Industry Study - Technical Factors

The Impact of Technology on Businesses

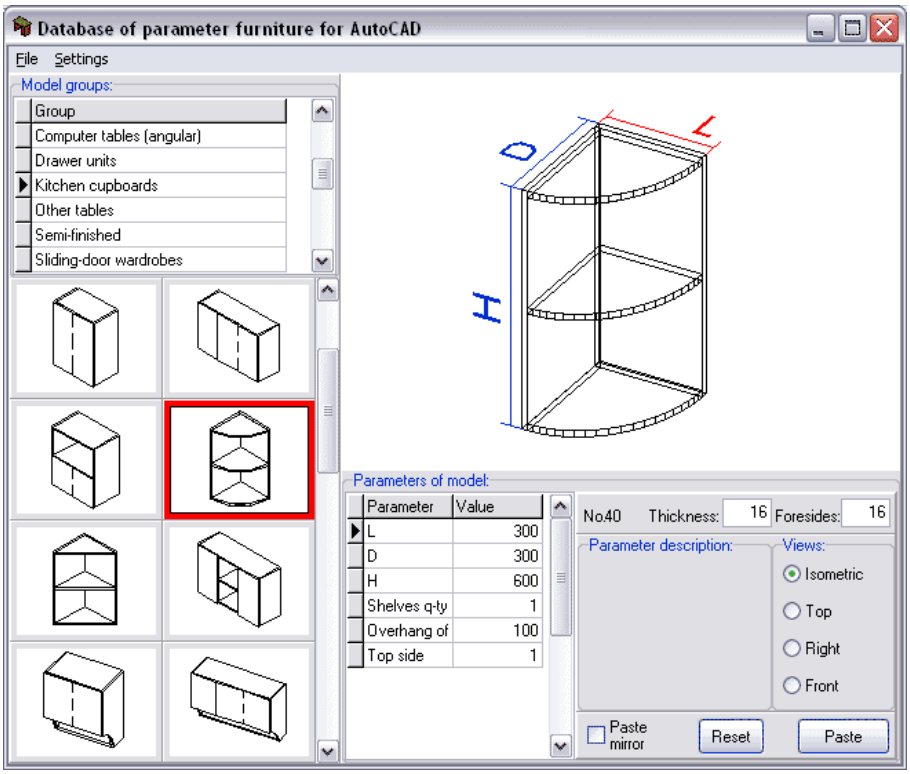
Technology can been described as the development of methods of production or products that help us do things faster, and often for less expense.

Businesses that embrace new technologies are generally able to adapt quickly to changes in the market. This new technology usually means products become cheaper and a larger variety of products can be produced.

Tools; Equipment/Plant; New & Emerging Technologies

Some significant new and emerging technology developments relating to the tools and equipment/plant used in the Timber Products and Furniture Technologies area include:

- Computer Aided Drawing(CAD)/Computer Aided Manufacturing (CAM) software - CAD allows designers to draw their plans in a much quicker time than using traditional methods. This information can then be used with CAM software to make the product. The CAM software allows the CAD drawings to be interpreted and followed by the equipment needed to make the product.



