
<td>Divergent</td>
</tr>
<tr>
<td>Permeable boundaries</td>
<td>Stable</td>
<td>Fluid</td>
</tr>
<tr>
<td>Proximity</td>
<td>Co-located</td>
<td>Globally distributed</td>
</tr>
<tr>
<td>Task interdependence</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
Research Project: 2 parents, 3 children

- Basic Theories
- Applied Problems
- Research Project
- Refined Theories
- Practical Solutions
- Guidance to Future Researchers
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New Knowledge

- Solutions
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The New ABCs of Research

Promote adoption & assess impact

Context

Guiding Principles

Lifecycle Strategies

New Knowledge
Promote Adoption & Assess Impact

- Clear writing begets clear thinking
  - Story-telling trajectories

- Promote adoption
  - Send Five & Thrive
  - Papers, websites, videos, tweets, blogs

- Assess impact
  - Citations, downloads, tweets, blogposts
  - Best Paper Awards, testimonials, usage reports
Promoting Adoption: Becker Model

- Ideas travel through networks and relationships
- Cultivate champions.
- Present, Present, Present!
- Join relevant committees & insert your findings into decision making
- Don’t wait for publication. Disseminate early

https://becker.wustl.edu/impact-assessment стратегии
Online Services

• **Open Research: arXiv.org, PLOS, Open Science**

• **Community Building Sites:**
  • *Academia:* platform for academics to share research papers… to accelerate the world's research (19M users)
  • *ResearchGate:* connect researchers share scientific output, knowledge & expertise
  • *ORCID, VIVO, FORCE11,* …

• **Research Paper Managers:**
  • *Mendeley:* The best free way to organize your research
  • *Zotero:* free, easy-to-use tool to help you collect, organize, cite & share your research sources
  • *CiteULike:* free service to help you to store, organise & share the scholarly papers you are reading
# The New ABCs of Research

| Applied & Achieving Analysis Actively Ask | Basic Breakthrough Based on Build Bigger | Combined Collaborations Creativity Connections Questions |
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Solutions

Theories

New Knowledge