Developing a research topic

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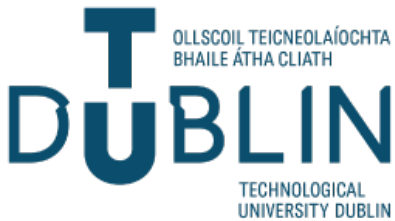
ADAPT, The global centre of excellence for digital content and media innovation
AIRC, The Applied Intelligence Research Center
D-Real, SFI center for research training in digitally-enhanced reality
CeADAR, EI Ireland's centre for applied Artificial Intelligence
ML-Labs, SFI center for research training in machine learning



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The six honest serving-men

This concept is widely used in research and the basis is to **question everything**.

- **What** do you want to know?
- **How** do you find out what you want to know?
- **Where** can you get the information?
- **Who** do you need to ask?
- **When** does your research need to be done?
- **Why?** (Getting the answer)

Where ideas come from

Finding an idea can follow two approaches:

- **Top-down idea generation: identify a specialised area of interest**.
  Start from a general domain of interest and narrow down to a specific area
- **Bottom-up idea elaboration: developing a research area.**
  Start form many small interesting problems and select one you want to investigate in depth

Top-down: Internal ways to identify areas of research

- Talk to other grads in your lab/class
- Get demonstrations of what they and others are doing
- Experiment with any SW/tool built by others in your group so you get your hands dirty in the area

Top-down: External ways to identify areas of research

- Read lots - conferences, journals, etc. You don't have to read every article
- Scan abstracts and browse those articles that seem more interesting
- Bookmark the articles for later review
- Copy the abstract (binder of file) for later review
- Attend a key conference in your area if you can
- As above, experiment with any SW that is built by other research groups (or from Internet)

Top-down: Deciding on an area of research

- Talk to your lecturers first. Some have specialised areas of interests and focused projects in mind that they will want you to work on. Others may be willing to consider projects outside their direct interest. Work with ten on this.
- It should be personally exciting and interesting to you. You will be working on this for a considerable amount of time.
- It should be rich in scope
- It should be topical i.e., something of relevance
- It should be related to your lecturer's experiences so he/she can guide you to key papers/researchers/etc.

Top-down: Research selected area

Research the area to gain exposure to it. In particular, collect all interesting material you find. This means:

- keeping copies of good articles
- maintain a list of references of selected articles as a bibliography
- better yet, create an annotated bibliography where you briefly note what is interesting about them
- keep a folder/sketchbook where you can collect ideas or snippets related to this area
- maintain a list of links to interesting web sites

Bottom-up: identification of problem area

At some point, you will find one or more specialised sub-area that snag your attention. You can now begin to go bottom up.

- Start with several very small but interesting problems. Your lecturers will likely be more than happy to give you one if you want.
- This problem does not have to be your thesis, nor does it have to be ‘big enough’ for a thesis. However, it should be rich enough in scope that it could be expanded to a thesis-sized problem.

Bottom-up: starting problems

A good starting problem can be:

- something you can learn from
- something interesting enough that it could become a publication on its own, or fit within a larger publication as a sub-topic or example
- something that adds to your knowledge, or the group's knowledge, or the world's knowledge
- a case study and/or example of something that arose from prior research
- a replication of something that someone else did (although the replication should add value, e.g., by varying something, by critiquing it, or by validating that the original 'thing' is correct)

Bottom-up: early success on problem

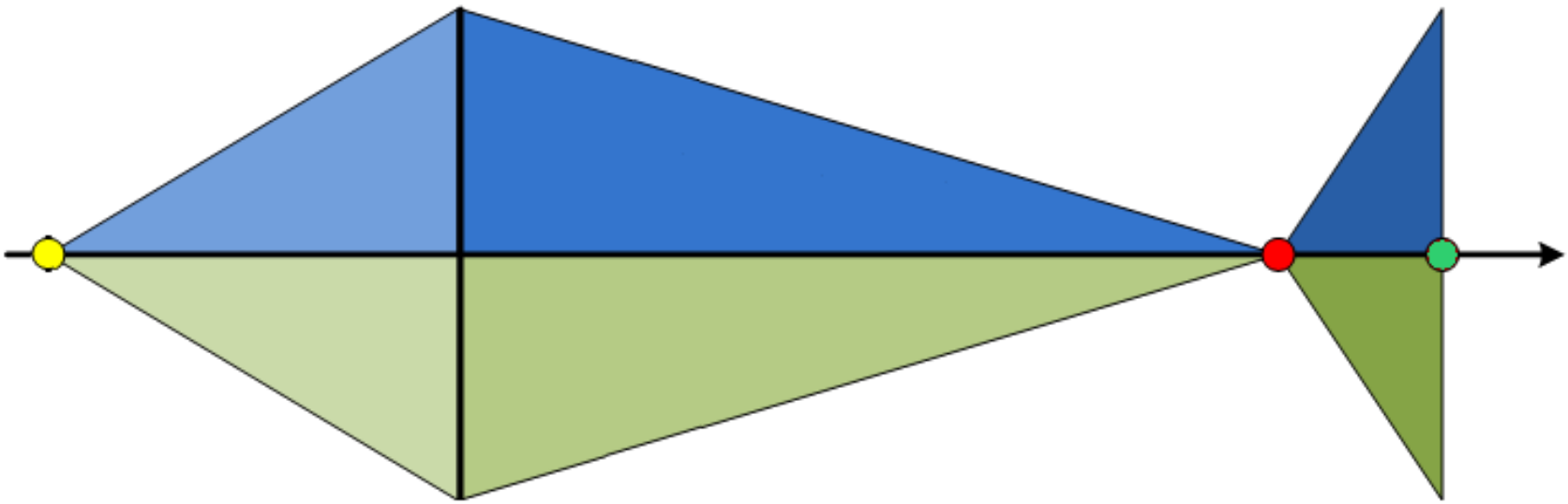
- Work on this problem until you gain some early successes and you understand it
- Good problems raise many questions/issues
- Start listing these problems in a sketchbook
- These questions and issues almost always expand the small problem into something more suitable for a thesis

Bottom-up: state/rephrase the problem

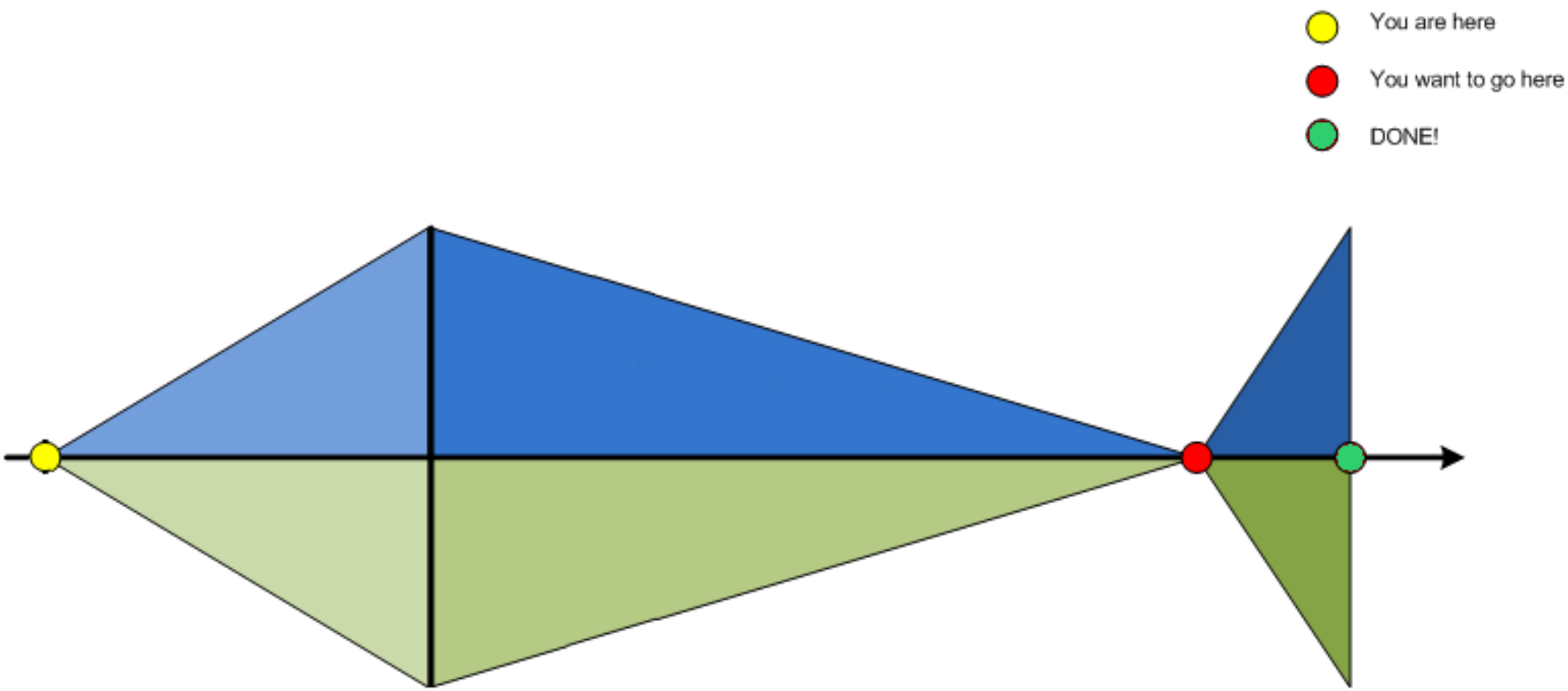
Try to rephrase the problem as:

