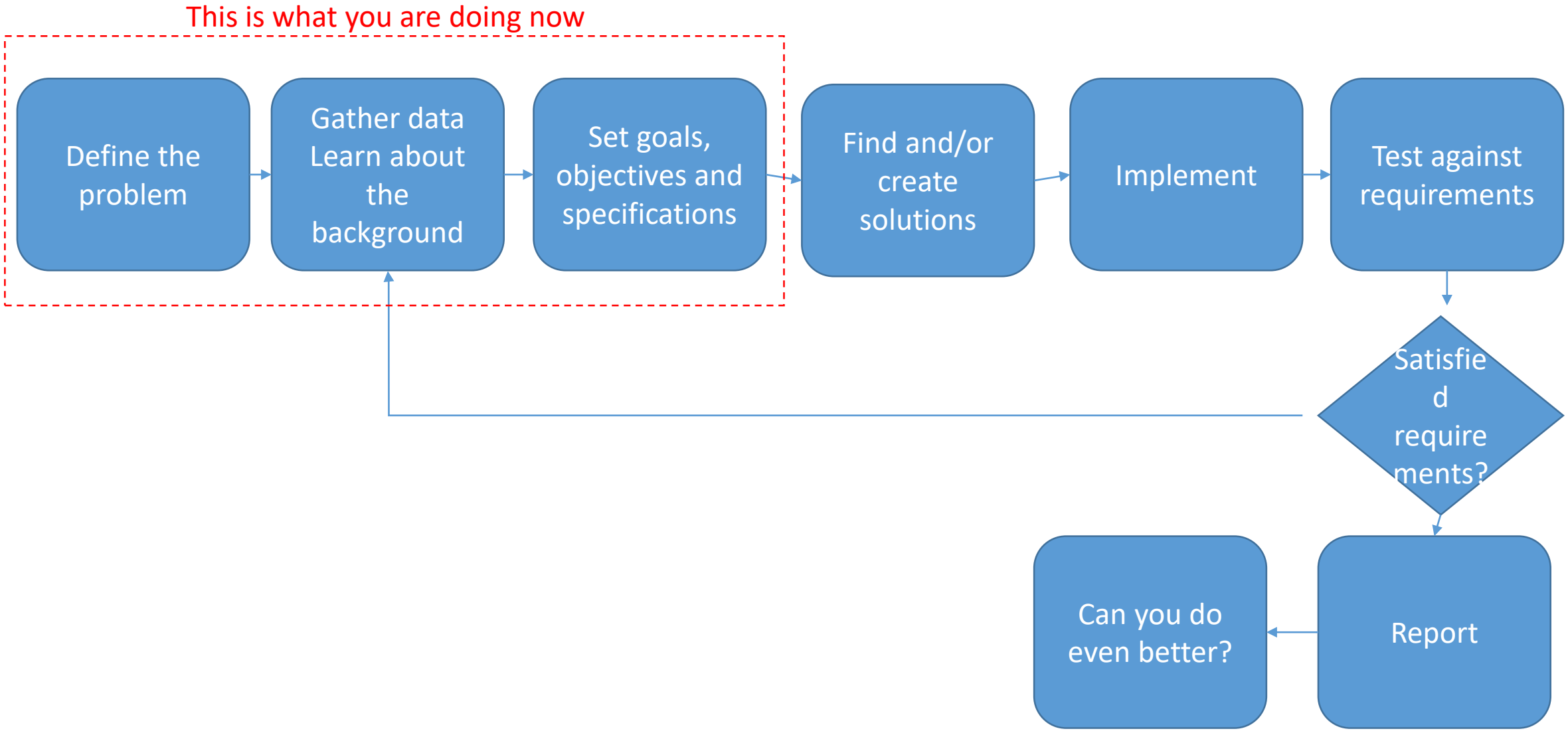
Final Year Projects lecture 2

Setting objectives

Planning

Background research

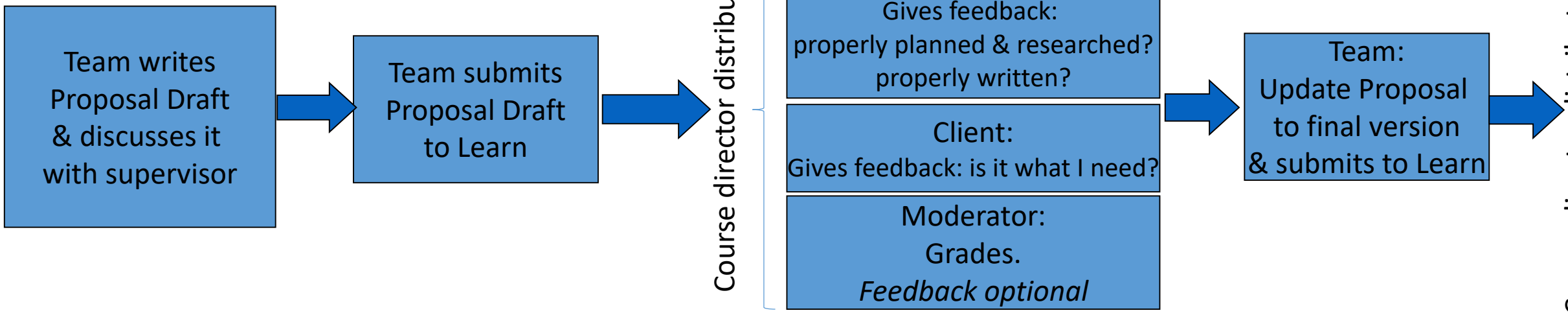
Problem solving cycle



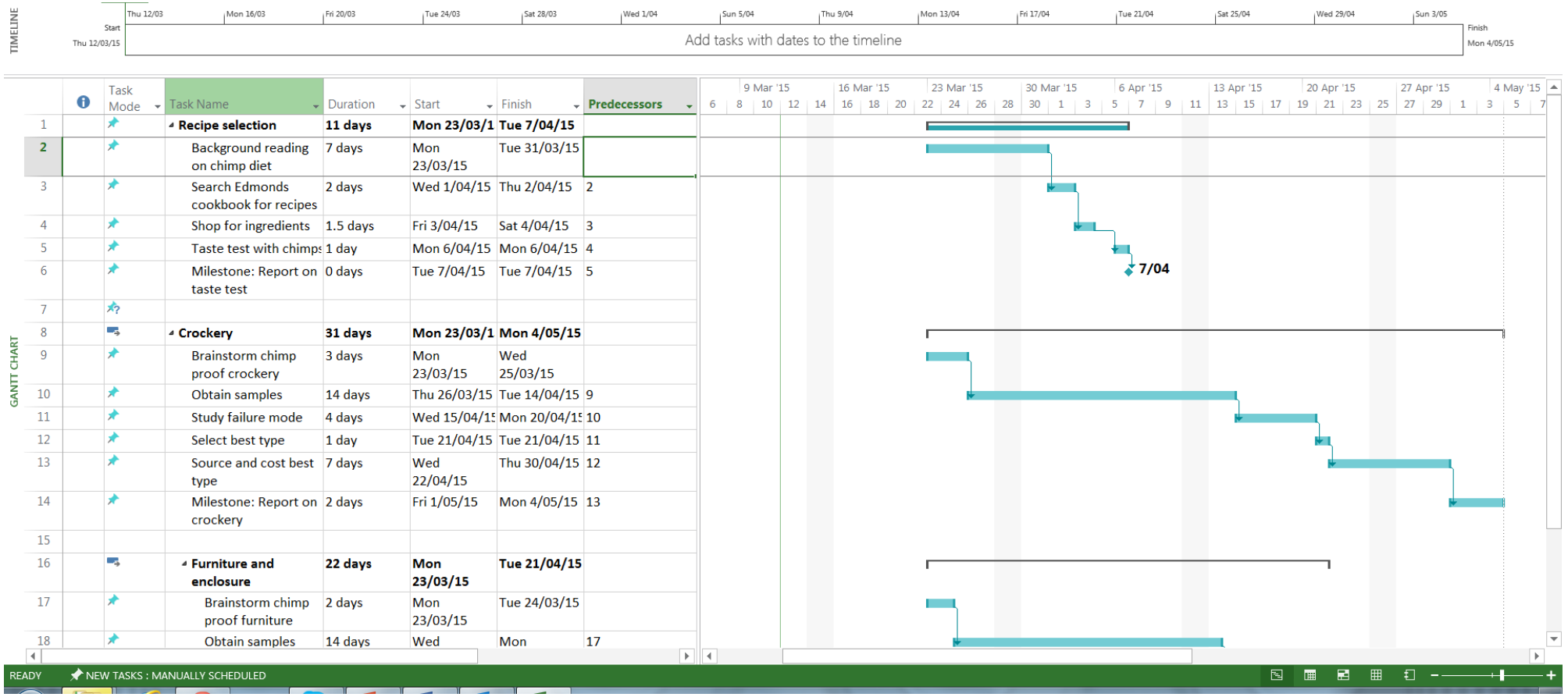
Writing the project proposal

- Executive summary (< 1 page)
- Introduction (Background to problems, background research and literature review)
- Purpose Statement (1 paragraph)
- Scope and deliverables
- Requirements and Specifications
- Work streams
- Risks
- Resources
- Financial/Budget
- Project plan (Gantt chart)
- Any other material you see necessary

Draft due 19th March
More information and Advice on Learn



Gantt chart: *contains all tasks, start and end dates, relationships with other tasks, and milestones*



You can’t start making the Gantt chart straight away: you need to work out the structure of the project first: Goal, Objectives, Tasks

Why compile a proposal?

