Donald W. King
Adjunct Professor
University of Tennessee
Bryant University
donaldwking@gmail.com
TALK WILL COVER

• A framework of library evaluation metrics

• Show how “value” and “ROI” fits in this framework

• Will use academic journal collections as an example

• Describe detailed methods used in the past
  - user surveys
  - in-depth library costs

• Explain major differences in public, special and academic ROI analyses
## EVALUATION PERSPECTIVES AND SPECIFIC METRICS

<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Specific Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library</td>
<td>Input resources and outputs</td>
</tr>
<tr>
<td>User</td>
<td>Use</td>
</tr>
<tr>
<td>University/college</td>
<td>Domain</td>
</tr>
<tr>
<td>External environment</td>
<td>Outcomes/value from use</td>
</tr>
<tr>
<td></td>
<td>Return-on-Investment</td>
</tr>
<tr>
<td></td>
<td>Alumni careers</td>
</tr>
<tr>
<td></td>
<td>Community outcomes</td>
</tr>
<tr>
<td></td>
<td>Society benefits</td>
</tr>
</tbody>
</table>
EXAMPLES OF LIBRARY METRICS (ACCESS TO JOURNAL COLLECTIONS)

• Input resources (staff, space, workstations, etc.)
  - Amount of resources (e.g., staff time)
  - Cost of resources (e.g. staff time)
  - Attributes of resources (e.g. staff education)

• Outputs
  - Amount of output (e.g. no. of titles processed)
  - Attributes of output (e.g., electronic vs. print)
EXAMPLES OF USER METRICS

• Amount of use
  (e.g. readings, hits and downloads, items reshelved)
• Type of users/non-users
  - Students (e.g., level, GPA, etc.)
  - Faculty (e.g., department/discipline, demographics)
  - Other professionals (e.g., administration, librarians)
  - Non-university (e.g., researchers, interlibrary borrowers)
• Factors affecting use
  - Purpose/reason for using (e.g., teaching, class assignment, research, current awareness)
  - LibQUAL+®
  - Available alternatives (e.g., books, proceedings)
  - Awareness of options (e.g., access from office)
  - Ease/cost of use
  - Importance of and satisfaction with attributes (e.g., electronic format, accessibility of articles)
• User information seeking behavior

- Choosing from available alternatives
- Ways articles are identified (e.g., browsing, searching)
- Where articles are obtained (e.g., library, personal subscription, colleague)
EXAMPLES OF OUTCOMES/VALUE FROM USE

• Direct outcomes
  - Inspired new thinking/ideas
  - Improved results (e.g., better research design)
  - Saved time (e.g., in classroom, on research)

• Indirect outcomes
  - Improved productivity
  - Improved quality of work
  - Results in more grants
  - Contingent valuation (e.g., cost more if no library)
  - Affects university goals (e.g., teaching research/service, student achievement)
• Higher order effects
  - Top Down look
  - Externalities
EXAMPLES OF DOMAIN METRICS

• Target population (e.g., number)
• User/non-user characteristics (e.g., demographics)
• User/non-user information needs and requirements
<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Specific Metrics</th>
<th>Derived Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library</td>
<td>Input resources</td>
<td>Performance</td>
</tr>
<tr>
<td>Library</td>
<td>Output</td>
<td>Effectiveness</td>
</tr>
<tr>
<td>User</td>
<td>Use</td>
<td>Cost Effectiveness</td>
</tr>
<tr>
<td>University/college</td>
<td>Outcome/value</td>
<td>Impact</td>
</tr>
<tr>
<td>General environment</td>
<td></td>
<td>Cost-Benefit</td>
</tr>
</tbody>
</table>
EXAMPLES OF DERIVED METRICS

• Performance (i.e. how well the library performs)
  - Cost per unit (e.g., cost per electronic or print title processed)
  - Productivity (e.g., no. of titles processed per hours of staff time)

• Effectiveness (i.e., the effect of a library service)
  - Amount of use per unit (e.g., readings per electronic or print title)
  - Distribution of titles read (e.g., x titles read once, twice, etc.)
  - Effect of accessibility on use