- the general problem
- a set of very specific sub-problems
- goals (that you want to solve the problem)
- methods (how you would go about solving the problems)
- evaluation (how can you prove you solved the problems)
- contributions (what would you offer if you actually solved it?)

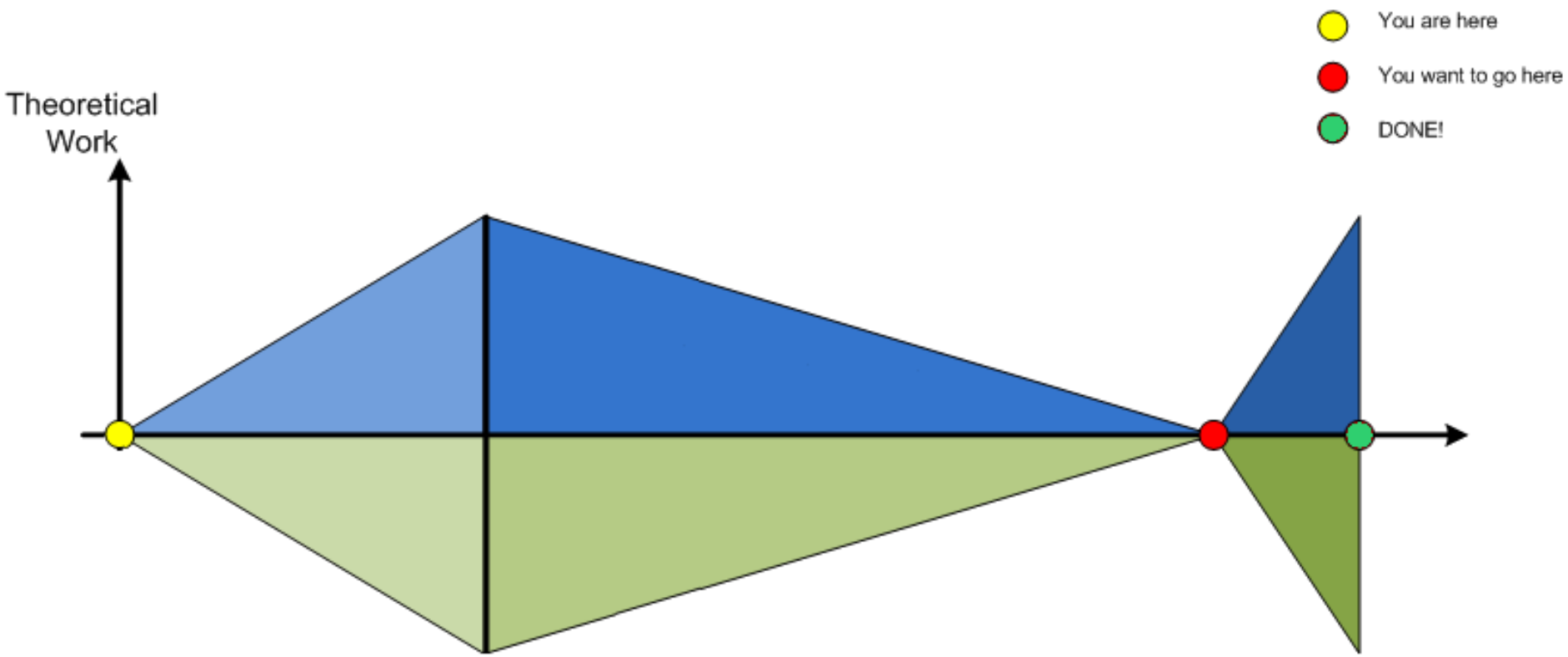
Planning research - the fish model



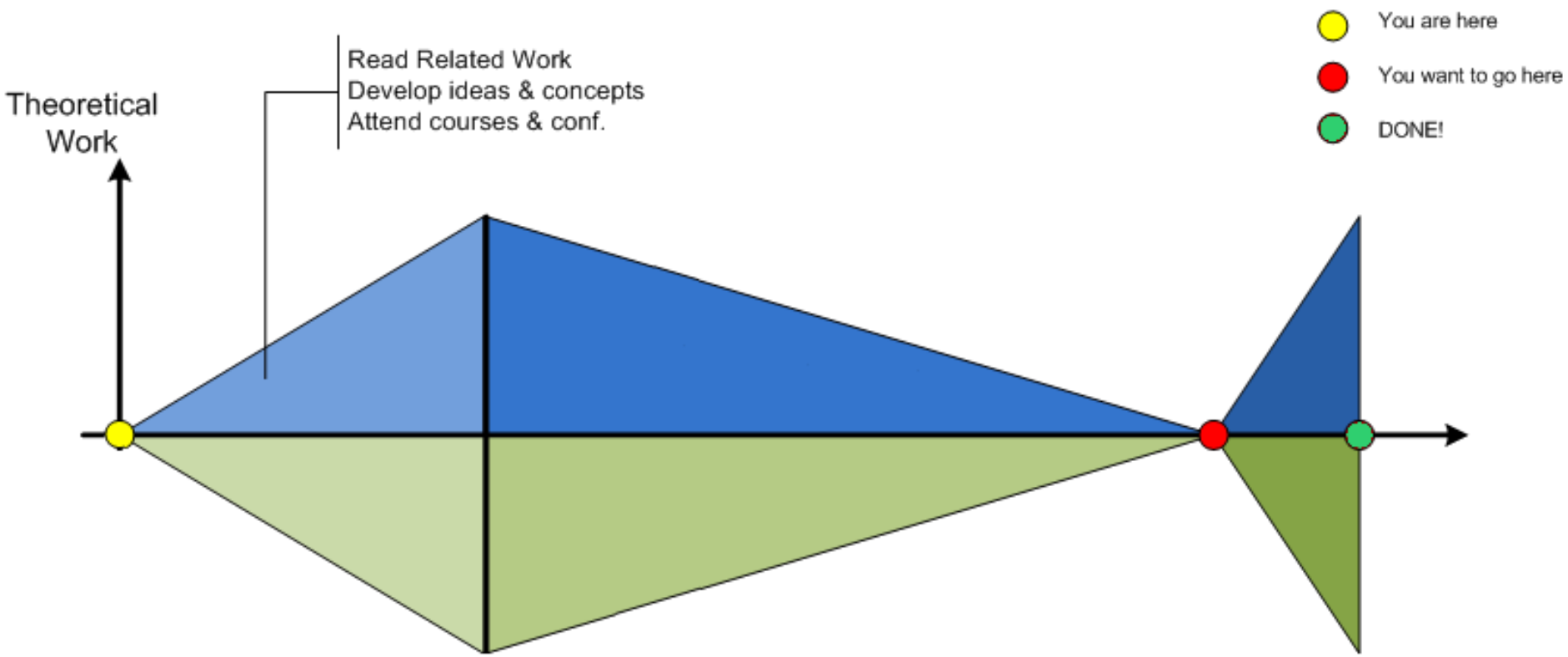
Planning research - the fish model - goal



