Research Methodology

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Time and Effort Management

Ph.D Research as a Project

- PhD research is a special type of project, called an iterative project, where:
    - New tasks may be defined as a consequence of current findings
    - Some steps may have to be performed again if errors or incompleteness are detected
    - Some steps may have to be dropped as a consequence of current findings
- Iterative project requires that:
    - A project plan exists and
    - The plan is periodically revised

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- Project management is not only important for very lengthy, expensive and technically demanding projects like launching a satellite, it is also required for a PhD research project
- Most funding agencies require a project plan as a precondition and use such plan for monitoring
- Though project management is of central importance, few researchers have project management skills or even are aware of the project management principles

Project Management Terminology

- Project:
  - A sequence of activities designed to achieve a specific outcome within a defined budget and time limit
- Goals:
  - Describe what is to be achieved. (often qualitative, e.g. Get a Ph D degree)
- Objectives:
  - Provide a specific, measurable description of what is to be achieved
  - In research, objectives correspond to research questions
- Tasks/activities:
  - Units of work which constitutes the project, e.g. "prepare draft of thesis"

Project Management Terminology Contd.

- Deliverables:
  - Defined outputs/ product from the project
  - e.g. Final draft of the "Introduction" chapter
- Events:
  - A point of time when a tasks starts or finishes, also when external deadline happens
  - e.g. Final draft of the "Introduction" chapter submitted
- Dependencies
  - Tasks and deliverables have dependencies
  - Certain tasks cannot begin until another task is completed
  - E.g. unless you build the bubble column, apparatus you cannot perform an experiment in it

Project Management Terminology Contd.

- Schedule:
  - timing of a list of tasks to be performed (with begin and end times and dependencies)
- Milestone:
  - Defines a time point (event) when a series of related tasks are to be completed
- Deadlines
  - Defines a time point by when deliverables must be produced so as not to upset the schedule or due to external conditions
  - like last date of depositing fees

- Project plan
  - A written description of the work needed to complete the project, including a description of the tasks, organization and management of the project.
- Planning
  - Development of a detailed scheme (project plan) to attain the objectives of the project

"A person with an ideal (plan) may make thousand mistakes.
A person without an ideal (plan) would make twenty thousands"
(Swami Vivekananda)

Advantages of Planning

- A plan
  - tells what to do next
  - reduces the risk of overlooking something important
  - forewarns about the dependencies between activities
  - orders the activities so that the researcher would not have to tackle too many activities all at once
  - provides discipline and motivation by indicating targets or milestones
  - allows scrutiny whether milestones are feasible in the time available
  - if not, something needs to change (resources, delivery schedule, follow up external suppliers)

Advantages of Planning Contd.

- A plan
  - allows prioritization
  - prevents too much time from being spent on long, only vaguely relevant activities just because they are the most enjoyable
  - reduces anxiety by externalizing what has to be done so that it need not constantly occupying one's mind
  - provides a sense of security that one is on track
  - allows one to relax and to take a certain amount of time off with a clear conscience

Advantages of Planning Contd.

- A plan
    - provides a focus in discussion with supervisors and others
    - allows review of the plan based on new situation and findings
    - if you have a plan, you can modify it. If you have none, you never know what to do next.
    - helps to ensure that the required resources are available when needed.
    - provides a basis for reflection so that future planning can be more realistic

- Start the plan activity as early as possible
- Prepare your thesis proposal
- List the activities in paper and pencil
- For a PhD research project, the steps and tasks are fairly known in advance

- In the first list, the activities could be too generic. This is expected
- Against each activity, allocate the approximate time needed and also any special resources needed (equipment, data logger etc,)
- Fix the time period for each activity from 2 to 4 months (it will depend on the type of activity)
- For example, if it is literature survey, then 1 to 2 months are sufficient, however, if it is hypothesis testing period it might be 3 to 4 months long