• Cost effectiveness (i.e., effect of input resources on use)
  - Total library cost per use
  - Purchase cost per use (e.g., electronic, print collection)
  - Cost per student or faculty use
  - Cost per purpose of use
• Impact (i.e., consequences of use)
  - How purpose of use leads to direct and indirect outcomes (e.g., x readings by browsing results in better research)
  - How information seeking relates to outcomes (e.g., x readings for research results in $x in savings)

• Cost-benefits (i.e., amount of resources applied on outcomes)
  - Return-on-Investment (e.g., outcomes per cost)
  - $savings per library cost
EXAMPLES OF “BOTTOM-UP” METHODS USED

- Surveys of users and potential users
- In-depth analysis of the cost of library resources
SURVEY METHODS

• Survey from all students, faculty and staff
  • Students surveyed by asking sampled faculty to distribute questionnaire at the end of a class (about 10 minutes)
  • Survey of all faculty and staff with some parts partitioned into more than one survey
  • Faculty surveyed by sometimes distributing in university mail and sometimes web-based
  • The principal method involves asking about the last article read (i.e., critical incident)
SOME QUESTIONNAIRE TOPICS

• Number of articles read in the past month
• Source of articles read (e.g., journal, author Web site)
• From the source how many read in last year
• Year article published/posted
• Time spent reading the last time
• How initially found out about article
• From what source read
• Time spent searching, accessing, etc.
• Purpose of reading
• Format when read
• Location where read
• Demographics including no. of personal subscriptions, authorship
ADVANTAGE OF THE CRITICAL INCIDENT METHOD

• Typical question
  - Rate your satisfaction with online searches
  - Problem is that each search is different and this gets lost

• Allows one to combine answers through cross-analysis:
  - Can establish age of articles read from library versus personal subscription that are read for research or to keep up
  - Can establish time spent reading for research versus teaching from library versus personal subscription (thus providing indicators of value for library-provided readings)
THE PATH TO THE OUTCOMES OF VALUE FROM USING THE LIBRARY JOURNAL COLLECTIONS

- Purposes or reasons for reading articles (e.g., research, teaching, comment awareness)
- Information seeking behavior (e.g., identifying articles, obtaining them, choosing the format)
- Article use (e.g., how much reading, time spent reading, age of articles read)
- Outcomes/value of reading (e.g., inspire new thinking/ideas, increased productivity, achievers read more, contingent valuation)

Return component of ROI
We know…

• Articles are read for many different purposes

• Each purpose leads to a different information seeking behavior
Principal Purpose of Reading
(Faculty in US and Australia, 2004-2006, n=1433)
Researcher information seeking behavior involves...

- Choosing from among information sources
- Establishing ways in which journal information is identified
- Choosing online search sources
- Determining where to obtain articles
- Picking a location
Information sources used

- Journal article: 93.9%
- Book or book chapter: 47.2%
- Website: 33.9%
- Conference proceeding: 24.3%
- Personal contact: 22.8%
- Magazine article: 8.3%
- Other: 4.0%
## Reasons for choosing journals/articles

### Rating of reasons for choosing journals/articles

(1-lowest rating to 7-highest rating)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Average Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article topic</td>
<td>6.21</td>
</tr>
<tr>
<td>Online accessibility</td>
<td>4.73</td>
</tr>
<tr>
<td>Source of article</td>
<td>4.54</td>
</tr>
<tr>
<td>Journal title</td>
<td>4.42</td>
</tr>
<tr>
<td>Author(s)</td>
<td>3.93</td>
</tr>
<tr>
<td>Type of publisher</td>
<td>2.79</td>
</tr>
<tr>
<td>Author(s) institution</td>
<td>2.18</td>
</tr>
</tbody>
</table>
How faculty first became aware of information found in articles

- **Journal articles**: 33.8%
- **Informal discussion with colleagues**: 19.4%
- **Conference or workshop**: 15.9%
- **Listserv or news group**: 3.7%
- **Email from colleague**: 4.8%
- **Website of author**: 0.9%
- **E-print server**: 0.4%
- **Other**: 21.1%
Ways in which journal information is identified