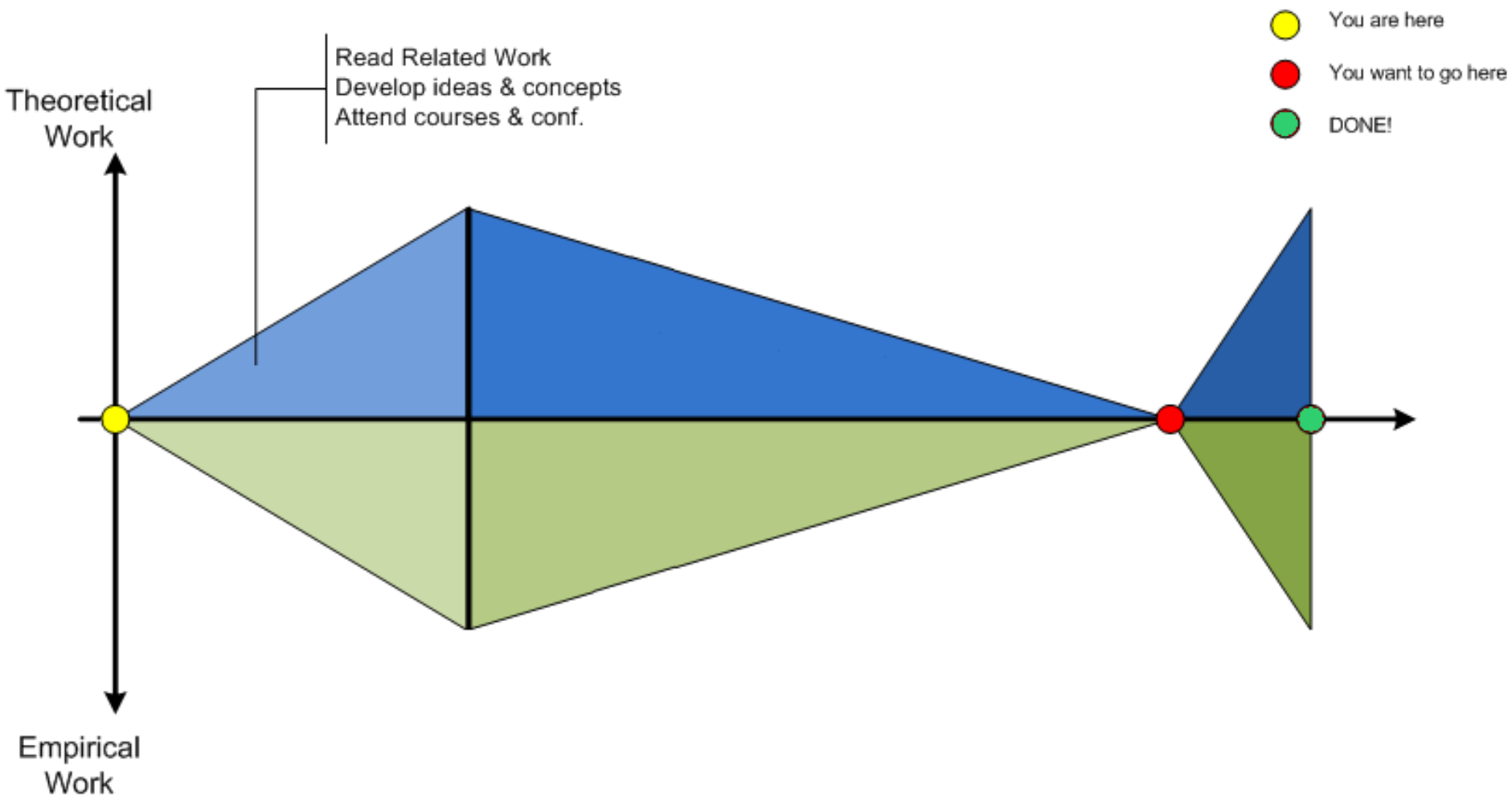
Planning research - the fish model - theoretical work



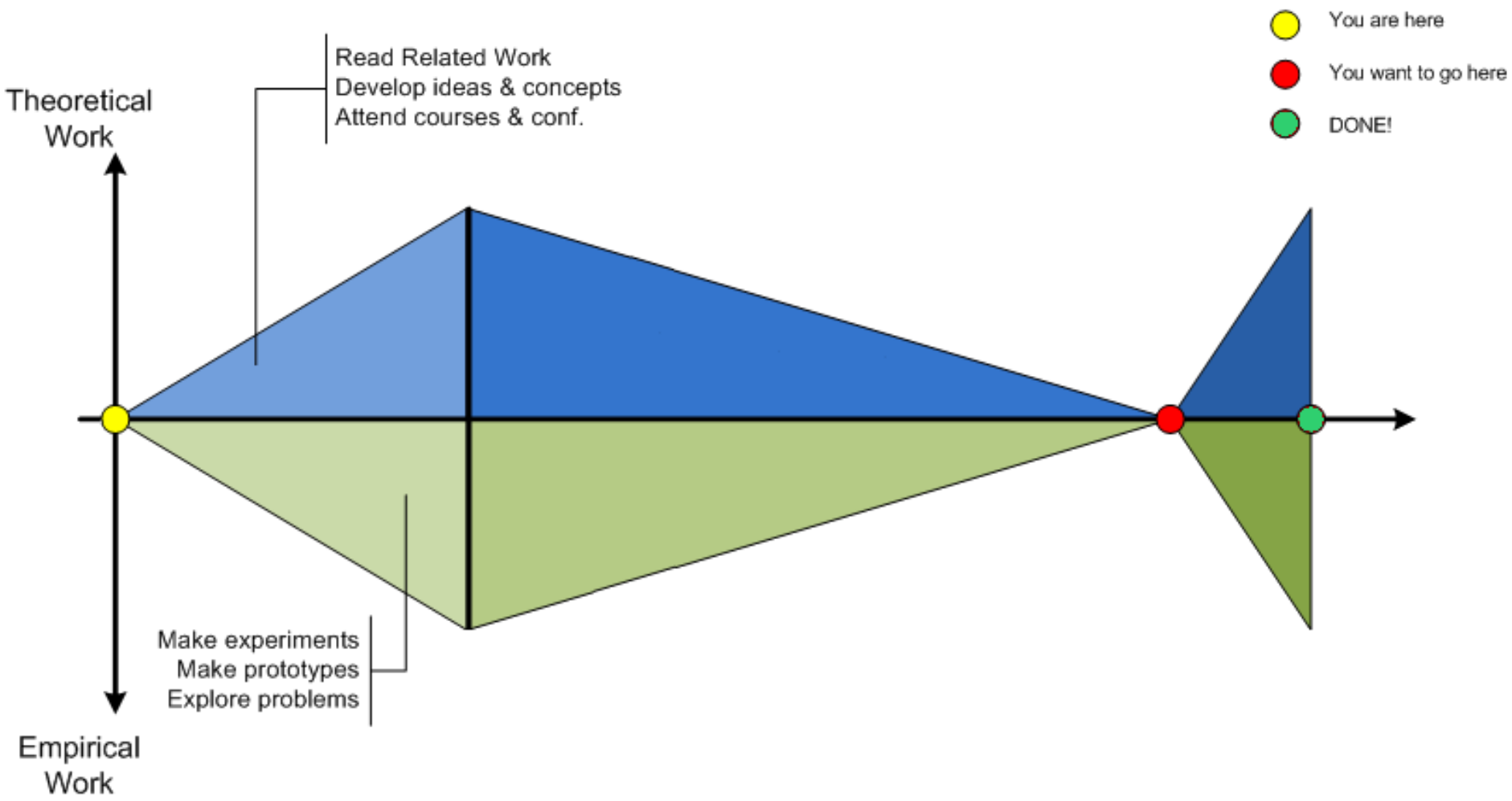
Planning research - the fish model - idea formation



