Why do I need to collect my own research?

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You may feel that doing research is a waste of time and that you are better off just getting started on your design.

But if you simply rush into your project:

- How will you know what has been developed already?
- Perhaps someone else has had your idea?
- Perhaps someone else has already conducted some research into your area of interest?
- Perhaps there is a new development that would really help you

> **Standing on the shoulders of giants**
> (Newton, 1676)

So putting some time aside to find out what has already been done and researched will:

- Save you time
- Stop you doing unnecessary research or testing
- Help you to understand the market you are working in
- Give you facts about what is possible
- Give you names/universities/businesses that are market leaders or experts in your field

Therefore it is useful to learn by "standing on the shoulders of giants." *(Isaac Newton, 1676)* or, to put it another way, using what has already been found out to inform your own design and investigations.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

There are two kinds of research that you can do

The first is secondary research or looking at evidence produced by others (meaning you didn't do the actual research). Innovation means developing something new, but without knowing what has already been done in your area you; will not know what is possible, what has already been learned or what mistakes have been made!

- You will need to think about what you want to find and plan how to start your search (key words, search terms).
- Your research might reveal that there is a gap in the market that you could fill. It could also show what people think about a certain topic.
- To do effective research you will need to find out about which databases are available and which search engines that you can use to access academic research. Ask your Librarian or Teacher, or contact a Local University for support.
- Academic research is more likely to present conclusions that are backed up by evidence and include research aims and methods. In this way you will be able to look at the data and make up your own mind about the findings rather than relying on a blog or newspaper journalists opinion on the research.
- You will also need to find background scientific and technical knowledge so that you can link it to the kind of design you wish to make. In this way you can ensure that the product or service you design is more realistic.
- You team will need to meet together to review and go over the information that you have found – Do you need more answers? Has the research presented you with more questions?

It's important to find out what people think and what they need. To do this you may need to carry out primary research and gather your own information using questionnaires or interviews.

- You may do this by interviewing people in general to gather opinions or by asking specific questions to the potential users of your innovation.

As you gather the different kinds of information, you will be starting to firm up your ideas for your design. Once you start to put them into practice, you may find that the design doesn't work as you planned. So, more research may be required. The information that you gather should enable you to improve your design and project.

How to protect *your* ideas

Take a look around you. *Almost everything* that you use has been created by someone who has invested their time, effort and money to make it. There are rules that protect their and your creativity.

Creativity & Intellectual property laws

These rules are called intellectual property laws and they don't just apply to finished commercial products, they apply to anything that anyone creates that is original. They are important to understand if you want to sell your ideas or your creative work but they are also equally important if you want to give your work away.

Patents

Things that are invented and can be made or used, like machines, can be protected by patents. A patent is effectively a certificate from the Government which says the idea for your invention is yours and although you have to explain how it works to get the patent, no one else is allowed to use it without your permission.

Patents must be registered and the process of getting them registered is often expensive and complex (on average it costs £4000 and takes 5 years to register a patent). It is a good idea to keep the inner workings of your invention a secret until you can find someone to pay for professional help (see Trade Secrets overleaf).

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

Copyright

Things that people create which have an author, artist or composer are protected by copyright and are known as copyright works. These include books, written reports, websites, apps, pictures, music, films and computer games.

You don't need to register a copyright work for it to be protected, but it does have to be original and written down or recorded in some form. This includes saving it to a digital device like a phone, tablet or PC.

Copyright is created automatically – the law says that other people can't make copies or send them to others without the author's permission. In order to make this clear you should always put a copyright symbol '©', the name of the authors and the year on anything you produce.

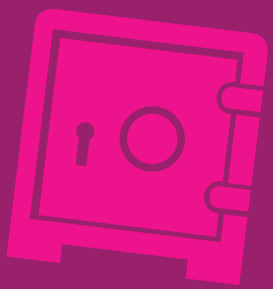
Design Rights

The way that a product looks on the outside is protected by design rights (think of the shape of the Coca Cola bottle). Design rights come in two types – registered and unregistered. Unregistered design rights don't last as long as registered design rights, but like copyright they are automatic as soon as you write it down or record it in some form.