Projects fail because the team:

- Starts late, or moves slowly.
  - Pro tip: Everything takes longer than you think.
- Spend too much time trying to implement ideas that won't work
  - Confused or wrong idea about what you should try to achieve
  - Initial ideas not good enough
  - Try to do too much and miss what really *needs* to be done; making it too complicated
  - Find out problems too late
- Make the wrong decisions
  - How do you find out if it's wrong, while there is still time to try something else?
- Make key decisions too late
  - Too little time to implement the decision
  - Too little time to obtain parts or make items
    - What if your suppliers are late?
- Pick people with the wrong skills for particular tasks
- Waste time in internal conflict
- Loses the trust of essential people
- Technical reasons (insurmountable obstacle, beaten to market)
  - HOWEVER you can always bypass an obstacle or recover from a competitor's actions

Projects turn out mediocre when:

- not ambitious enough; not enough stretch
- not enough quality time put into it

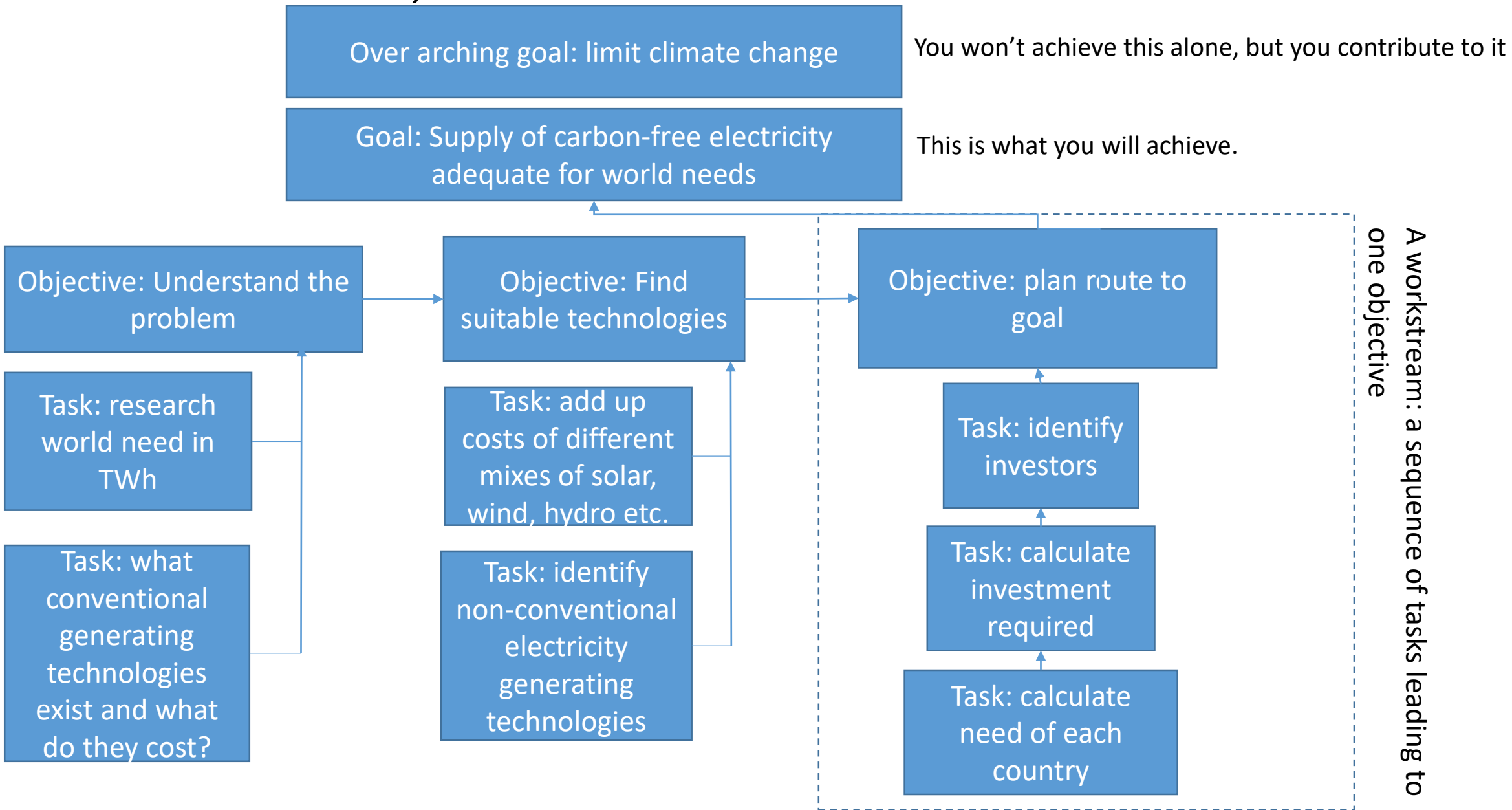
Most of these can be avoided with proper forward thinking (planning):

Defining the essential problem clearly
Breaking it down into pieces you can manage
Building & testing ideas early & crudely:
Fail fast

The proposal is a key step in good planning.