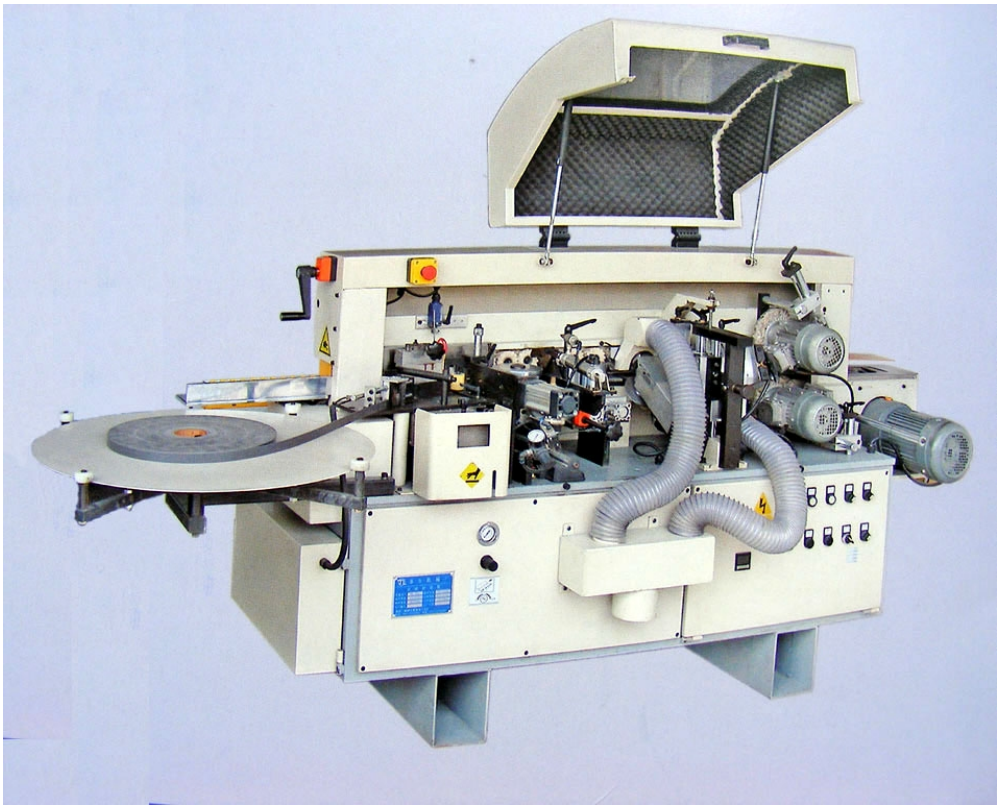
- Computer Numerically Controlled (CNC) mills and lathes - CNC milling machines and lathes help to speed up the production process and remove human error. The machine is programmed using a keypad or can be linked to a computer, using CAM software, with a design already drawn or by inserting a memory device that has the design on it. CNC machines use co-ordinates to program the movements of the tools. Generally they are more efficient, contribute less waste material, save money, can run for long periods of time without breaks and are more accurate than humans completing the same process.

- Point to Point Router Systems - Point to Point (or CNC) Router Systems are typically used to cut and drill holes in large panels during an operation called 'nesting'. They use CAD/CAM software to control the movement of the machine head across a vacuum table. The vacuum table holds the material in place while it is being routed and helps remove dust produced by routing.

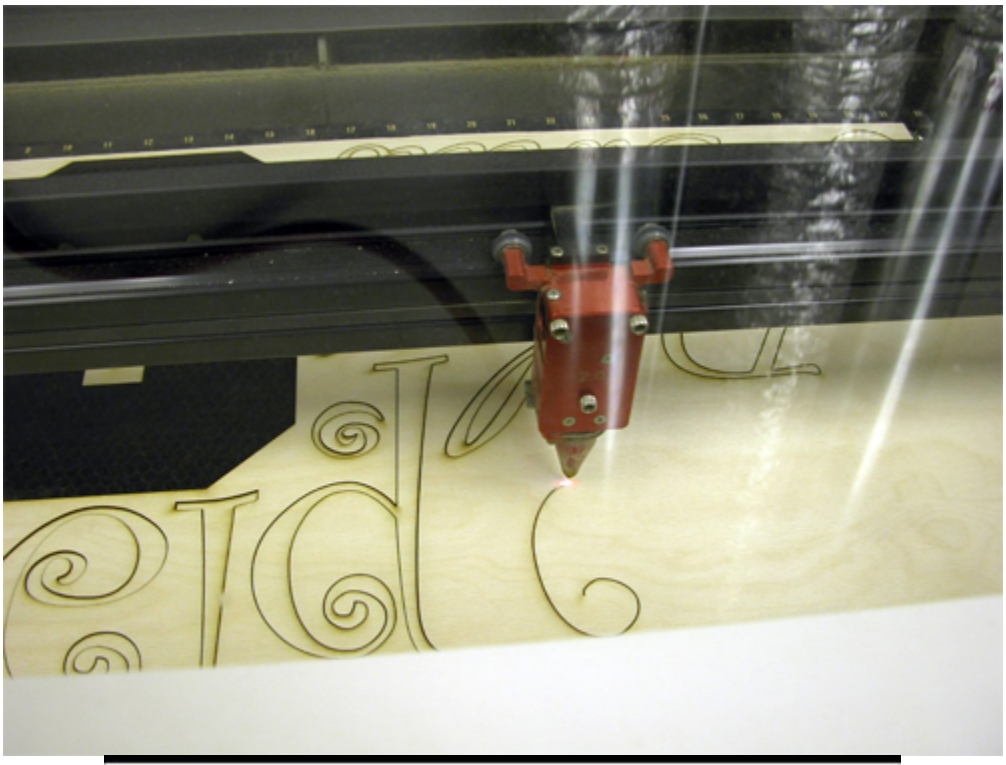
- Colorply - Colorply is a plywood product that consists of veneers that have been dyed to produce different colours while still retaining a grain pattern. It is done using one of two methods. Either the tree is fed the dye while it is growing or the veneers are dyed after they have been cut from the log. The veneers are then glued up in the same way as plywood.