- Found by browsing: 35.7%
- Found by searching: 26.7%
- Another person: 17.6%
- Cited in another publication: 15.8%
- Other: 4.2%
Choose online search sources

- Electronic A&I services: 58%
- Online journal collection (e.g., HighWire, OhioLink EJC, JSTOR): 20%
- Web search engine (e.g., Google, Yahoo): 14%
- Other: 8%
Where articles are obtained

<table>
<thead>
<tr>
<th>Source</th>
<th>Proportion of Readings (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library-provided article</td>
<td>52.0%</td>
</tr>
<tr>
<td>Personal subscription</td>
<td>32.6%</td>
</tr>
<tr>
<td>Copy from an author, colleague, etc.</td>
<td>7.0%</td>
</tr>
<tr>
<td>Free web journal</td>
<td>4.7%</td>
</tr>
<tr>
<td>Preprint copy</td>
<td>3.2%</td>
</tr>
<tr>
<td>Other website</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
Source of additional readings over time

- Library collection
- Other

<table>
<thead>
<tr>
<th>Year</th>
<th>Library Collection</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>120</td>
<td>92</td>
</tr>
<tr>
<td>2000-03</td>
<td>115</td>
<td>96</td>
</tr>
<tr>
<td>2004-06</td>
<td>131</td>
<td>121</td>
</tr>
</tbody>
</table>
Reasons for shift to reading from the library collection

- Decrease in personal subscriptions
- More reading of articles identified by online bibliographic searches
- Electronic collections have broadened access to articles
Indicator of broadened access

- In 1977 researchers read on average at least one article from 13 journals
- In 1995 that number increased to 18
- By 2003 it was 23
- By 2005 it was 33
# Format of articles read

<table>
<thead>
<tr>
<th>Source</th>
<th>Electronic (54%)</th>
<th>Print (46%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal subscription</td>
<td>13%</td>
<td>87%</td>
</tr>
<tr>
<td>Library</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>Other</td>
<td>69%</td>
<td>31%</td>
</tr>
</tbody>
</table>
Select article format

**ELECTRONIC 54%**
- 8% Downloaded and printed out
- 23% Reading online screen
- 69%

**PRINT 46%**
- 1% Reading from an issue
- 19% Reading from a photocopy
- 80% Reading from a fax

Center for Information and Communication Studies
Pick a location to read

- 59% Office or laboratory
- 31% Home
- 4% In library
- 5% Traveling
- 1% Other location
Aspects of Article Use

• Amount of reading
• Time spent reading
• Age of articles read
• Leads to outcomes of reading/value
Trend in number of readings by scientists

Average Number of Article Read

- 1977: 150
- 1984: 171
- 1993: 188
- 2000-2002: 216
- 2004-2005: 280
Trend in source of additional readings over time by scientists

![Bar graph showing trends in source of additional readings over time]

- Personal subscription
- Library-provided articles
- Other source

Year: 1977, 2005
Two types of value of articles

• Purchase value: what researchers are willing to pay for article content in their time and/or money

• Use value: the favorable outcomes derived from use of article content
Purchase value

• Average time spent per reading
  - 6.9 minutes per reading spent browsing
  - 5.3 minutes per reading spent searching
  - 33.1 minutes per reading

• Average about 148 hours per year
  - 10 hours spent browsing
  - 6 hours spent searching
  - 132 hours spent reading

• Unknown dollars spent on subscriptions, etc
Trend in time spent reading

Average time (in minutes) spent per article reading

- 1977: 48
- 1993: 47
- 2000-2003: 36
- 2005: 31

Center for Information and Communication Studies
Age of articles read

- 1 year: 50.2%
- 2 years: 19.8%
- 3-5 years: 11.5%
- 6-10 years: 8.9%
- 11-15 years: 3.4%
- 16-25 years: 3.4%
- Over 25 years: 2.8%

Center for Information and Communication Studies
Time spent reading by purpose of reading

- Research: 37.1 minutes
- Writing: 34.5 minutes
- Continuing education: 29.3 minutes
- Teaching: 27.1 minutes
- Current awareness: 22.7 minutes
- Other: 28 minutes
## Use value of reading