- Draw a rough dependency diagram between tasks, again using paper, pencil and eraser
- Prepare a Gantt chart (coming next, preferred) or a network diagram (not preferred)
- Reorganize the Gantt chart to avoid too many overlapping activities
- Insert a date and take photocopies of the list and the chart. Paste these in your bound notebook
- Save the pencil copies for the next revision
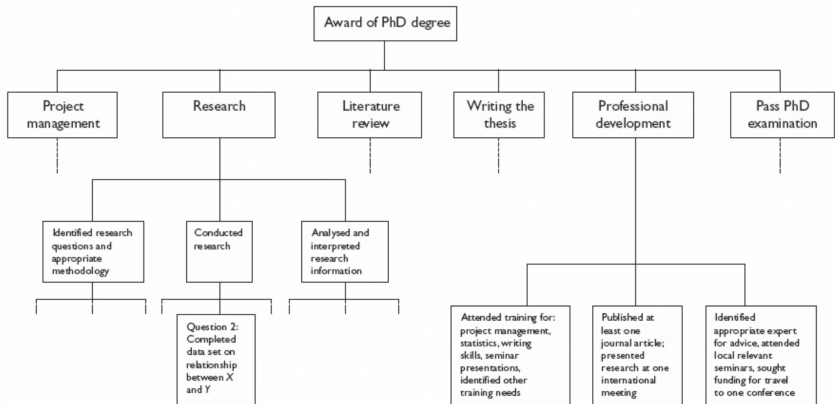
Example of a Goal-Task Breakdown

Figure:

Example of an Outline Plan for the First Year of a Doctoral Research Project

Table 3.3 Example of an outline plan for the first year of a doctoral research project

| Tasks	Oct–Dec	Jan–Feb	Mar–Apr	May–June	July–August	Sept–Oct
Meetings with supervisor	Discuss and clarify objectives of project	Discuss literature review and project outline and get feedback on selected research questions	Discuss experimental design and sampling methodology	Inform supervisor of progress of fieldwork	Inform supervisor of progress of fieldwork	Discuss detailed plans for year 2 and outline plan for year 3
Project planning	Clarify objectives of project	Submit project outline to supervisor; prepare project schedule for fieldwork season (Mar–Oct)	Plan experimental design of pilot experiments; refine experimental design and sampling protocols; assess health and safety issues; meet statistician to discuss experimental design; create record sheets and spreadsheet for raw data	Enter raw data from record sheets into spreadsheet; file record sheets	Enter raw data from record sheets into spreadsheet; file record sheets	Preliminary analyses of data; start detailed planning for year 2

Figure:

- A Gantt chart is a simple but effective tool for scheduling activities in a project
- It is a type of bar chart that illustrates the start and finish dates of the activities (tasks), which constitute a project
- It is fairly simple for standard projects like PhD research
- Some Gantt charts also show the dependency relationships between activities

Example of a Gantt. Chart
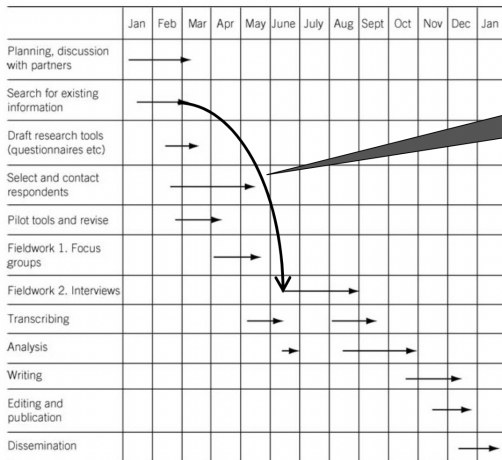
Figure:

No	Activity	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	5th Qtr	6th Qtr	7th Qtr	8th Qtr	Ext Agency
1.	Literature survey- Phase-1	■								
2.	Literature survey- Phase-2					■	■			
3.	Problem formulation and Bench mark selection (Transfer Alignment)	■								
4.	Algorithm development for TA with unscented transform approach		■							
5.	Dev. of TA algorithm with particle filter			■	■					
6.	Transfer alignment Numerical trial						■	■		
7.	Transfer alignment HILS trial							■	■	
8.	Bench mark problem selection (Target Tracking)	■	■							
9.	Glint Model Consolidation		■	■						
10.	Selection of best non-Kalman filter for tracking in glint noise removal				■	■				
11.	Selection of the optimal target maneuver detection algorithm					■	■			
12.	Development and numerical trial of on-board variants of particle filters							■	■	
13.	Final Report and Documentation								■	
	Project Review Meetings			1st			2nd		3rd	

Figure:

Pert Chart

- A PERT chart is a graphic representation of a project's schedule,
    - showing the sequence of tasks,
    - dependencies of tasks,
    - which tasks can be performed simultaneously.
- It also identifies the critical path of tasks that must be completed on time in order for the project to meet its completion deadline.
- The chart allows a team
    - to avoid unrealistic timetables and schedule expectations,
    - to help identify and shorten tasks that are bottlenecks, and
    - to focus attention on most critical tasks

Pert Chart Contd.

