Research design and methodology for maximum impact

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Lesson 1: Make every paper matter, even student ones

- My mother and the allure of students: you have some of the best ideas
- Turn your assignments and term papers into publishable articles
  - Better grades (put more effort into the final product)
  - Better articles (feedback)
  - Experience (you learn quickly about publishing)
  - Chance to distinguish yourself and your department
- Partner with professors, even those that are not your supervisors or advisors
Lesson 1: Make every paper matter

• Transform bachelor’s theses into single articles
• Transform master’s theses into 2-3 articles
• Transform dissertations into 4-5 articles and possibly a book
• Transform all working papers or conference papers into an article (eventually)
• Utilize all dormant “original data” (discussed below)
• Seek and cherish “research appointments,” sabbaticals, or visiting fellowships where you can churn out papers
Lesson 2: Gain experience

• Publishing is a numbers game, almost like the lottery
• Don’t always aim for the best journal, try second, even third tier journals or even open access journals (will discuss these below)
• Don’t always start with full research articles
  o Forums and Perspectives (2,000 to 4,000 words)
  o Academic op-eds (1,000 to 1,500 words)
  o Communications (1,000 to 2,000 words)
  o Insight articles (various)
  o Book reviews or book review essays
  o Other forms of valuable commentary (blogs, media op-eds, university publications)
Lesson 3: Be careful about your data sources

- Not all sources of information are created equal
  - *Science, Nature, PNAS*, peer-reviewed at the top
  - EIA, IEA, UNFCCC/IPCC, World Bank, GAO, other US and EU agencies, generally fact checked and peer reviewed
  - Government ministries outside of the EU and USA
  - NGOs (World Resources Institute, GreenPeace, Open Society Institute, Brookings Institution, Borneo Project)
  - Newspaper and magazine articles, blogs at the bottom, only use if absolutely necessary, then for quotes rather than data

- In the energy field, I try as much as possible to rely only on two institutions for reliable data, the EIA and IEA

- Get the original source, no matter how much work
  - Search google, often posted (sometimes PDFs, sometimes word documents)
  - Email the author directly
  - Interlibrary loan
Lesson 4: Be strategic with your partners

• Use your home institution as a resource (all top universities have dozens of researchers in your area, though not necessarily your department or college)
• Consider reaching beyond your discipline, find scholars that help strengthen your weaknesses (quantitative methods)
• That said, be selective and consider having partners who:
  – Aren’t jerks
  – Meet deadlines
  – Write well
  – Are rigorous
  – Are ethical
• Done right, having three authors means 1/3 the work to produce a good paper, done poorly it’s three times as much work
• Learn to say “no”
Lesson 5: Do broad, systematic literature reviews

• Be comprehensive and systematic in your literature review
  − Always start with the journal itself, can search TOCs for free
  − Be exhaustive in searches (cook stove, cookstove, improved cookstove, modern cooking, rural energy, traditional cooking)
  − Use bibliographies as a resource and contact authors for suggestions

• My technique:
  ▪ Science Direct (science and energy), JSTOR (social science), Project Muse (social science), Hein Online (law), PubMed (medicine), SpringerLink (business and area studies), Taylor Francis/Routledge (business and area studies), Wiley Blackwell (area studies), Sage (area studies), EBSCOhost (environment and geography), targeted internet searches (World Bank, DOE, IEA, IRENA, etc.) and google scholar (anything I missed)
Lesson 6: Mix your methods and ground your research in concepts

- Always try to collect “original” or “primary” data
- I am a big fan of “grounded theory”
- Try to mix “qualitative” and “quantitative” methods
  - Quantitative analysis (regression, principal component analysis, econometrics)
  - Documents/literature
  - Archival records
  - Surveys
  - Research interviews
  - Focus groups
  - Direct observation
  - Participant observation
  - Physical artifacts
  - Meta-analysis
  - Spatial analysis (GIS)
  - Discourse analysis
  - Critical stakeholder analysis
  - Content analysis
Distinguish between concepts/theories and methods

- Concepts or theories are lenses through which you interpret your data, examples would be the tragedy of the commons (governance), the resource curse (political economy), symbolic convergence theory (communication studies), or accumulation by dispossession (political ecology/geography).

- Methods are the ways in which you collect the data for your study, many times this is just a (non-systematic) review of the literature but it can also include models, interviews, surveys, case studies, etc.