Trade Marks

Trade marks are the names that organisations use for their brands. For example the name 'Coca Cola' is a trade mark and if anyone made a new soft drink called 'Kuka Cula' it is likely that they would be breaking the law. Make sure that any product name you use is not already in use by another product.

Trade Secrets



Trade secrets are a very important way of protecting your ideas and the recipe for Coca Cola is a good example. It's protected and it is illegal to find out that secret and tell it to anyone. In order to protect your ideas you should make sure you don't tell people everything about your project – just enough that they understand what makes it special. TeenTech use something called a non-disclosure agreement (or NDA) which mentors and awards judges sign to promise that they will not use or tell anyone about your ideas without your permission.

For more information

- **The UK Intellectual Property Office (IPO)**
  is the Government department responsible for intellectual property law
  https://www.gov.uk/government/organisations/intellectual-property-office
- **The British Library Business and IP Centre**
  helps people develop ideas and they have library resources and expert advice
  http://www.bl.uk/bipc/

Evaluating the information that you find using the CRAAP test.

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Once you have found your information it is important to evaluate it so that you can keep what's best. One way of doing this is by performing the CRAAP test on your sources.

Currency, Relevancy, Authority, Accuracy and Purpose

Asking the questions below about each website, document or piece of information that you find will help you decide which ones are relevant for your project.

Currency

When was it published? Is the information too old? Does it have a date on it? When was it last up-dated? How important is it that you have up-to-date information?

Relevancy

Does it fit your project? Will your project be stronger if you include this information?

Authority

Who has published or written the information? Do you trust them? Is it easy to find out anything about them? Who was it written for?

Accuracy

Is the information correct? Check with another source, if you are not sure to see if they say the same thing. Are the details correct?

Purpose

Why does the information exist? Is it trying to sell you something, persuade you or give you an opinion? Once you figure this out, you can then decide how to use the information that you have found.

There is lots of information available on the CRAAP test produced by universities and other libraries that can show you the test in action. You can find it by doing a simple search on the internet.

REMEMBER if you are not sure how to apply any part of the test, ask your librarian or teacher for help and support. Always evaluate the information you find.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

Search strategy: How do I make the most out of a Google Search?

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Simply typing in your search term will bring back thousands, sometimes millions, of *'hits'*. Be smart and reduce this number to get exactly what you want from your search.

You can use the modifiers below to make your searching more precise. Add one at the end of your search or between two different terms.

Search term	
site:edu	hits limited to educational websites, or site:ac.uk for uk websites only
filetype:ppt	hits limited to Powerpoint presentations
OR synonym	hits include results with either search term

You can use speech marks " " as a modifier. This keeps the phrases you want together and stops Google from looking at each word separately. For example:

Search term			
regenerative animals	1,950,000 hits *Mixed selection based on each word*	*"regenerative animals"*	2,410 hits *all deal with your subject*

Remember, the internet changes every day therefore the number of results may vary.

You can use the minus symbol to exclude words from your search. For example, if you were searching for 1960s British TV show, The Avengers, you would want to exclude any results relating to the Marvel films of the same name, Avengers -Marvel. This is a powerful tool and should be used with caution.

To only show results with that word in the title, you can use *intitle:word*.

intitle:

A search engine will not just search for the words that you put in. Google in particular will look for different spellings and similar words automatically. Choose your search words carefully and use alternative ones if the first ones are not bringing back enough useful results.

Use ctrl+F (Mac - cmd+F) to search for a particular word in the web page or document that you have found so that you can spot them in the text.

CTRL F

REMEMBER Google has lots more features; ask your librarian or teacher if you need support or guidance with your search strategy.

Link your project to what your customer *actually* wants and needs

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Having a great new idea or approach to solve a problem is fine, but *remember* that it has to be fit for purpose.

Think about the intended customer and their needs.

If you do not know what they want, you need to do some research to find out.

You could also:

- Contact a business that already works in your targeted field of interest.
- Talk to the people that your innovation is aimed at and find out what they actually think – you may discover that the problem requires you to solve a number of different needs.
- You should understand your users values and environment and problems in order to come up with a useful idea.