- Steps
    - Identify all tasks or project components.
    - Identify the first task that must be completed.
    - Identify any other tasks that can be started simultaneously with task #1.
    - Identify the next task that must be completed.
        - Select a task that must wait to begin until task #1(or a task that starts simultaneously with task #1) is completed. Place the appropriate box to the right of the box showing the preceding task.
    - Identify any other tasks that can be started simultaneously with task #2.
        - Align these tasks either above or below task #2 on the working surface

Pert Chart Contd.

- Continue this process until all component tasks are sequenced
- Identify task durations
- Duration of the time is usually considered to be a period of time, say two/three months, for the task, rather than actual number of hours/days spent doing the work
- Construct the PERT chart consists of the following
  - Number each task, draw connecting arrows, and add task characteristics such as duration, anticipated start date, and anticipated end date
  - Determine the critical path (optional)
  - The project's critical path includes those tasks that must be started or completed on time to avoid delays to the total project. Critical paths are typically displayed in red
  - Note: Most commercially available project management software will routinely generate a PERT chart.
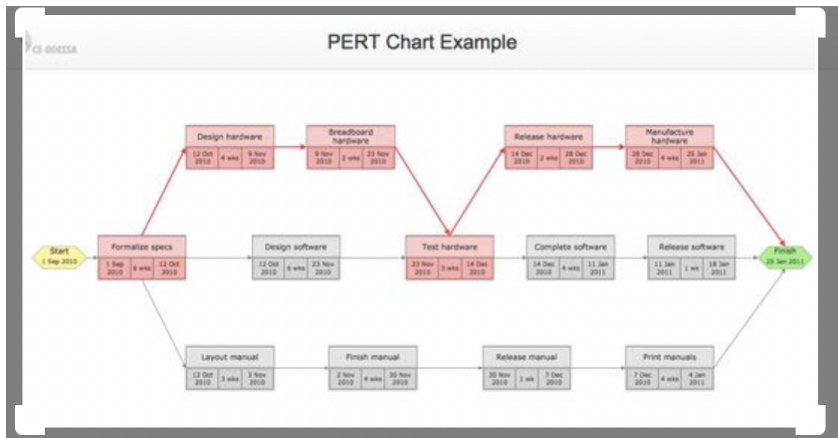
Pert Chart Example

Figure:

"Time wasted is existence, used is life."

- Time management concerns efficient allocation and utilization of time and thereby managing time on an hour to hour and day to day basis
- Time management is about managing time in a finer gain compared to project management
- If one follows an effective time management regimen, management of the PhD project becomes much easier

10 Principles of Time Management

1. Identifying long-term goals
2. Make medium-term plans
3. Developing a personal sense of time
4. Distinguishing between urgent and important
5. Planning the day; Make the best use of your best time
6. Keeping a to-do list
7. Apportioning time for meetings and seminars
8. Avoiding the time-wasters
9. Making use of committed time
10. Leveraging cooperation and delegation

Time Awareness

- Being time aware is the continuous realization that time goes on and the lost time cannot not be recovered
- Though it borders philosophy, time awareness is an effective method and motivational factor in preventing wastage of time
  - Time is a non-replenishable commodity
  - Time awareness is a sure cure for lethargy, procrastination and blues

"Everyone knows that time is limited, but only a few are aware of that fact"

Hazrat Uwais, a Sahabi (a term designating Companion of Prophet Hazarat Muhammad)

- There are a few simple exercises to be time aware:
  - Noting time frequently
  - Keeping a time log

- Makes one more aware of the passing time
- Use your watch or mobile to aware you about every hour by setting an alarm
- After a few days, you would be able to count 1 hour in your mind more accurately
- Then set it for every half an hour and
- Finally do it for every 15 minutes