Explicitly acknowledge both the value and limitations to your concepts/theories and particular methods
My own research has generally fallen into four categories:

1. **Theory dependent** – test a theory, your own, someone else’s; tend to be deductive (e.g., symbolic convergence theory and the hydrogen economy)
2. **Problem or puzzle dependent** – something curious, touches upon concepts learned in classes (e.g., socio-technical systems theory, regulatory capture, bounded rationality, market failure, realism and how they all relate to energy systems), tends to be inductive
3. **Data driven or grounded**: entirely inductive (e.g., what’s stopping solar panels in Papua New Guinea? Is the EITI effective?)
4. **Hypothesis driven**: test, confirm, or disprove certain hypotheses (e.g., energy security survey)
Lesson 7: Milk your data

• The allure of primary data: it’s almost always publishable
  - Economic modeling
  - Surveys
  - Interviews
  - Field research and site visits
  - Anything else that is time-intensive (meta-surveys, good, systematic lit reviews, content analysis, critical stakeholder analysis)

• Maximize your data set (e.g., energy security survey)

Lesson 8: Employ visual techniques along textual ones

Use images, maps, charts, figures, tables, and photographs

• Different purposes (more on that in a moment)
• Fully explain them in the text/caption
• No more than 2-3 of each per article
• Make them yourself or get permission, you’d be amazed what Microsoft Office can do
• US government ones are great, no copyright, also check out the DOE Digital Photo Archive http://www.doedigitalarchive.doe.gov
Table 2 (Continued)

<table>
<thead>
<tr>
<th>Proposition</th>
<th>Explanation</th>
<th>Survey question(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3: Defending one’s vocation</td>
<td>One would expect that perspectives on energy security held by those employed in the private sector would be significantly more conservative, with those participants rating and ranking climate change and environmental dimensions poorly. Industry representatives and government officials would also be expected to rate energy research expenditures highly.</td>
<td>When you think about energy security for your country of residence in the next five years, how important is it to minimize the impact of climate change (i.e., adaptation); and to reduce greenhouse gas emissions (i.e. mitigation)?; to minimize the destruction of forests and the degradation of land and soil; to provide available and clean water; and to minimize air pollution?; to conduct research and development on new and innovative energy technologies?</td>
</tr>
<tr>
<td>P4: Feminism and mother earth</td>
<td>We would expect women to prioritize climate change, environmental issues, and renewable energy more than men.</td>
<td>When you think about energy security for your country of residence in the next five years, how important is it to minimize the impact of climate change (i.e., adaptation); to reduce greenhouse gas emissions (i.e. mitigation)?; to minimize the destruction of forests and the degradation of land and soil; to provide available and clean water; and to minimize air pollution?</td>
</tr>
<tr>
<td>P5: The influence of affluence</td>
<td>We would expect developing countries such as Brazil, China, India, Kazakhstan and Papua New Guinea to be predominantly concerned about the security of fossil fuel supply, given their rapid economic growth, whereas developed economies such as Germany, Japan, Singapore, and the United States would prioritize energy efficiency and energy research and development.</td>
<td>When you think about energy security for your country of residence in the next five years, how important is it to have a secure supply of oil, gas, coal, and/or uranium?; to have low energy intensity (unit of energy required per unit of economic output)?; to conduct research and development on new and innovative energy technologies?</td>
</tr>
<tr>
<td>P6: The have and have nots</td>
<td>One would expect major energy importers such as Germany, Japan, and the United States to be concerned with lessening dependence on foreign supplies and increasing diversification and decentralization, whereas exporters such as Kazakhstan and Saudi Arabia would emphasize trade and the value of energy exports. The rapidly industrializing economies of Brazil, China, and India would be expected to “scramble” for as many energy resources as they could acquire.</td>
<td>When you think about energy security for your country of residence in the next five years, how important is it to promote trade in energy products, technologies, and exports?</td>
</tr>
</tbody>
</table>
Table 1
Qualitative comparison of four governance networks.