The rest can be avoided with good teamwork and individual responsibility.

One goal, several objectives and many tasks
organized in a hierarchy



Purpose statement: summarises objectives

First: Develop a clear sense of PURPOSE

- What will your team accomplish?
- What will be the benefit? To whom?
- What will exist in October that does not exist now?
  - Why?
  - How?
- How will you know when you have achieved that purpose?

Procedure:

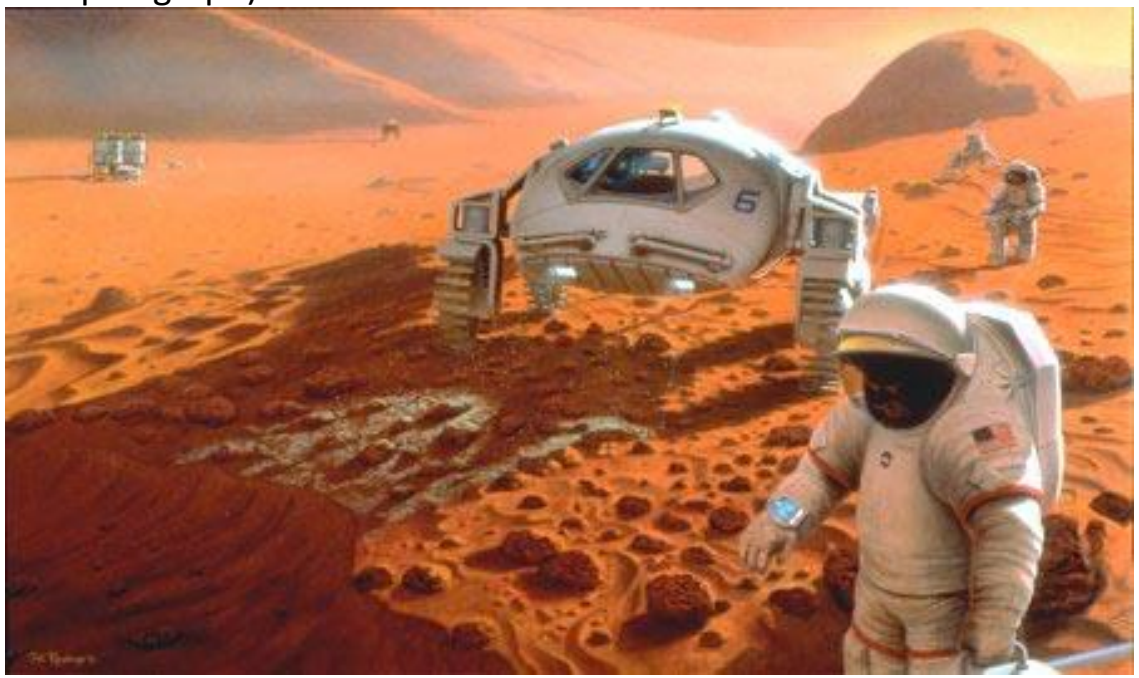
- Listen to the Client. The more ears the better.
- With your Supervisor and Technician, discuss what the Client's NEED is, and what you can offer that will add VALUE. Not everything the Client wants can necessarily be provided.
- The team discuss the different ideas, and accept some STRETCH taking you out of your comfort zone.
- Express this as a PURPOSE statement

Outcome: Purpose Statement

- Also called “Mission” or “Vision” (but these are not really the same)
- Answers these questions with technical accuracy:
  - What are we going to do? “The team will…
  - Why or for whom? “…the purpose of the project is…”
  - Give quantitative aims if you can “it will cost less than $1000 to manufacture”

- Uses positive language “we will….”
  - Is clear and concise
  - Specific about <u>what</u> you will achieve, without limiting you as to <u>how</u>

- Task: By next Thursday morning email your team’s PURPOSE statement (a brief concise paragraph) to the Course Director.
  - One email per team
  - Subject of email “E/Mxx Purpose Statement”
  - To Richard Lane for E projects
  - To Mark Jermy for M projects



Examples from previous projects

“The Centre Pivot Team will conduct research and provide a solution to the problem of irrigators toppling over in high winds.”

“The purpose of the project is to analyse plant data from the Ngatamariki Power Station to gain insight on the process of mineral scaling and its effects on heat exchanger effectiveness, plant efficiency and power output. Detailed plant models will be created to analyse the plant data and quantify the effects of mineral scaling. A maintenance schedule defining the cleaning process and frequency will be recommended based on the results of the data analysis and will take into account the economic factors of a plant shutdown.”

Examples

"Our aim is to continue developing the prototype XXXX robot, bringing it to a functional status for field trials.“

'The purpose of this project is to design and build a prototype for a device to recover the
lees from the bottom of a wine tank, without requiring human access into the tank.'