- Keeping a time log for a few weeks helps to create
    - A personal awareness of time
    - The log entry should be created for every hour of awake time and describe the type of work done for the past hour (15 minutes granularity is adequate)
    - Apart from time awareness, this auditing would also reveal the time we spend in actual productive work
    - There is often a gap between what we think we would do and what we are actually doing

- Being time aware helps to discard useless activities
- The goal should help you decide what is useful what is not
- For successful utilization of time you need to distinguish between **Urgent and Important**
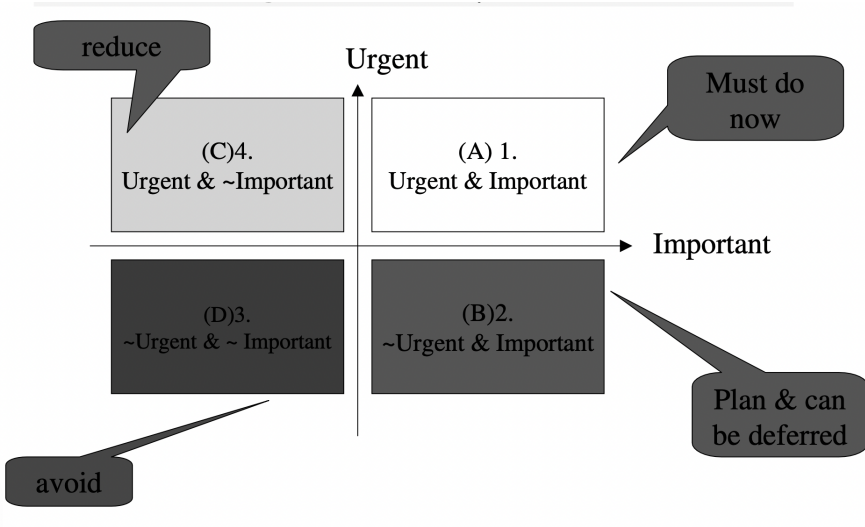
Figure:

Urgent Vs. Important Contd.

- Tasks, however small, should be classified as to whether these are important or not and also whether these are urgent or not urgent
- Mapping a task in the urgent-important plane helps to prioritize
- Tasks which are both urgent and important would have the highest priority

- Tasks which are not urgent but important would have to be performed eventually
- These can be deferred only if demanded by the quadrant-1 tasks. These would have to be rescheduled then
- Quadrant-2 tasks cannot be postponed beyond a certain time, as these would become urgent
- Tasks which are neither urgent nor important should be avoided without any mercy

Urgent Vs. Important

- Most troublesome tasks are quadrant-4 tasks, which are urgent but not important
- Examples are;
    - renewal of a magazine subscription which has a deadline for a small discount
    - end of "SALE" in the supermarket
- Many quadrant-4 tasks, originates from other persons
- Not much effort should be allocated to these tasks
- Try using the following poster

"Your lack of planning does not constitute an emergency for me"

POSEC Method

- POSEC is an acronym for Prioritize by Organizing, Streamlining, Economizing and Contributing
    1. Prioritize - Define your time and life by goals
    2. Organizing - Things you have to accomplish regularly to be successful (Family and Finances)
    3. Streamlining - Things you may not like to do, but must do (Keeping Note in Class, finishing a paper)
    4. Economizing - Things you should do or may even like to do, but they're not pressingly urgent. (Pastimes and Socializing)
    5. Contributing - By paying attention to the few remaining things that make a difference. (Social Obligations)

- Planning for a day requires a "to-do list". This list should be updated everyday, preferable at the end of working day
- In a day planner, tick the items to be done on the next day (a subset of to-do) against time of the day
- The day planner is very similar to the to-do list, unlike the to-do list which is entered rather randomly, the day planner is entered sequentially

- Apart from professional items, also enter time slots for thinking (appointment with self), social, entertainment, prayer (if applicable), lunch, date (if applicable) etc.
- After each hour, tick-off the items completed in the to-do registe
- Keep at least one difficult (but important) task early in the morning
- Schedule pleasant tasks at the end of day
- Quantify the tasks if possible
- For example, browse 17 papers :-))

- Planning also helps to allocate tasks to suit your bio-rhythm
- Planning must be executed with best effort
- To eliminate type-C and Type-D tasks, some tact may be required
- One has to learn to say no, otherwise priorities of others may take up lot of productive time
- The practice of time management should enable the aspirant to enrich professionally so as to contribute more to society and to others, in a planned manner but not by terms dictated by others