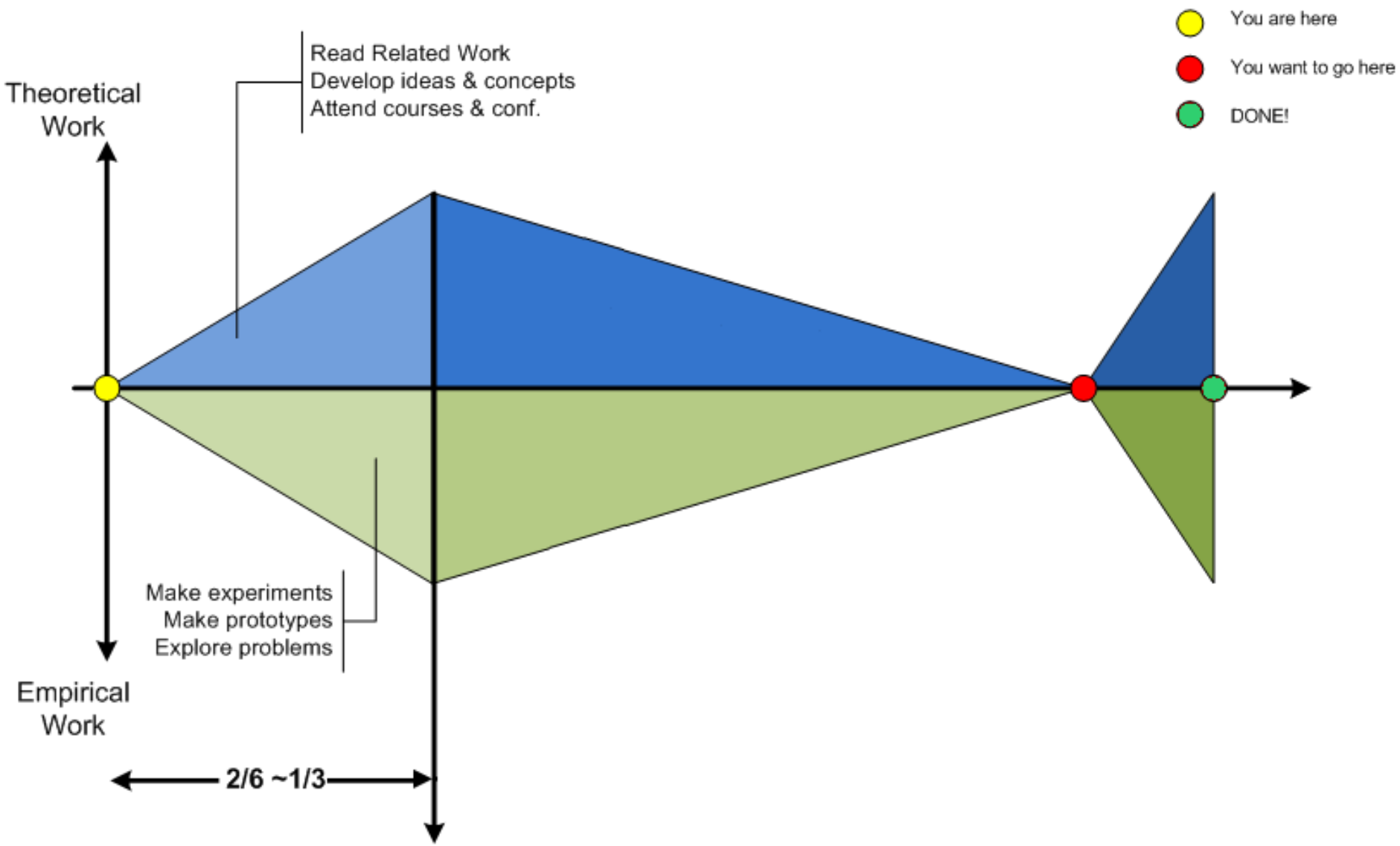
Planning research - the fish model - empirical work



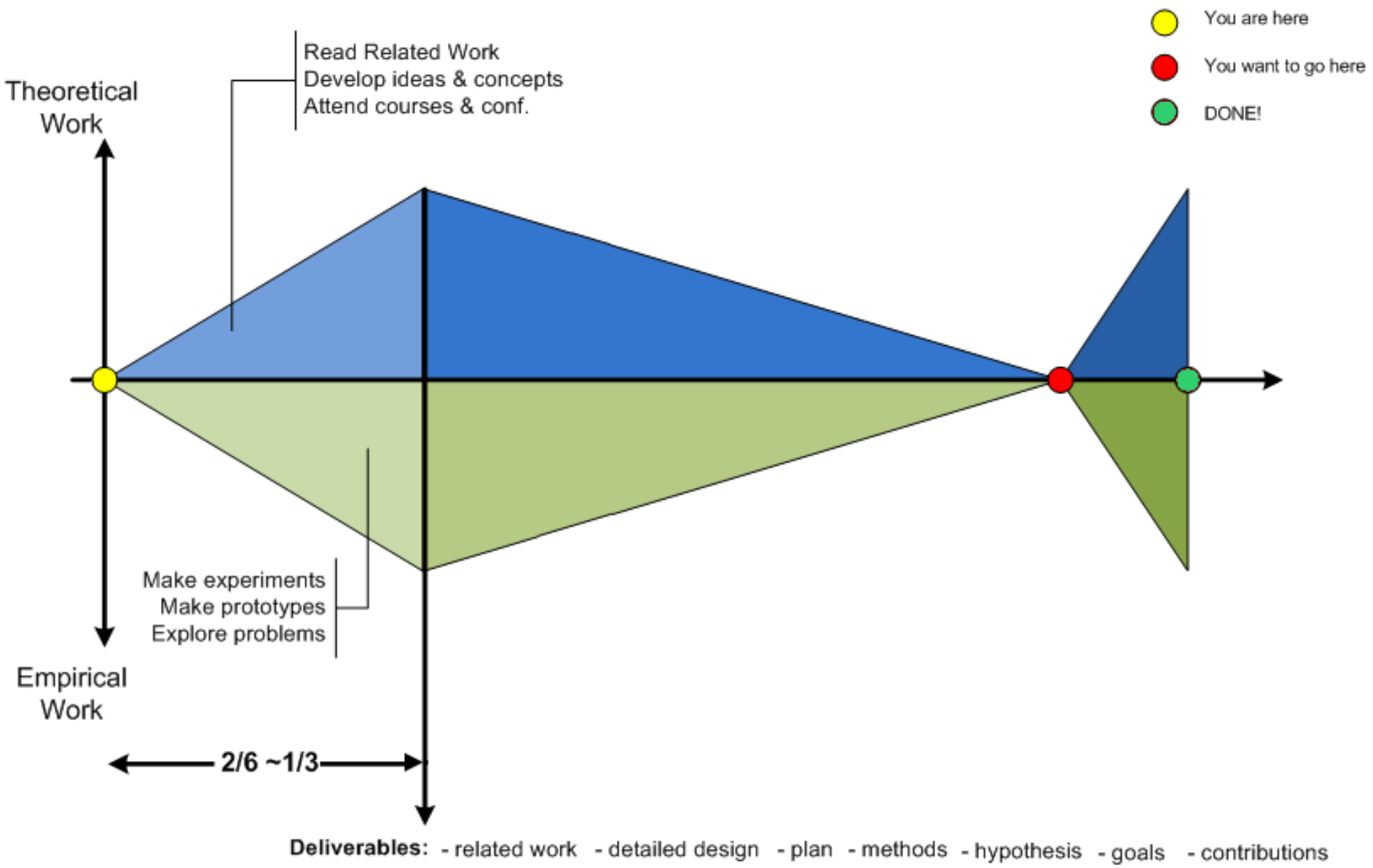
Planning research - the fish model - experimentations