<table>
<thead>
<tr>
<th></th>
<th>Clarity of purpose</th>
<th>Resources/ Funding</th>
<th>Institutional formality</th>
<th>Scope of power</th>
<th>Level of Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEAN Centre for Energy (ACE)</td>
<td>Lack of specific mandate</td>
<td>Moderately supported funding</td>
<td>Semi-Formal</td>
<td>Limited</td>
<td>Somewhat resilient</td>
</tr>
<tr>
<td>Renewable Energy and Energy Efficiency Partnership (REEEP)</td>
<td>Very Clear</td>
<td>Broad based funding</td>
<td>Robust</td>
<td>Influences members and policy</td>
<td>Very Resilient</td>
</tr>
<tr>
<td>ASEAN Regional Knowledge Network on Forest Law Enforcement and Governance (FLEG)</td>
<td>Somewhat clear but ambitious</td>
<td>Weak</td>
<td>Semi-Formal</td>
<td>Limited</td>
<td>Not very Resilient</td>
</tr>
<tr>
<td>ASEAN Regional Knowledge Network on Forests and Climate Change (FCC)</td>
<td>Not clear due to complexity of the issue</td>
<td>Weak</td>
<td>Semi-Formal</td>
<td>Limited</td>
<td>Not very Resilient</td>
</tr>
</tbody>
</table>

Illustrating Domestic U.S. Energy Resources and Reserves

Documenting

## Simplifying

<table>
<thead>
<tr>
<th>OIL SECURITY</th>
<th>1970</th>
<th>2004</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil imports as a % of oil consumption</td>
<td>22</td>
<td>58</td>
<td>36%</td>
</tr>
<tr>
<td>Price of oil ($ per barrel)</td>
<td>12</td>
<td>34</td>
<td>134%</td>
</tr>
<tr>
<td>Non-petroleum transportation fuels (%)</td>
<td>4.9</td>
<td>3.9</td>
<td>-25%</td>
</tr>
<tr>
<td>Average fuel economy of new passenger vehicles (mpg)</td>
<td>15</td>
<td>27</td>
<td>80%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTRICITY RELIABILITY</th>
<th>1970</th>
<th>2004</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas imports as a % of natural gas consumption</td>
<td>3.6</td>
<td>15.3</td>
<td>336%</td>
</tr>
<tr>
<td>Natural gas price for electric power ($/MBtu) in chained 2000 dollars</td>
<td>1.0</td>
<td>5.6</td>
<td>460%</td>
</tr>
<tr>
<td>Electricity retail price (¢/kWh)</td>
<td>6.2</td>
<td>7.0</td>
<td>13%</td>
</tr>
<tr>
<td>Annual investment in electric transmission ($B) in 2003 dollars</td>
<td>5</td>
<td>2</td>
<td>-58%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENERGY EFFICIENCY</th>
<th>1970</th>
<th>2004</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy intensity (thousand Btu per dollar of GDP)</td>
<td>18</td>
<td>9</td>
<td>-50%</td>
</tr>
<tr>
<td>Energy use per capita (indexed to 1970)</td>
<td>1.0</td>
<td>1.1</td>
<td>10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL QUALITY</th>
<th>1970</th>
<th>2004</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO(_2) emissions from electric generators (billion tonnes)</td>
<td>17</td>
<td>12</td>
<td>-29%</td>
</tr>
<tr>
<td>CO(_2) emissions from energy consumption (billion tonnes)</td>
<td>4.3</td>
<td>5.9</td>
<td>39%</td>
</tr>
</tbody>
</table>

Lesson 9: Tell a good story

- Remember the power of drama and simplified story lines (e.g., the “seven common plots”):
  1. The Rebel
  2. The Underdog
  3. Boy meets Girl
  4. Rags to Riches
  5. Good versus Evil
  6. Tragedy
  7. Rebirth
Lesson 9: Storytelling

- Or keep in mind the common suggestive themes from a longitudinal study of effective advertising appeals over four decades that seem to resonate with people.
- These include the need for:
  - (1) sex
  - (2) affiliation
  - (3) to nurture
  - (4) for guidance
  - (5) to aggress
  - (6) to achieve
  - (7) to dominate
  - (8) for prominence
  - (9) for attention
  - (10) for autonomy
  - (11) to escape
  - (12) to learn
  - (13) for aesthetic sensations
  - (14) to satisfy curiosity
  - (15) to satisfy physiological needs such as eating, drinking, and sleeping
Lesson 9: Storytelling

• Use rhetorical devices to enhance the persuasive appeal of your writing
• Have fun and be creative
  – Rhetorical devices (Purple cows, Kabuki dances, and Gers that just Want to Have Fun)
  – History (sex and EVs) or insightful anecdotes (Nixon versus Khrushchev and the 1959 toaster)
  – Use what you’ve got (Voltaire and birds, photo of Copenhagen)
• Sometimes telling a good story can trump data limitations or weaknesses in argument
Lesson 10: take the time to write well and reflexively