Use the design thinking approach and follow the steps of a successful innovation cycle.

- Use your background research to inform the decisions that you make for your innovation.
- Check your budget and the availability of the materials you require.
- Estimate the time that you will have to devote to your project so that you can deliver your idea on time
- You will need to build a prototype or representation of your idea that you can take back to your customer to check that it fulfils the needs that were identified.
- Communicate and check at regular intervals – seek feedback and then incorporate it
- At this stage you can modify and change aspects as necessary or test it with users to check how well it works.

REMEMBER if you have any questions or problems, ASK your librarian or teacher for support and advice.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

Research is a *messy* process!

Most of you will be used to completing tasks set by your teacher, who will give you a question to answer, tells you when to do your research and tell you where to look for your answers. You then discuss and write your answer. *Job done!*

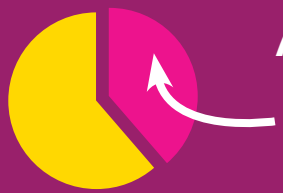
For TeenTech the expectation is that *YOU* will drive the project.

This means deciding what questions you need to have answers for and when and how you will do your research. Reading reports, articles and opinions often provides answers – but often as you learn more about your topic, it leads you to more questions that need to be answered. For example:

- You may want to know how a product is constructed. You then need to do research in order find out more about the properties of the materials used. You might then read about possible problems with these materials and need to find alternatives.
- You might make a prototype but then find it doesn't work as expected – more research may be needed.
- You may contact a business that wants to know costings for your innovation.
- You might find that your innovation needs greater data capacity – more research into component parts and how they are used may be needed.
- You may need to test the effectiveness of your innovation by researching the need within the market

So, to be successful you need to realise that MORE research, information and data may be needed in order for *YOU* to fully realise your design.

The more research you do – the more questions you will have.



Around 40% of your project time will probably be spent on doing research.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

Research is a *dynamic* process!

Research is a *surprising* process!

Effective research takes time and the answers require you to stop and think Your brain needs time to reflect on what you have found.

REMEMBER ● Manage your time ● Keep Active ● Stay Focussed ● Be Curious

How to write an *effective* questionnaire

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To get information and opinions that will be useful for your project, you will need to write your questions carefully. You need to be aware that the same question written in different ways might get different answers.

The best questionnaires are easy for the users to understand and also provide the researcher with answers that are easy to analyse. It is important that you consider what information you need to collect right from the start, such as:

- ✔ What price people would pay for your product or service
- ✔ Which design consumers like the best
- ✔ Which features are most important to consumers
- ✔ Are there any additional features that you need to add

You then have a good starting point from which to write your questions

Who should I ask to do my Questionnaire?

- It's important to try and get a range of different people's opinions.
- It's also important that you target your questionnaire to the right people, for example, people who are likely to be interested in or might use your product or service, or already know something about the kind of project you're doing.

REMEMBER There wouldn't be much point in asking a person who never rides bikes if they think your idea for a new bike light is good.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

What kinds of questions can I ask?

You can write your questions in a number of different ways and each has different advantages and disadvantages.

Free Text Questions

These simply ask a question and let people write whatever thoughts or opinions they have in the space provided.

Advantages - They let people write anything they like to answer your question. This means you can get more detailed and honest answers

Disadvantages - It can be very time-consuming if you have a lot of questionnaires to go through, as you will need to read and understand each one. It can also be difficult to compare answers if they've all written very different replies.

Multiple Choice

These questions let the respondent pick an answer from a list of choices that you've written for them.

Advantages - These questions are easy to understand afterwards as they have a fixed set of answers

Disadvantages - You might not include exactly the option that the person completing the questionnaire wants so they may give a false answer or no answer.

Scale Questions

These questions usually let people pick a choice that is on a scale to show how much they agree or disagree with that sentence.

Advantages - These questions help you understand the strength of peoples feelings.

Disadvantages - If the number of choices on the scale are fixed then you may get a false answer or no answer.

Ranking Questions

Respondents have to say how important they think different things are by placing them in order from most to least important to them.

Advantages - These questions help to understand what is most important to customers.

