CAD - Advantages and disadvantages.

The advantages of using CAD methods over traditional methods of drawing such as technical drawing with drawing boards and other hand held equipment are many. Listed below is a range of the most impactful advantages:

1) It is more often than not easier to make corrections to drawings using a computer than it would be using pencil / pen and paper
2) You can easily send electronic documents to clients and colleagues for input / sign off etc. via. The internet which speeds up the process of agreeing finalised drawings.
3) There are a range of tools available within most 3D modelling software that to simulate using pencil and paper would take a huge amount of time and specialised knowledge
4) CAD can be relatively easily taught to others where as accurate technical line drawing using pencil and traditional methods requires much more time, effort and skill to learn.
5) Using a 3D model you can inspect and rotate the virtual item in various ways which allow you to visualise the finished article without having to actually physically prototype it.
6) You can run various tests for stress etc via. Simulation in a CAD package reducing the need even further for physical modelling to iron out any issues.
7) CAD applications can be set to send data directly to a CAM machine / packing and can even be set to auto define tool paths and changes for CAM applications.
8) You can drop models into virtual environments in scale and test them.

There are different software titles available to use as CAD packages, all are similar in some ways and differ in others. CAD packages that are purely based on vector lines such as AUTO CAD were developed to create technical orthographic drawings for use in manufacture. Vector based applications all share similar drawing tools but the way they are programmed to respond to the user's mouse inputs may be slightly different.

All of these applications require a minimum of 16GB of ram and a decent graphics card to run smoothly, there is a smaller range of CAD packages that work on Macintosh computers.

Autodesk, Fusion 360 and Solid works are all solid modelling applications and in my experience Solid works stands out as it is specifically designed to cope with complex projects but has a very user friendly interface and so makes it simple to create very good orthographic and isometric drawings in addition to the solid modelling functions. This application also looks to provide the most comprehensive amount of add-ons for testing, evaluation, sustainability reporting, BOM and can also even be set to order materials for your projects.

3D CAD models can be used at all stages of the design process:

1) Sending out preliminary design ideas to clients through the tendering process, this can help with speeding up the design process as well as create a communicative approach to projects.

2) Producing drawings for development and signoff, CAD is an accurate and easily corrected and amended format to work with. Good CAD drawings will be easy to read for makers and clients alike.

3) Producing / refining drawings for manufacture, the act of modelling in 3D and 2D CAD enables better visualisation of the finished product and to aid in making fitting and design alterations before production runs occur.

4) Prototyping and testing before creating physical models, as above, CAD lends itself to rapid and other prototyping thus helping in the production of a improved or watertight final design.

5) Evaluation of carbon footprint, this can help before manufacturing and resource procurement to ensure carbon footprint is reduced and profit therefore maximised in this regard.

6) Evaluation of material properties and behaviours, testing for stress and failure as well as CNC toolpaths can be done in CAD prior to production therefore limiting the range of possible failures on projects.

7) Representing a finished item in physical context before production, as above, also this can be good for securing future and existing tenders and contracts as it allows clients and engineers to communicate and visualised ideas more deeply.

It appears in all aspects and stages of the design process CAD modelling can be used effectively to speed up the design process, to speed up communications, to give the designer analogous visual 3D feedback on the fly, all of which combine to smooth over much of the more difficult / challenging aspects of traditional design process for manufacture.

P3, P5, P7

See attached drawings