- My old boss and his “rule of 5” for paragraph structure, every paragraph has a crisp, identifiable thesis
- Write, rewrite, and edit repeatedly, often with a printed copy (for me at least)
- George Orwell identified a series of problems with contemporary thinking and writing
  - Dying metaphors: worn out and lost all power, used to save people trouble (e.g. toe the line, fishing in troubled waters, Achilles heel)
  - Verbal false limbs: use phrases instead of verbs (such as render inoperative instead of break, mitigate against instead of stop)
  - Pretentious diction: dressing up simple statements with big words or foreign words
Lesson 11: When in doubt, write to editors

- If you have questions about the aims and scope of the journal (which you should read), formatting, ethics (milking the data set), authorship, length of review, acceptance rate, impact factor, production schedule, etc., in many cases you can write to the editor or editorial office
  - Most journals have at a minimum an editorial assistant (or team) that handles such requests
  - If they don’t, or take a long time to get back to you, that also tells you something
  - Editorial advice can save *everyone* (authors, editors, possible reviewers) a great deal of time
- Follow through with editors after you submit (I do it every 4 months)
  - Example of editor forgetting to send out for review
  - Example of editor forgetting article was submitted
  - Example of editor not realizing reviews were in
Lesson 12: Prepare for rejection

• For especially innovative papers, expect rejection (e.g., Elinor Ostrom and sixth time being the charm)
• You can appeal rejections, but only in extreme circumstances (Editors are busy, underpaid [or not paid at all], and overworked)
• That said, watch for conflict of interest (ADB example), bias (gender example), inappropriateness (swearing example), editorial bias (wind power article), and editorial error (municipal heating example), all of which probably justify an appeal, though even here only one (editor error) was successful
• In the energy policy area, I’m about 4 for 5, but this drops to about 1 for 5 when publishing in other fields
Lesson 13: Disseminate your work

- It won’t happen by itself, sometimes more work than actually writing, submitting, revising, and publishing in aggregate.
- Track your own h-index and establish a Google Citations Account.
- Citation counts matter, both individually and organizationally, this means:
  - Ask colleagues to (reasonably) cite your work.
  - Cite the work of your colleagues.
  - Cite your own research, though not obsessively.
  - Keep on top of the literature and email others your research (Daniel Kammen example).
  - Have a professional and a personal website.
“Impact” can take a variety of forms

- Citation counts (ISI, Scopus, or Google Scholar)
- Author impact factor/h-index
- Downloads (journal, institutional website, or SSRN)
- Court decisions / testimony
- Political debates documenting use
- Press releases or citations in the popular press
- Personal communications/emails/requests
- Requests for consultancies
- Media interview requests
- Invitations to conferences
- In rare cases, advertising?
“Impact” can take a variety of forms

Be active about dissemination

• Arrange for opinion/editorial newspaper articles (a great strategy, WSJ)
• Submit material for department websites or newsletters
• Host press releases and/or media events (e.g., book launch)
• E-mail lists of colleagues in particular areas (topical and geographic)
• Reports and policy briefs, data rewritten for a general audience
• Distribution of material at conferences (my WREC example)
Lesson 14: “Good” is good enough

- Don’t wait for perfection, submit early (and publishing takes practice)
  - Timeliness: some reviews can take years, article production can take years
  - Idea ownership: stake your claim
  - Free feedback: worst case, you get good critical comments for free, best case, you get published
- Publishing, like finding your soul mate or a good deal on a house, is a numbers game. I have had some of the worst papers of mine accepted without revision, best papers rejected by three journals.
- I’ve also taken the same article, rejected by one, and submitted with no changes to a second journal, accepted as is.
- Force yourself to write even on bad days, it definitely gets easier (and you get better)
Summary: Key Takeaways

• **Writing articles**
  - Good is good enough, and publishing is easier the more you do it
  - Do comprehensive lit reviews and use mixed methods
  - Be persuasive (write to an audience, tell stories, use visual tools)
  - Have fun

• **Choosing a journal and submitting**
  - High impact factor
  - Indexed and online
  - Online submission system (quick review)

• **Choosing reviewers**
  - Do it if you can

• **Handling rejections**
  - Expect rejection, and don’t let it get you down

• **Dissemination**
  - Papers will not disseminate themselves

• **What not to do**
  - Be ethical; work out authorship *before* you begin, avoid FFP
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