Disadvantages - It can be difficult to build a picture from the respondents you unless they've put quite similar answers.

The best questionnaire designers will *think carefully* about what information they need and pick a *question type* that will give this information to them in a way that *can be easily understood.* In your opinion gathering you will probably find that you use a range of different question types.

Referencing your research:
creating citations and bibliography

There are *3 reasons* why you need to reference, or show, where you found the information that you have used for your innovation.

1. To show what you have read and found (or referred to). This allows the judges to see how widely you have researched, the range and type of sources (documents and/or people) that you have used.
2. to show that you are aware of current developments in your field
3. To show that you have acknowledged other people's work and have avoided plagiarism (or copying) ideas.

Referencing takes place in two ways:

1. The bibliography

This is the list of information sources you have used to produce your work. They may be books, magazines or periodicals, webpages, blogs, reviews etc. (any source of information that you have used).

To help the reader find your sources, they are listed alphabetically by author surname (if there is no named author then you can use the company that produced the work).

There are different systems or styles that you can use – the important point is to be consistent! There are websites that will help you to generate your bibliography in the correct format, which can help save you time and effort.

To help you with your referencing try using:

1. The references function on Word for citations and bibliography

2. Sign up (it's free) for www.refme.com add in the author and title of the book you have used and it will give you your reference.

3. Use www.citethisforme.com and choose your referencing style. This has an automatic function that allows you to paste the webaddress into the box to create your citation but it only saves your list for a limited time. You will need to copy and paste your work to save it.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

How to write down the differerent sources you have used:

Books

What will my references look like?

Spence, B. ed. (1993) Secondary school management in the 1990's: challenge and change. Independent Publishers.

Articles

What will my references look like?

Bennett, H. Gunter, H. & Reid, S. (1996) Through a glass darkly: images of appraisal. Journal of Teacher Development, 5 (3) October, pp.39-46.

World-Wide-Web Documents

What will my references look like?

NASA,. 'National Aeronautics And Space Administration'. NASA. N.p., 2015. Web. 23 Sept. 2015.

TIP: If you cannot find a publication date put in n.d.

2. In text references

You will want to refer to the ideas that you have read in your report. To do this your need to put in a citation when you use a direct quotation and a reference, when you mention someone else's ideas but do not quote them directly.

These in-text references link the reader to the sources that you have listed in your bibliography so they know how to find the original piece of information that you have used. In your writing the reference is just the author's surname and the date if you refer to an idea and the page number (if one exists) if you add a quote.

For example:

Spence (1993) says that…."

Or

It was clear that, "school management at the end of the 20th century was changing (Spence 1993)"

Most universities have guidelines on the internet about referencing styles and rules. A good example can be found at: http://libweb.anglia.ac.uk/referencing/harvard.htm

TIP: Make sure you record the source at the same time as you take the information. This will make the whole process a lot easier!

REMEMBER if you have any questions or problems, ASK your librarian or teacher for support and advice.

Research and **Information Literacy** award checklist

This **Teentech Award** is judged across **all** categories and is open to **all** projects. The Information Literacy Group of CILIP have written a series of resource sheets that will help you through this process **http://www.teentech.com/teentech-awards/supporting-materials/**

Use **this checklist** to ensure that you include the evidence you need to demonstrate your research and information skills.

- ☐ **Have you** written down all the ways you explored your idea, including those that did not work? **(*Resource Sheet:* Your Aim)**
- ☐ **Have you** outlined a plan for your research and shown how it was changed as you continued your investigations? **(*Resource Sheet:* Research is a Messy Process)**
- ☐ **Have you** included a list of the keywords that you used to search books and the Internet? **(*Resource Sheet:* Search Strategy)**
- ☐ **Have you** listed a range of different search engines that you used and commented on which gave the best results? **(Resource Sheet: What Search Engines are Out There?)**
- ☐ **Have you** shown that you used both printed resources e.g. books, newspapers and magazines as well as the internet, e.g. online encyclopedias, news websites, online journals and relevant websites?
- ☐ **Have you** gathered information from an expert including how you made contact and the questions you asked? **(Resource Sheet: Evaluating the Information)**