“The purpose of the project is to represent both the University of Canterbury and New Zealand at the Shell Eco-Marathon competition in March 2017 and to create publicity opportunities for UC and Shell NZ. This will be achieved by the design and manufacture of an energy efficient electric vehicle. The solution must be a realistic car that people would want to drive and also must demonstrate good design.“

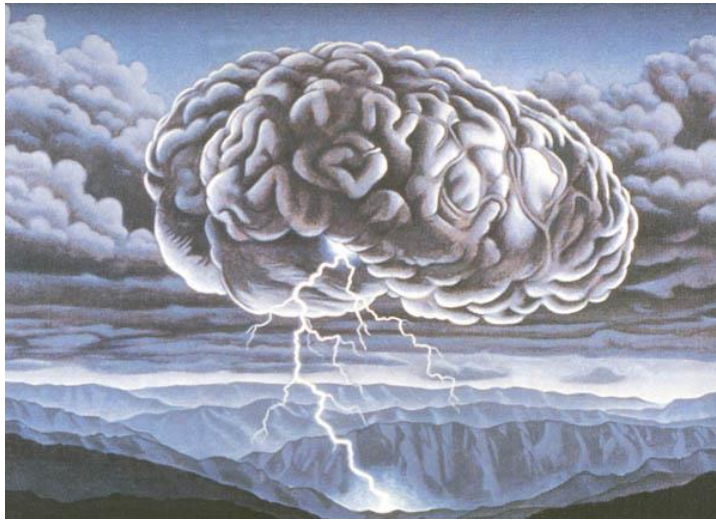
Examples

The purpose of this project is to design and build an auto-sampler suitable for integration with existing Company XXXX devices. This is done as an alternative to current auto-samplers on the market, which are typically costly and expensive to transport. Additionally, through the production of such a system the cheaper alternative will become attractive to a larger market. Currently, Company XXXX devices need to be manually fed. Through the use of this system, less labour will be required for this simple task. At the end of the project a working prototype will be developed, tested and validated.

“The team will provide a vortex generator solution to improve the annual energy production of the XXXX turbine. This will be achieved through prototype testing in the University wind tunnel and Computational Fluid Dynamics modelling. The team will deliver guidelines for the optimal shape of the vortex generators and their optimal layout on the wind turbine blade.”

The objective is to design a means to increase the value of an (animal product) in a continuous production environment. The solution must be taken to the prototype stage and be capable of producing a repeatable output while accepting input size variability between carcasses. The solution needs to be economically viable to effectively replace current means that achieve the same output. Manufacturing of the solution must fit within the production capability of XXX Sponsor’s current facilities and will not require new production methods or equipment.

A method for generating ideas: Brainstorming



- Everyone puts ideas forward with minimal explanation
- Recorded *without comment or criticism* by others
  - Whiteboard, Post-It notes on the wall
- Be brief, not wordy. Use as few words as possible to convey meaning.
- Go for quantity
- Withhold criticism
- Welcome wild ideas
- Combine and improve ideas
- Set a time limit (5 mins)

- Evaluate: but keep a record of every idea
- Discuss and do background research
- Repeat

Using different perspectives

- What is the problem or opportunity presented by the sponsor?
- Use different ways of looking at the project to generate new ideas
  - Problem=negative: opportunity=positive
  - Different viewpoints: both valuable
  - Deliberately shift your viewpoint to generate more ideas

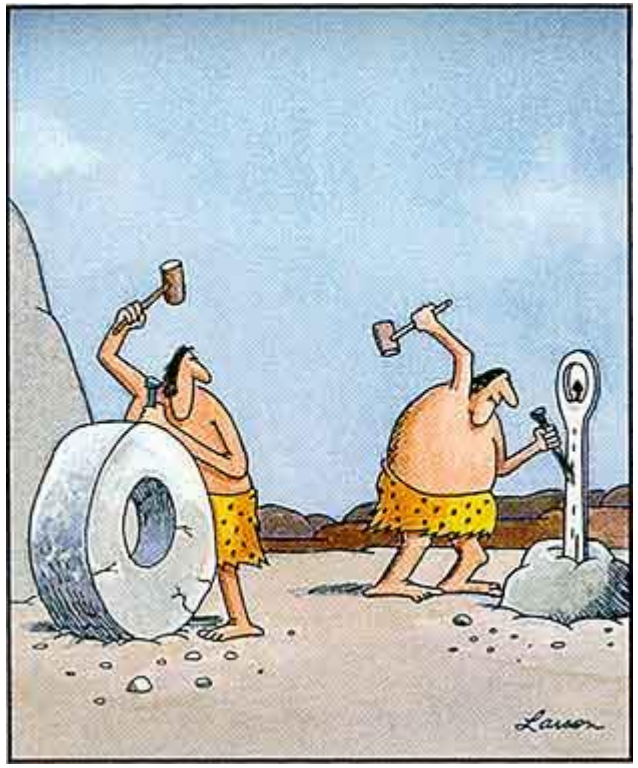
Positive and Negative

- Try expressing your problem/opportunity as a negative
- Try expressing the barriers as a positive