(Faculty in US, n=880)

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspired new thinking/ideas</td>
<td>55%</td>
</tr>
<tr>
<td>Improved results</td>
<td>40%</td>
</tr>
<tr>
<td>Changed focus</td>
<td>27%</td>
</tr>
<tr>
<td>Resolved technical problems</td>
<td>12%</td>
</tr>
<tr>
<td>Saved time</td>
<td>12%</td>
</tr>
<tr>
<td>Faster completion</td>
<td>7%</td>
</tr>
<tr>
<td>Collaboration</td>
<td>6%</td>
</tr>
<tr>
<td>Wasted my time</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>
Indicator of faculty productivity

- Articles in refereed scholarly journal: 3.82
- Non-refereed articles: 1.37
- Chapters in scholarly books, proceedings, etc.: 1.17
- Books: 0.09
Faculty who publish more tend to read more per month (i.e., be more productive)

- Publication author
  - Any publication: 29
  - Refereed articles: 29.6
  - Books: 33.7
- Non-publication author
  - Any publication: 15.3
  - Refereed articles: 18.4
  - Books: 26.7
Achievers read more

- Number of readings: achievers (276 readings), non-achievers (222 readings)

- Hours spent reading: achievers (159 hours), non-achievers (119 hours)

- Time per reading: achievers (35 minutes), non-achievers (32 minutes)
UNIVERSITY OF PITTSBURGH JOURNAL
COLLECTIONS AS AN EXAMPLE (2002-2004)

- Conducted an in-depth cost analysis of library collections
- Size of print and electronic collections were similar
- Conducted a survey of students, faculty and staff
- Planning an update set of studies in October to provide a longitudinal comparison and consequences of changes in publishing models
- Unique opportunity
PRINCIPAL PITTSBURGH UNITS (2002)

- Journal collection
  - Electronic collection:
    - 14,284 titles
    - 8,560 unique titles
  - Print collection:
    - 16,924 titles
    - 9,400 unique titles

- User community (not including law and medical)
  - 30,085 students
  - 1,725 faculty
  - 750 other professional staff
• Use (readings)

- Electronic: 933,200
- Current print: 129,980
- Backfile print: 238,020
- Interlibrary lending: 14,236
- Interlibrary borrowing: 5,124
TYPE OF COSTS

• Fixed costs (e.g., collection-related functions)
• Variable costs (e.g., annual cost of reshelving)
• Marginal costs (e.g., incremental cost of each item shelved)
• Direct costs (e.g., identified with collection services)
• Indirect costs (e.g., support costs to be allocated)
• Annual costs of the five collection services
• Life-cycle cost of a single electronic or print title
FIVE JOURNAL COLLECTION SERVICES

• Access to the electronic collection
• Access to the current periodicals collection
• Access to the backfile (bound volume) collection
• Interlibrary lending (ILL)
• Interlibrary borrowing (ILB) and document delivery
STEPS IN DEVELOPING COLLECTION SERVICE COSTS

• List activities performed by staff (67 at Pittsburgh)

• Identify other resources involved (e.g., staff, space, workstations, systems, etc.)

• Allocate staff time to 67 activities

• Assign a cost to staff time (including fringe benefits)

• Sum across five service components

• Analyze input, output and performance for each component
• Partition print staff time to current and backfile collections

• Estimate amount of use (reading) for each of the five collection services (electronic, current print, etc.)

• Allocate all other resource costs to the five services

• Performed detailed cost analysis of annual total and life-cycle unit costs
FIVE SERVICE COMPONENTS INVOLVING STAFF

• Collection-related functions
  - Collection development
  - Negotiations
  - Acquisitions
  - Receipt processing, etc.

• Backfile-related functions
  - Binding
  - Physical processing, etc.

• User-related functions
  - User instruction
  - Faculty liaison
  - Tours, briefings, etc.
• Use-related functions
  - Reference and research
  - Online bibliographic searching
  - Circulation
  - Photocopying
  - Reshelving, etc.