- [ ] **Have you** surveyed your potential customers and explained why your questionnaire was effective? Did you have any problems? **(*Resource Sheet:* How to Write an Effective Questionnaire)**

- [ ] **Have you** evaluated the results and shown how they support you project? **(*Resource Sheets:* How to Write an Effective Questionnaire *and* Link Your Project to What Your Customer Actually Needs)**

- [ ] **Have you** explained how your research will help you design the innovation that your customers want, e.g. how it has both functionality and market potential and can you suggest any further research that might be needed? **(*Resource Sheet:* Link Your Project to What Your Customer Actually Needs)**

- [ ] Have you written a bibliography to include all of the source of info you have used? **(*Resource Sheet:* Referencing Your Research)**

- [ ] **Have you** made sure that your ideas are protected? **(*Research Sheet:* How to protect your ideas)**

Your research report should include:

Title Page with the name of the project and who was involved

Acknowledgements - thanking other people who helped e.g. an expert or a teacher

Summary - no more than 200 words explaining what the project is about and your research findings

Contents Page showing all the sections of the report and page numbers

Literature Search - the results of what you found out from looking at sources such as books and journals and the internet

Results from your own research e.g. a survey questionnaire, an interview with an expert or a visit to a company

Analysis of your results and what you think you could have done better or differently and what needs more research

Conclusion summarizing your results and showing how the idea you have will be of use to your potential customers

Bibliography listing **all** the resources you used in researching your project

Appendices to include **all** your results from any questionnaires or interviews that you conducted

Remember to include pictures and charts to support your writing. Make sure these are labelled with a title explaining what they are and any pictures that are not yours will need to be referenced in your bibliography

Include page numbers in your report

What *search engines* are out there?

Most of you will be familiar with Google and will automatically use it every time you need to search, but there are a number of different search engines to choose from that also search the internet.

What are the differences between them?

Each engine has their own index, or collection, of sites that they look through. Different engines have different formulas, or ways, of searching through the information.

Some engines are specialised, meaning that they only look for certain types of information in specific places on the internet.

Using a selection of search engines and not simply relying on Google all the time will give you a wider range of results. Most search engines rely on advertising, so don't just look at the top 5 results, take time to scroll down the list to see what has been found!

First complete some basic searches using general search engines such as Google, Yahoo! or Bing to gain a basic understanding of your topic. Below is a selection that you might want to use to widen or focus your search for information.

Newspaper articles – You can choose to search national or local newspapers here, and again it is quicker than simply searching the internet.
http://www.philb.com/nationaluknewspapers.html

Academic/Research: These sites offer you the chance to look for specific information. The best way to use them is once you have some ideas that you need to research. For the best results, make sure that you have thought about the keywords that you want to use. The results they give you may look different to those you get from Google. Remember if you need help – ask! Not all search engines will give you full access to the text – you may need to note down the details and use your local university to get the full article.

Refseek - An Academic search engine for students and researchers. Locates relevant academic search results from web pages, books, encyclopedias & journals
http://www.refseek.com/

Google Scholar - Allows you to search for academic articles, however not all of them will give you access to the full text
https://scholar.google.co.uk/

Science research - A search engine that concentrates on scientific research
http://scienceresearch.com/scienceresearch/

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

Wolfram Alpha is the best search engine to use if you are looking for mathematical or scientific answers, or you want the search engine to perform calculations or comparisons of data.

http://www.wolframalpha.com

ChemSpider - part of the Royal Society of Chemistry website, for over 10,000,000 chemical structures.

http://www.chemspider.com/

Lexis Web - specialises in legal content

http://www.lexisweb.com/

Images

Although you can simply search for a picture on Google Images, you can never be sure if those pictures are really free for you to use. Pictures and photographs on the web are not necessarily copyright free, meaning that the owner of the picture might not want you to use it.

You need to learn about referencing and copyright to make sure that you give credit to the owner of any images that you use. To be absolutely sure you only use images that you are allowed to, use the sites below:

StockSnap - https://stocksnap.io/

Flikr Creative Commons
https://www.flickr.com/creativecommons

Pexels - http://www.pexels.com/

Sounds or music

To find music that you can download try using some specialist music sites. These sites allow users to upload their own tracks and for others to download them.