These are ways of shifting your viewpoint to create ideas

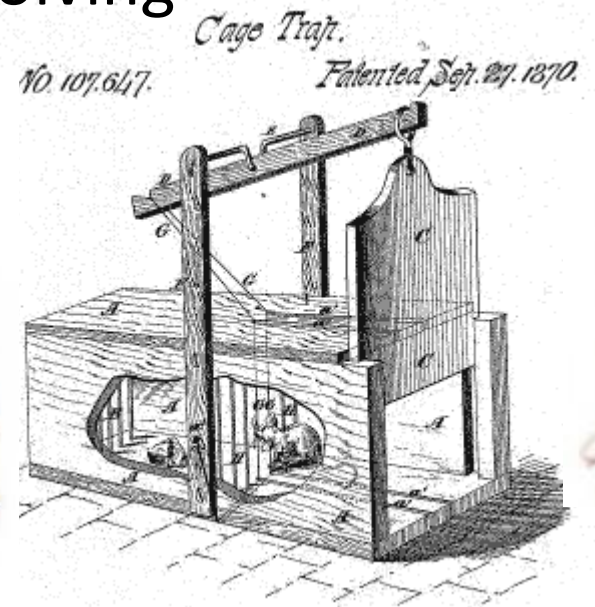
Complete this Sentence:

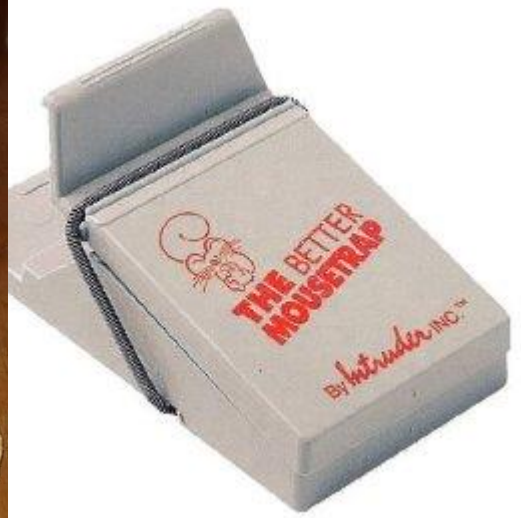
- What we would really like to do is…
- If we could break the laws of reality, we would try…
- If I could change the time it takes to do one operation…
- If we could invent a machine or system to…
- When we are finished, it will….



Related Solutions

- Has your “October Outcome” ever existed before?
- Can you think of anything else that is like what you want to do?
- YES ➔ Closed-Ended, Analytical Problem Solving
- NO ➔ Open-Ended, Creative Methods of Problem Solving