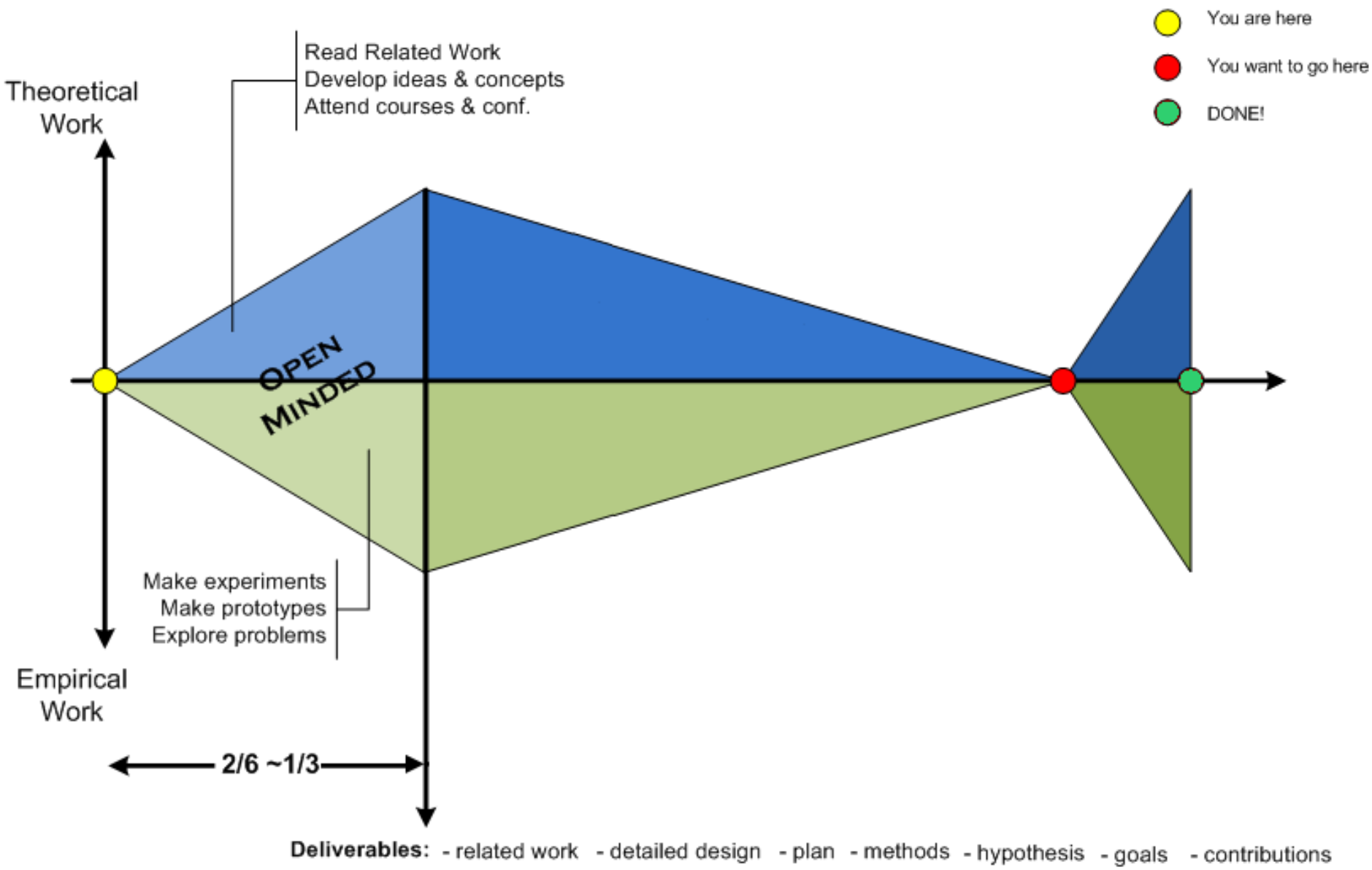
Planning research - the fish model - 33% on timeline



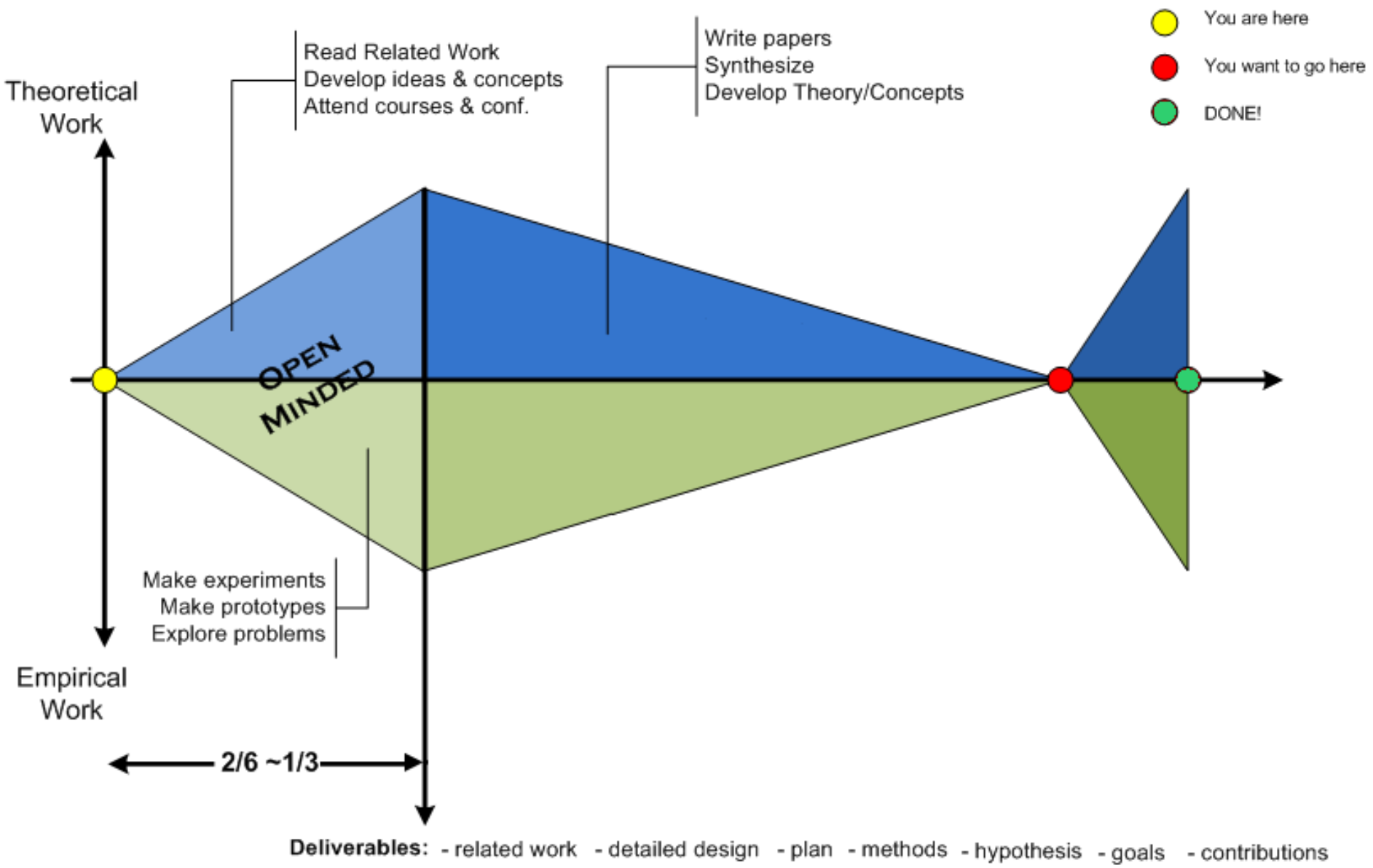
Planning research - the fish model - first deliverables