Check the agreements on any website that you use to make sure that you are allowed to download the music and if it is royalty free. Check to see what type of acknowledgement the artist would like if you use their track. To start, try using:

Sound cloud - https://soundcloud.com/
Jamendo - https://www.jamendo.com/en#/en

Finding the original of an image

If you have a picture and want to find the original so you can give the owner credit for it, you can do a Google Image reverse search. Go to www.images.google.com and upload your picture to the search bar using the camera symbol. Press return and Google will search for that image and other similar ones.

REMEMBER

If you need help - **ASK!** You may have access to databases in school. Talk to your librarian or teacher who can help you identify the right places to look. If you need to find academic articles or to access specific journals ask about using your local University as they have a range of databases that you will be able to search.

Thinking around your topic

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Your Aim

Have an idea which could make life easier, simpler or better. Clearly identify an opportunity or a problem and match it to an Award.

REMEMBER

At any stage of your project you might need or want to do some research so that you can make decisions based on real information. Use information to back up a hunch or idea.

Spend some time *thinking!*

A really important process that you need to start with is thinking as widely as possible. You and your team members need to generate lots of ideas so that you have a good basis to use to focus in on your final project.

WARNING!

If you don't get your focus correct from the start; then this could lead to problems later on, especially if you don't know what it is that you are trying to achieve.

Generating ideas

Set aside some thinking time. Prepare for your challenge individually, by looking at the Awards and thinking about them before you meet. When you meet as a team, everyone will then be able to take part and share their ideas and think of new ones; be open-minded and let the ideas flow without judgement. This is the time to be imaginative, quirky, inventive and as creative as possible with your thinking. Don't judge the ideas at this point.

Capturing ideas

Choose the form that suits you best for example; a spider diagram, post-it notes, lists, ideas board, Word.doc, PPT slide. You could use, software available in your school such as MindView or ? (free software) or take photographs of your notes. This evidence of your team's creative and thinking process can be used in your Innovation Log.

REMEMBER

Being creative can be a messy process that might take some time. You may need to have several thinking sessions individually and as a group.

If you are having problems coming up with ideas, look carefully at the Award Categories; what areas have been identified for development. Find out about the Award by doing some background RESEARCH into the area. This should give you an idea of what has already been done or is available as a product e.g. a basic search on "wearable technology" will bring up news articles and businesses that you can explore that will tell you what is already available and what it is possible to do at the moment. If you need support with your searches ask your school Librarian to help you search or discuss your ideas with your teacher.

For further information please contact Dr R Jones - jonesr@malvernstjames.co.uk

Once you have some ideas – it's time to evaluate them

You could use the Thinking Hats idea to help you think about your ideas from different angles. You could all wear the same hat (Green) when thinking up new ideas and choose different hats when you are looking more closely at each idea. Using the hat system makes sure that you have thought about the idea from lots of different angles.

White – What do I already know? What do I need to know?
Green – What is possible? What new ideas do I have? IDEAS
Black – What are the possible problems? NEGATIVES/CAUTIONS
Yellow – What are the strengths of this idea? Why will it work? POSITIVES
Blue – What have we done so far – what do we need to do next? PLAN
Red – How do I feel about this? HUNCH, GUT FEELINGS

By the end of this thinking process, you should ask yourself:

1. What is the team goal?
(What problem do we want to solve and what are our main ideas. Which Award(s) are we aiming for?)

2. What are our requirements? (materials, time)

3. What are our limitations? (How long do we have to do the project in school/outside of school?)

4. What do we need to do next? (plan, research & contact, make, evaluate)

You could put your ideas into a process such as Design thinking that will take you through your project:

1 EMPATHIZE
Develop a deep understanding of the challenge

2 DEFINE
Clearly articulate the problem you want to solve

3 EMPATHIZE
Brainstorm potential solutions. Select and develop your solution

4 PROTOTYPE
Design a prototype (or series of prototypes) to test all of part of your solution

5 TEST
Engage in a continuous short-cycle innovation process to continually improve your design