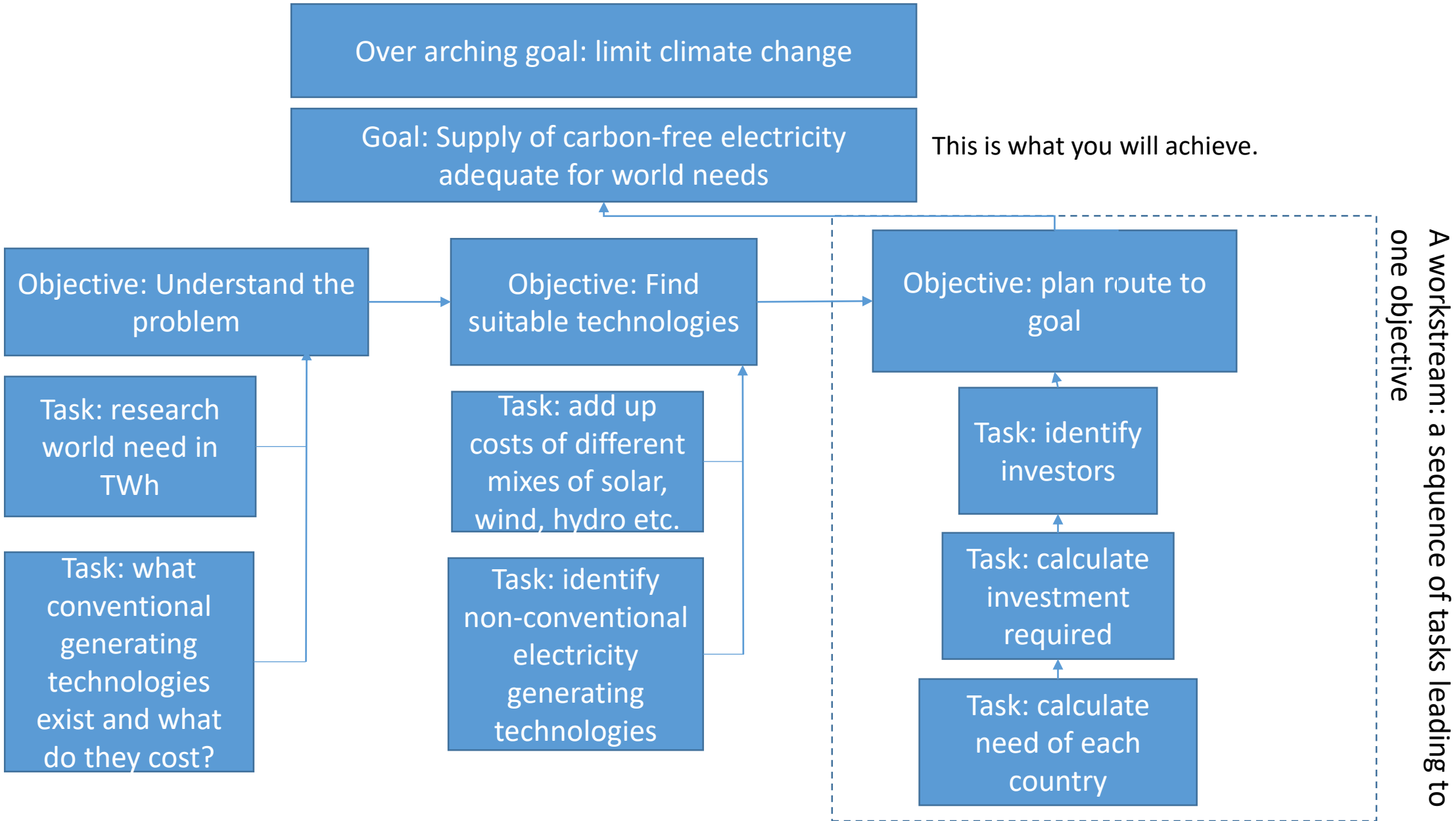
Look into the future

- Instead of thinking about how to start, think about where you will end
- When the project is finished, what will be the outcome?
- What are the obstacles that might keep you from achieving this outcome?

Think about the methods you could use or the solutions you can try

Think broadly- allow many possibilities- narrow it down later

Now write your objectives and tasks



It’s much easier if you’ve seen one already

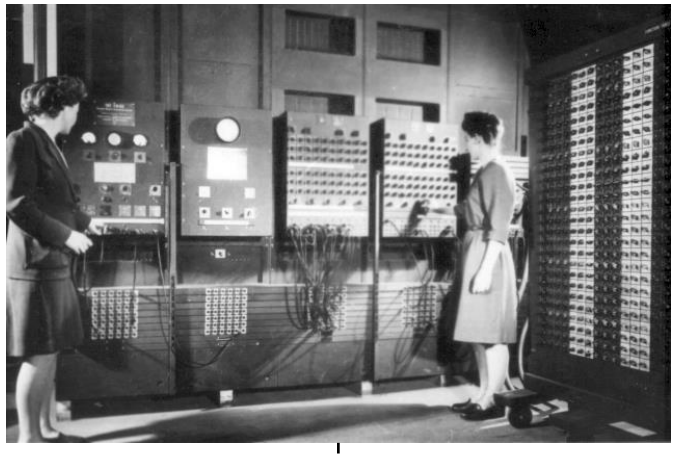
Australopithecus made **simple stone tools** at least 2.6 million years ago in Ethiopia.

Olduvai handaxe
Lower Palaeolithic, ~1.2 million years old, Olduvai Gorge, Tanzania
The cutting edge of technology for 2 million years

Why did it take so long to get from this

To this?

Homo erectus started making **stone-tipped spears** at least 500,000 years ago in South Africa. Within 100,000 years, everyone was making them.



Yet only 70 years for this?

To develop technology rapidly, you need to know what’s already been done: this is *background research*

Background research: finding information

Ask

- Client: ask good questions
- Staff
- Vendors
- People you know (beware of confidentiality)

We live in an information age: the problem is not finding information but finding *relevant* information (filtering).
You may have to cycle through this a few times as your ideas come clearer.

Read

- Wikipedia - technologies, products: 5 min expert
- You Tube – shows How
- Google:
  - Client's company: products, size, markets
  - Competitors
  - Technologies used
- UC Library:
  - Books
  - Interloans
  - Subject Librarian Dave Lane
- Patent offices- start with the US (is what you want to do already protected?) http://www.uspto.gov/

- What is the state of the art?
- What has been tried?
- Who else is looking into this?
- What is the context? – needs, problems, competitors, costs, regulations
- What models or tests can I do?
- What data is already available?

The importance of working together

Research shows that in team tasks, good interaction is more important than individual knowledge, competence or past performance

Meet regularly as a group with **all** students present but **without** your client or supervisor. You have to be there to be a trusted team member.