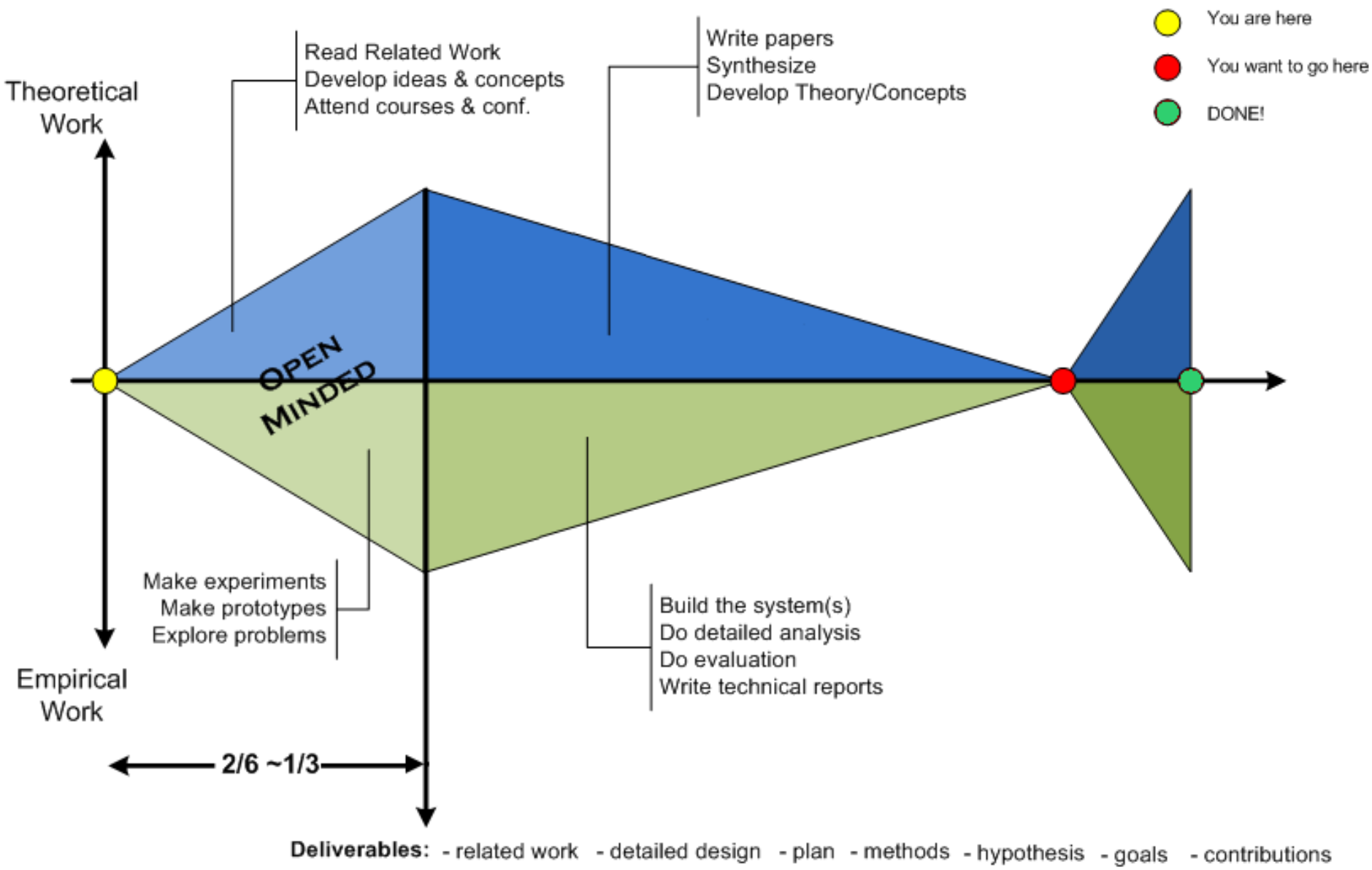
Planning research - the fish model - 33% open minded work



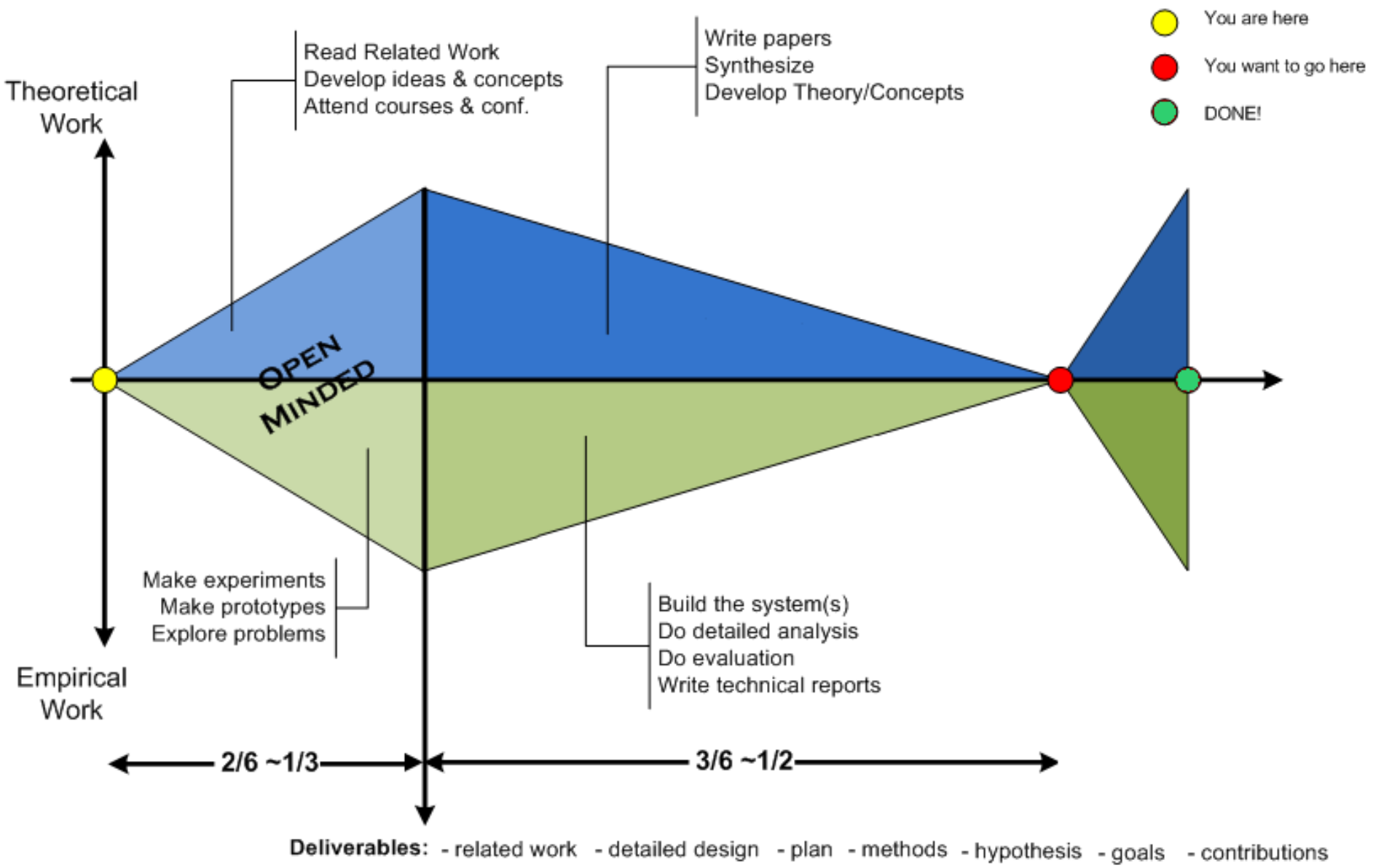
Planning research - the fish model - synthesis