- Some researchers favour Keeping 'regular hours' rather than work flexitime
- Keeping a fixed routine helps in many respects
- More free time to enjoy
- Attending to family and kids
- Regular hours need not mean (10am to 5pm)$\times$5 . It can be odd hours too! (from 11 pm?? :-)))
- Unless there are some non-avoidable reasons, the routine should not be broken
- Adhering to a daily plan and a to-do list saves a lot of time

Best Use of the Biorhythm

- Efficiency of carrying out different tasks varies with the time of the day
- More generic patterns are as follows
  1. Manual dexterity – the speed and co-ordination with which one performs complicated tasks with the hands – peaks during the afternoon
  2. Most of us seem to reach our peak of alertness around noon
  3. Short-term memory is best in the morning – in fact, about 15% more efficient than at any other time of a day
  4. We tend to do best on cognitive tasks – things that require the juggling of words and figures in one's head – during the morning
- Biorhythm of individual varies from person to person
- It would be a good idea to know ones own biorhythm
- From the general trend and individual types, it is possible to prepare a very effective daily schedule

The Pareto Principle

- It is a common experience that 80% of tasks can be completed in 20% of the disposable time
- This is called Pareto or "80-20" Principle
- When the principle is accepted, one should seek to identify these 80% tasks which apparently are easier tasks
- The rest 20% must then be relatively difficult

The Pareto Principle Contd.

- Depending on the personal working styles (and also biorhythm) the tasks can be scheduled
- Many of us would attempt the easier 80% first and not do the real tough ones at all
- To prevent this undesirable situation, some tough tasks must be scheduled when the productivity and intellect are at the peak level

Review Your Daily Achievements

- It is worthwhile to review the performance of daily schedules, at least weekly
- Try the following questions for self assesement
  1. Are you trying to accomplish too much in a day?
  2. Did some tasks not get done because you were not ready at that time to do them?
  3. Was the item or task clearly formulated?
  4. Did you find it difficult to make decisions?
  5. Did you have all the available information?
  6. Had you neglected to plan sufficiently for the day because you were feeling under pressure?
  7. Did you abandon a task because it was too difficult or too boring?
  8. Did you follow best use of the best time?

- Time flies when you are at the computer and on the 'net'
- Of course you need the computer and the internet for
    - Literature search
    - Drafting paper
    - Running program etc.
- You must not spend unnecessary time at the PC
- Spending too much time looking at the monitor and sitting in the same position are harmful for your health too

Classic Time Wasters

- Net Surfing without an agenda
  - decide in advance what precisely you are going to use the web for, and stick to it
  - You may allow yourself a specific small amount of surfing as a treat or a break from work
- Web Chatting
- Spending too much time in Social Networking sites
- Downloading some software which you might not use at all
- Downloading as you wish to download
- Playing on-line games
- Meticulously creating a 'PowerPoint' animation which is not needed

Things to Keep in Mind

- The only time you should multi-task is while you are waiting for an experiment such as an incubation step. People are much more productive when concentrating on one task at a time
- Make time for a break. Research has shown that you are less productive when you work long hours. The increase in stress and exhaustion not only slows you down; it leads to errors, accidents, and ill-health. Any of these factors could cost you extra time and decrease your productivity in the long run

- Avoid aggravation during group meetings and maintain a positive environment at work. This can certainly improve productivity
- Make time for meals. Deficiency of essential nutrients can have a deleterious effect on memory and cognitive ability

- Plan your day according to your most productive times. If you are a morning person, schedule tasks that require more concentration early in the day. Create a to-do list in accordance with your plan

- Assign a fixed time during the day to deal with interruptions such as emails, phone calls, instant messages, and social media rather than allowing them to interrupt you throughout the day. You could waste up to half an hour of your time regaining your focus after you have been disturbed

- Always keep something to read with you. A reading task can be done while waiting on a bus or in a queue
- Needlessly postponing unpleasant tasks just delays completing them
- May use a project management software to help you organize and keep control of all your tasks
- Lack of self-discipline is a serious impediment. Stick to the plan
- Schedule an extra 50% of the time as a buffer when you schedule time for a task