Every meeting should include some brainstorming on the problems of the day. Let everyone contribute. Encourage each other to contribute and develop ideas. Ideas don’t have to be perfect or even good- ideas stimulate better ideas.

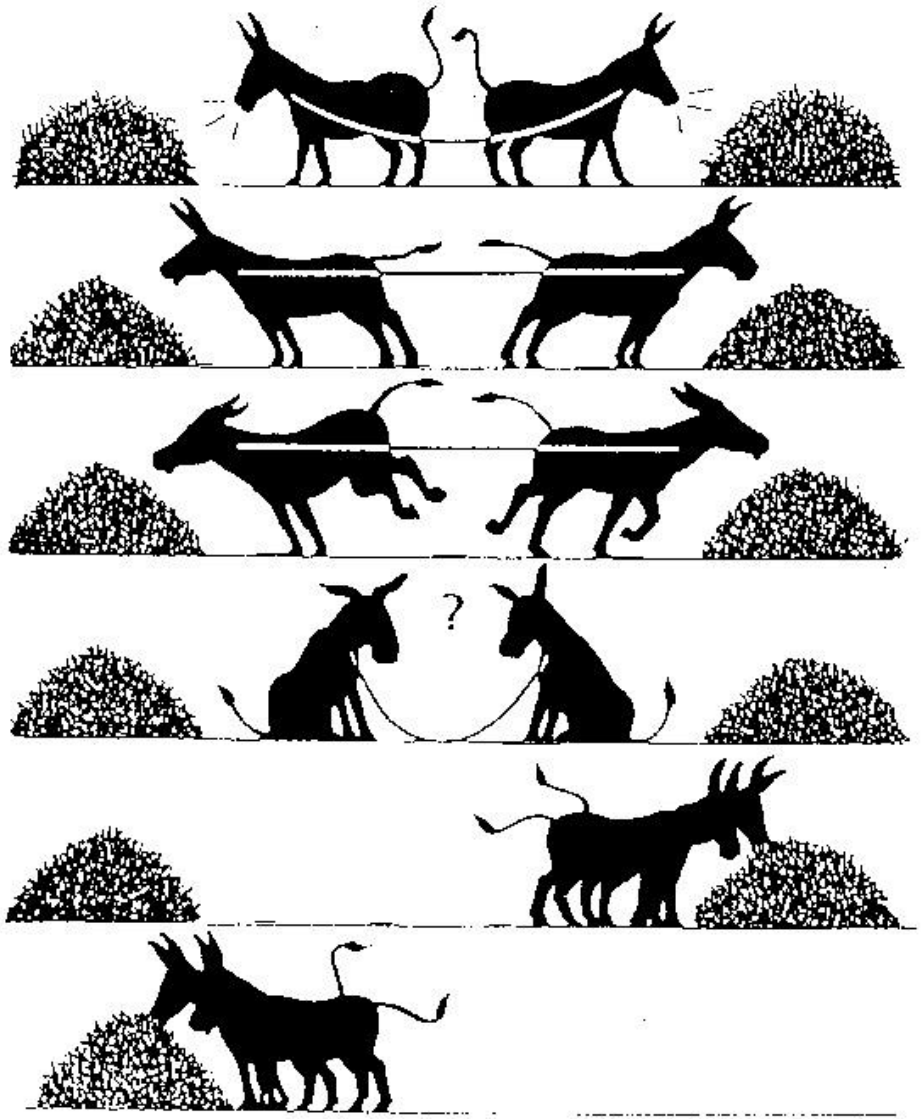
Help each other in you technical tasks.

Do something together that isn’t your project: go bowling, etc.

Also meet regularly with your client and supervisor.

Good team members:

- Turn up and participate
- Do good quality work using their strengths
- Contribute good ideas
- Pay attention to quality
- Meet deadlines
- Manage different personality types
- Listen
- Give and receive feedback without rancour
- Manage conflict
  - Between people, goals, resources
- Own the problem and take responsibility
- Work efficiently, and de-stress
- Deliver more than the brief



These are qualities we look for in individual reviews.

Team roles: administrative tasks

This is one way of dividing up the admin tasks

- Meeting Chair- ensures discussions are focussed on timely issues, agenda is followed, makes sure action items are assigned to a person and given a due date
- Communications Officer – writes and circulates agenda and meeting minutes, interact with client and supervisor
- Resources Officer – monitors expenses vs. budget, orders parts, keeps list of what items borrowed, purchased etc. and what is located where
- Project Manager – keeps team on schedule – alerts to events and tasks coming up, keeps Gantt chart up to date

Rotate through these roles so everyone gets to do each

Experiment, and work together.

These are in addition to your technical tasks (designing, simulating, building, testing etc….

Next step:

- See materials on Learn for more information on literature searches

- See materials on Learn (section “Proposal”) for more detail, videos, and templates on:
  - Organizing tasks into workstreams
  - Making critical checkpoints
  - Making a Gantt chart