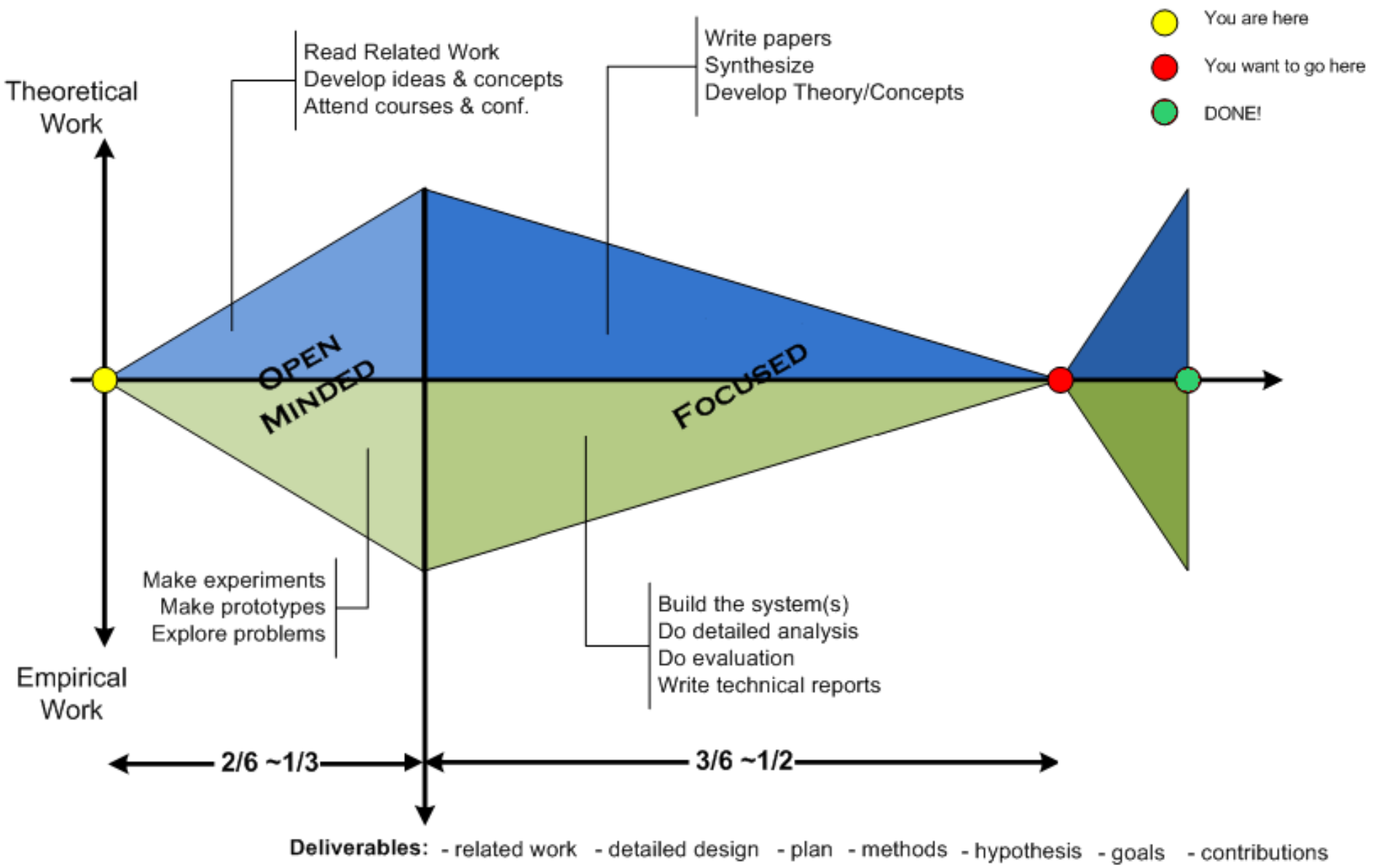
Planning research - the fish model - development



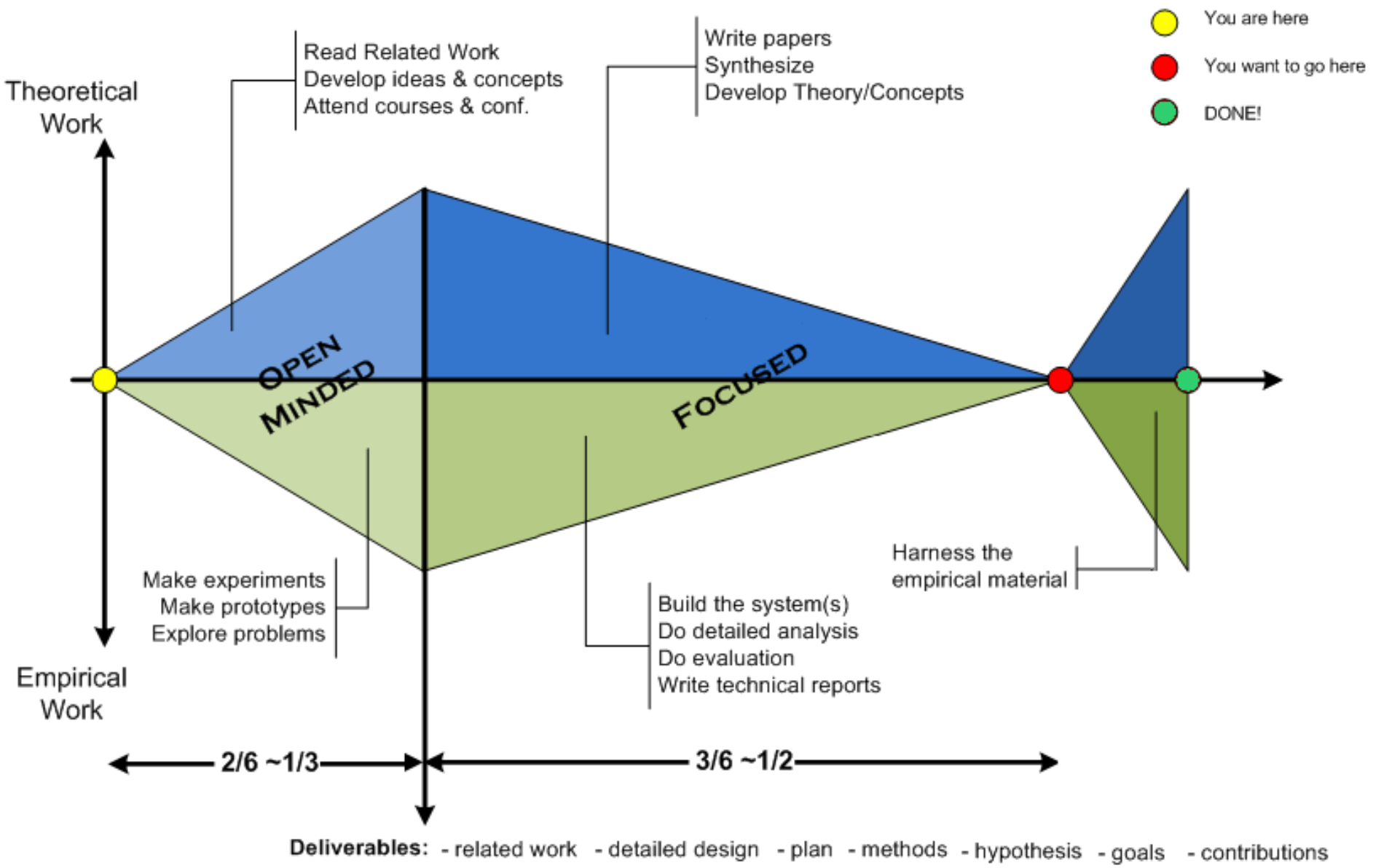
Planning research - the fish model - 50% on timeline