• Support-related functions
  - Systems
  - Maintaining statistics
  - Preparing procedural manuals, etc.
<table>
<thead>
<tr>
<th>Resource</th>
<th>Electronic ($000)</th>
<th>Current ($000)</th>
<th>Backfile ($000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase</td>
<td>$1,395</td>
<td>$1,005</td>
<td>$1,841</td>
</tr>
<tr>
<td>Staff</td>
<td>$1,316</td>
<td>$672</td>
<td>$1,641</td>
</tr>
<tr>
<td>Space</td>
<td>$16</td>
<td>$78</td>
<td>$120</td>
</tr>
<tr>
<td>Binding</td>
<td>----</td>
<td>----</td>
<td>$86</td>
</tr>
<tr>
<td>Photocopying</td>
<td>$1</td>
<td>$3</td>
<td>$5</td>
</tr>
<tr>
<td>Workstations</td>
<td>$17</td>
<td>$7</td>
<td>$17</td>
</tr>
<tr>
<td>System</td>
<td>$29</td>
<td>$1</td>
<td>$1</td>
</tr>
<tr>
<td>Total</td>
<td>$2,774</td>
<td>$1,765</td>
<td>$3,710</td>
</tr>
</tbody>
</table>
## 25-Year Life-Cycle Costs

<table>
<thead>
<tr>
<th></th>
<th>Print ($000)</th>
<th>Electronic ($000)</th>
<th>One-time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One-time</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Purchase, etc.</td>
<td>$3,895 ($2,850)</td>
<td>$750 ($1,395)</td>
<td>- License</td>
</tr>
<tr>
<td>- Current</td>
<td>$65</td>
<td>$88</td>
<td>- Acquisition</td>
</tr>
<tr>
<td>- Backfile</td>
<td>$307</td>
<td>$270</td>
<td>- Collection</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$4,267</td>
<td>$1,108</td>
<td></td>
</tr>
<tr>
<td><strong>On-going</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Current</td>
<td>$50</td>
<td>$250</td>
<td>- License</td>
</tr>
<tr>
<td>- Backfile</td>
<td>$244</td>
<td>$63</td>
<td>- Acquisition</td>
</tr>
<tr>
<td>- User-related</td>
<td>$138</td>
<td>$171</td>
<td>- User</td>
</tr>
<tr>
<td>- Use-related</td>
<td>$816</td>
<td>$789</td>
<td>- Use</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$1,248</td>
<td>$1,273</td>
<td>Total</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$5,515</td>
<td>$2,381</td>
<td></td>
</tr>
</tbody>
</table>
EXAMPLES OF DERIVED METRICS

• Performance
  - $170 per electronic title
  - $330 per print title

• Effectiveness
  - 65 readings per electronic title
  - 22 readings per print title

• Cost-effectiveness
  - $3.00 per reading of electronic collection
  - $13.60 per reading of current periodicals
  - $15.60 per reading of print backfiles

• Impact: Contingent valuation (faculty)
  - 49 hours
  - $4,226,000
• Investment
  - Library cost (allocated): $1,728,000
  - Faculty, staff cost: $12,765,000
  - Total: $14,493,000

• ROI: $14,493 / $4,226 = 3.4 to 1
DIFFERENCE IN ROI OF
PUBLIC, SPECIAL AND ACADEMIC LIBRARIES

• Public libraries: 5.8 to 1
  - Investment / local, state, federal - $7.20 per visit
  - Return--contingent valuation--$41.70 per visit
• Net benefit: $27.90 per visit for users
• Savings due to information: $2.40 per visit
• Library salaries lost to economy: $5.20 per visit
• Purchases lost to economy: $2.00 per visit
• In-library gift shops, etc. lost to economy: $0.03 per visit
• “Halo effect”: $2.30 per visit

- REMI:
  • GRP $3.79 per dollar of public funding
  • Net impact $3.14 of GRP per dollar of funding
• Special libraries: 2.9 to 1
  - Investment: Cost to library plus to users
  - Return: contingent valuation

• Academic libraries: 3.4 to 1
  - Faculty
  - Students: unknown