5P’s of Academic Research

Everything you really never wanted to ask about academic research, but here it is anyway!

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5P’s of Academic research: A personal perspective

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What are the 5 P’s?

- Propose
- Plan
- Prepare
- Present
- Publish

*This is a simplistic list of what academic research entails!*
Propose

- First step is to propose a suitable project that is relevant, of current and potential interest and, in many instances, fundable.
- Proposer must be up-to-date with current state-of-the-art.
- No short-cut to uncovering, accessing and studying critically relevant research literature - must cover broader range of subjects.
- Too narrow a literature search can cause problems since all significant literature may not be uncovered with few keywords!
More on Defining project

- Define objectives and scope - remember these are dynamic especially over 3-5 year span of PhD work
- Work elsewhere can impact research scope/objectives/methodology etc
- Develop continuous network involving research groups around the world - share research results when feasible to avoid duplication and get feedback from experts
- Think globally but act locally - what is relevant or important in one part of the world may not be so in another part
- Think about producing an excellent researcher and research (often a by-product!)

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More about proposal...

- Be realistic – match resources (quality and quantity) with objectives and scope!
- Evaluate human resources (grad students etc) carefully
- Be ambitious but goal posts should be reachable!
- Avoid buzz word research! Buzz may fizzle out before work is finished!
- Also, steer clear of ROM (run-of-the-mill) or Me-TOO research!
- Collaborate if necessary expertise is brought in by collaborator- or else work may simply be slowed down with additional resistance to communication in group. Have real cooperation.
- No point in having collaborator with same or less skill level in same area- will dilute publications and delay work!
- Too many cooks spoil the broth- also true for research!

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Planning

- Important first step - develop schedule, assign resources correctly. Wrong assignments can cause problems later.
- Be flexible - timeline cannot be cast in concrete in true research marked by significant uncertainty.
- Update timeline frequently.
- Report/present results within group/network regularly - not sporadically!
- Get all team members involved - they should assume ownership of their research.
- Make researchers entrepreneurs and CEO’s of their projects!
Planning-Human resources

- Assuming you have financial resources, quality of human resources can be even more critical.
- Evaluate quality of research personnel available - analytical vs experimental traits.
- Potential graduate students must be resourceful, keen, highly motivated, intrigued and fascinated by project, driven to succeed and make a difference!
- Develop initiative, willingness to work hard under extreme pressure, enjoy learning/reading, have patience, ethical bend; have leadership and team-building skills, willingness to share success, appreciate others’ strengths and achievements etc.
Traits of potential researchers

- Must have strong fundamentals
- Willingness to self-study and self-learn
- Capable of critical thinking
- Creative, able to innovate
- Able to identify opportunities to make a contribution to knowledge and strong desire to do so
- Able to take up ownership of the “Research Enterprise”
More about what makes a good researcher...

- Has desire to stay up-to-date
- Has desire to be a team member and lead teams when required
- Logical, ethical, amicable, resourceful, helpful to others, willing to share knowledge, good in oral and written communication skills
- Preferably analytical and good in experimental techniques needed
- Interested in life long learning
Prepare ...

- Allow mistakes but not the same repeatedly!
- Learn from experience of team members - critical for multi-disciplinary projects
- Hold formal/informal group meetings
- At NUS, we hold mini-technical sessions with 6-8 formal presentations every few weeks!
- Researchers more enthusiastic when there is interested audience that learns from them and have genuine interest in their output!
- Encourage critical discussion - not at personal level
More about preparation – execution of project

- Researchers and advisors must keep abreast of literature continuously - not just in initial phases
- Evaluate literature critically - do not read it like a novel or newspaper!
- Prepare summaries of relevant papers – to be cited in your work
- Benchmark against high quality work in same area. Try to achieve similar or higher level of accomplishment
- Do not repeat earlier work except to compare/validate your work – inject element of innovation and creativity in your research
Prepare....

- No substitute to hard work!
- Researchers must be able to multi-task i.e. carry out several tasks in parallel and in series
- Often delays can occur over which one has no control- use this time productively
- Analyze data critically (and statistically!). Take ownership of results..
- Research students must take their project as their business enterprise- must strive to make it a “profitable” undertaking – profits are research output of value.

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Preparation contd..

- Be productive thinker- coupling creativity with productivity
- Research value is time-dependent-typically decays with time.
- Half-life of research results depends on area- some may be short (1 yr) while others may be 10 years!
- Basic work lasts longer than applied work, in general
- Rapid publication is essential for short half-life areas.
Presentation of work to proper audiences at right time is key to success. Dated presentation to wrong audiences is wasteful.

High quality presentation is key to attract and maintain audience interest.

Do not make false claims - worse, do not claim someone else’s work as yours!

Always cite and credit earlier work - not just in passing but with a high quality citation.

Follow ethical and professional guidelines rigorously.

Choose conferences and journals carefully.
Choose journal based on its acceptance in audience you wish to address.

Engineering papers in physics journals will be largely ignored—although ISI may give it high impact factor!

Let your paper enhance impact of journal—rather than expecting the reverse!

Some work may be more appropriate to large-circulation professional journals (e.g. CEP, Chemical Engineering rather than AIChEJ or Chem.Eng. Sci. if the work is of direct engineering interest!)
Presentations...

- Impact factor (IF) may not quantify actual usefulness or real engineering impact—more a measure of academic impact.
- Objective of engineering paper should not be to lead to another paper by someone else—either the work is incomplete or only of academic interest in such cases.
- No objective or quantitative way to measure real engineering impact e.g. in design or operation of processes and equipment.
Publish...

- Critical in academic life—must be done carefully
- Only results of archival value (not transient value) should be published
- Research in progress may be presented at conferences
- Study “good” papers carefully—identify why you think they are really “good” so that you can use them as models
- Be original but benefit from past experience of others
- Papers must be clear, concise and correct (3C’s!)
More on publishing

- Reviewers comments can help improve quality of presentation but also research itself.
- Third party, unbiased comments are useful-negative comments must be accepted professionally and should not be taken as personal attack!
- “To cite or not to cite..” is a difficult question to answer in a blanket form
- Ensure that appropriate credit is given to earlier work- do not just list reference but actually refer to it in text (review as well as results & discussion)- quality of citedness is important.

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Publishing...

- Do not focus on number of papers - it may measure extent of research but not its quality and impact.
- Measurement of impact is difficult and subjective.
- Invitations to write book/handbook chapters, give plenary and keynote addresses etc, membership of editorial boards, scientific committees of major conferences etc are some measures used commonly.
- Thesis is a public document of limited visibility - hence important to publish in journals.
- Remember the adage: Publish or perish!
Closing Remarks

- For academics the 5Ps are very important – what is given here is only a personal viewpoint based on experience in many parts of the world.
- Coverage is only superficial - much more can be said and done!
- Research by academics, in academia and for academics is just that - academic research (of little wider interest).
- Note every researcher is not effective as an academic - some better off working in industrial R&D instead.

**SO DO YOU REALLY WANT TO DO JUST ACADEMIC RESEARCH?**