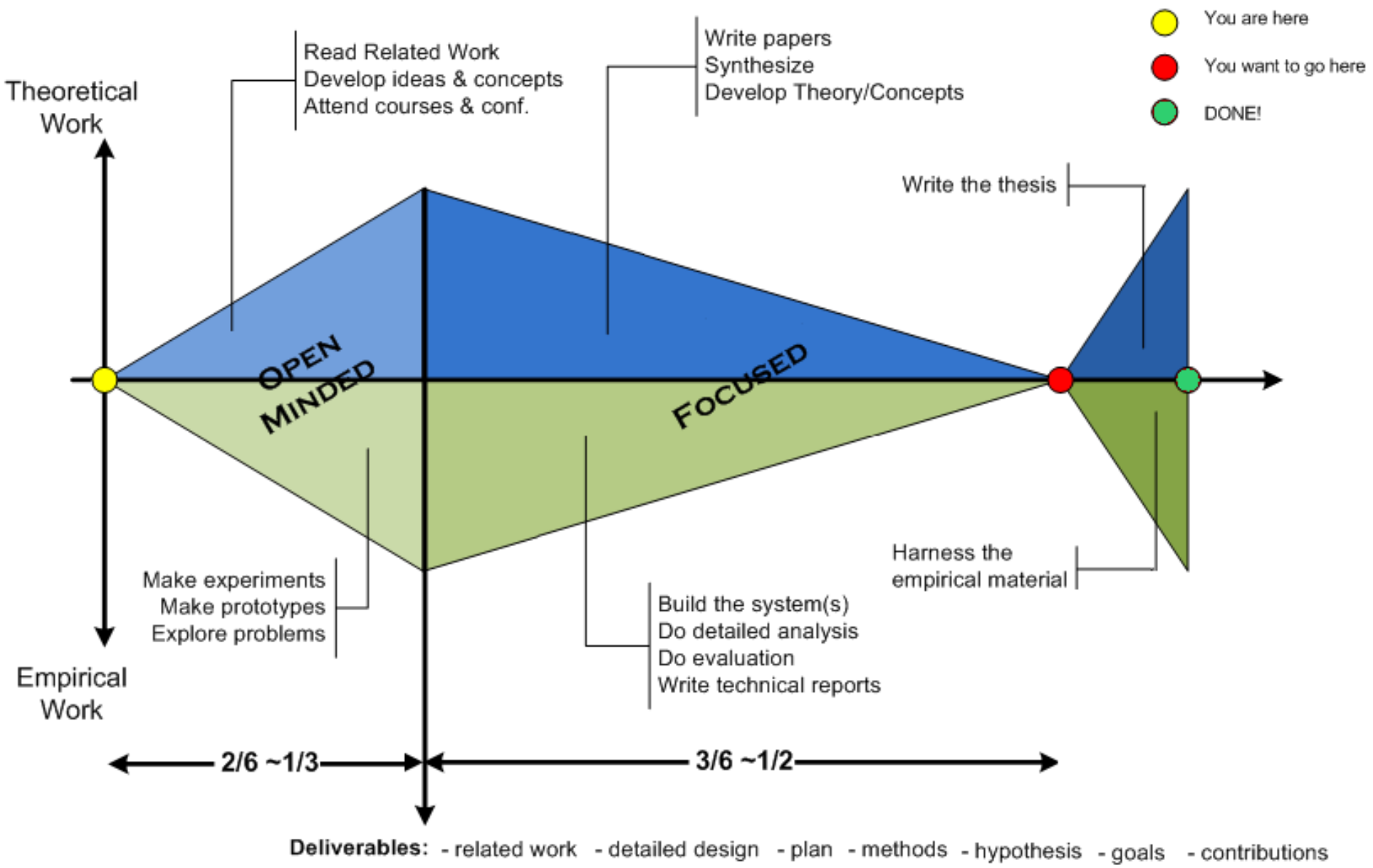
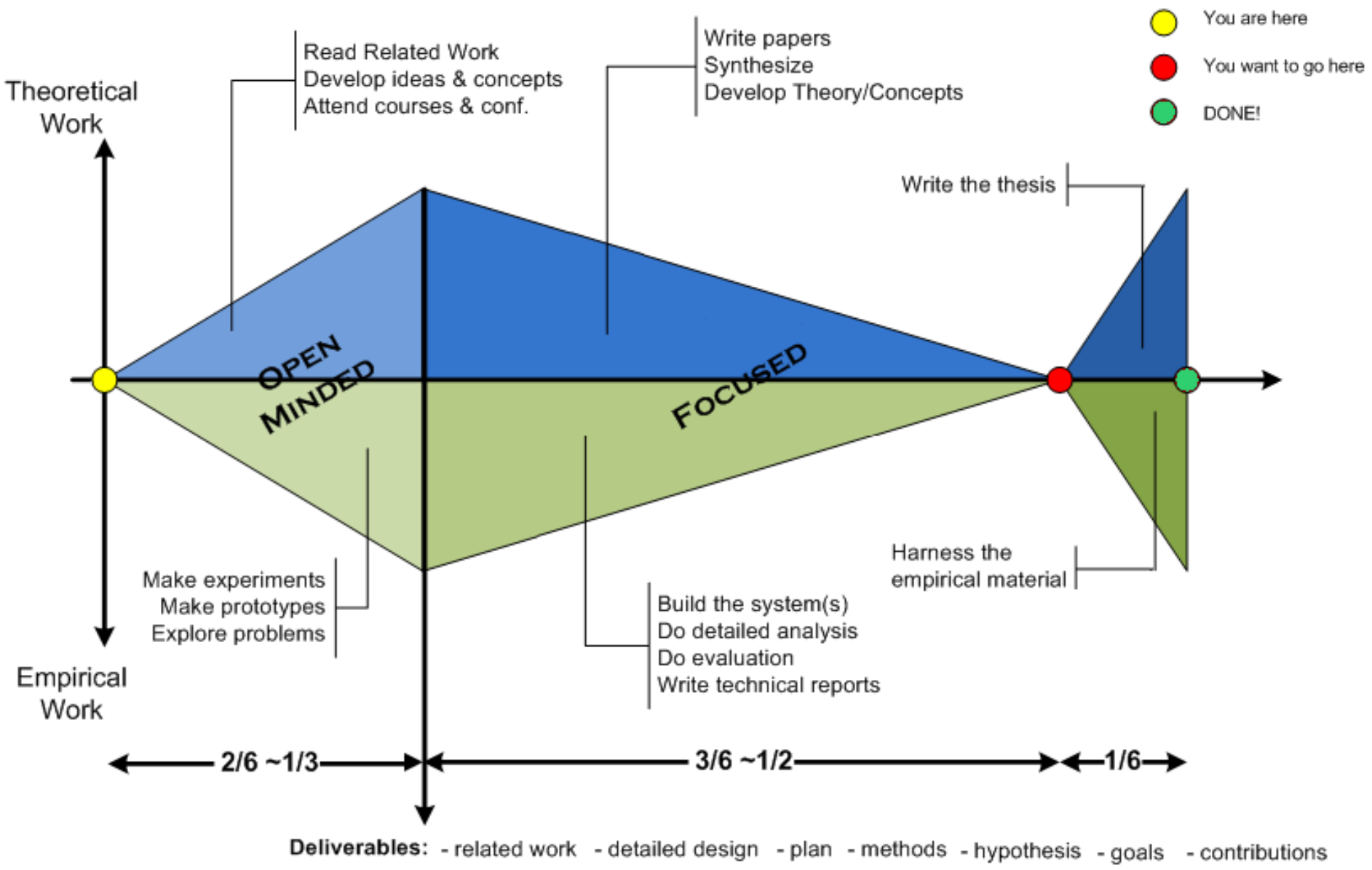
Planning research - the fish model - 50% of focused work



Planning research - the fish model - harnessing of material



Planning research - the fish model - thesis write up



Planning research - the fish model - 16.6% on timeline