- Beam Saws - CNC Table Saws or Beam Saws are usually very large pieces of equipment that completely remove the need for human intervention in the cutting process. They can have arms that are programmed to place the sheet material onto the table and then either the blade will move to cut the sheet into the pre-programmed sizes or the sheet will be moved so that a stationary blade can then cut the material. The sizes are usually guided by lasers that determine the starting and finishing points of the material being cut, if the material is not of a pre-programmed size.

- Edge banders - Edge banders are machines that apply a strip of timber or plastic material to the edge of panels and boards. Large edge banders can apply an edge to two sides at once, apply material around a curve and/or apply material to a shaped edge.



- Lasers - Lasers are becoming increasingly popular for measuring purposes. They can be seen on some saws and drills available from the local tool shop but are also used on large CNC machines and when measuring on sites. Lasers are very accurate and generally eliminate the human error factor.



- Multi Borer - A Multi Borer is essentially a drilling machine that can drill more than one hole at a time. To do this it must have a number of heads. Each head can be positioned in a specific location so that multiple holes can be drilled at once.

Mechanisation and Specialisation/Generalisation

Mechanisation is an integral part of mass production. It involves the introduction of machinery into the manufacturing process. This machinery replaces hand tools and hand processes. When the machinery becomes controlled by computers and begins to operate without human input, then the process becomes automated, leading towards mass production.

As an example, look at producing a decorative edge on a table top. Traditionally it would have been done using planes, carving gouges, chisels, mallets and other hand tools. A highly skilled craftsman would be needed to produce an intricate design of high quality. It would be extremely time consuming and the smallest slip could ruin the table top. The next step towards mass production would be the introduction of a mechanical tool, such as a router. The router can be used by a person having less skill than the master craftsman. It would dramatically decrease the time to produce the edge and as long as the router is used correctly, the quality of the job would be excellent. The next step in the direction of mass production is to introduce an automated process. This is done by using a point to point router system to do the job. Now we only have a person placing the table tops on the vacuum table and removing the item once the process is completed. There is no skill required to do this and the machine can finish the edge even faster than the person using a router. The final step in producing a fully automated mass production process would be to have the table tops coming from the previous stage of the production process via conveyor belts and using robotic arms to position the table top on the vacuum table for the point to point router to do its job. Another robotic arm could remove the table top and place it on a conveyor belt going to the next stage.

Specialisation is where a person becomes highly skilled in a specific area. In the timber products and furniture industries a person may choose to specialise in many areas of production or operating a business.

Generalisation is the opposite of specialisation. A person becomes proficient in a range of areas. This can be associated with multi-skilling and ideally the employee would become highly skilled in all areas of work that they are participating in, although not to the same level as if they were specialising in a single area of work.

Automation, Mass Production and Efficiency

Automation involves removing hand processes and installing machinery and equipment that can be used without human interference. This includes methods such as CNC, CAD/CAM and robotics.

The benefits of automation include:

- An increase in manufacturing speed, accuracy and efficiency;
- Reduced waste;
- Fewer employees are needed during the manufacturing process.

Some disadvantages to automating a production process include:

- Time required to train employees to use specific pieces of equipment;
- The high initial cost of the equipment.

Automation is usually used in conjunction with mass production.

Mass production involves producing a large quantity of the same item. All of these items will be identical in dimensions but may vary in colour. The opposite of mass production is the cottage industry. Cottage industry businesses make one off products and are very labour intensive.

Advantages of mass production over cottage industry include:

- The final cost of the product being much cheaper;
- The time to manufacture an item is greatly reduced;
- Less skilled employees so human resources do not take up as much financial resources;
- A high degree of automation;
- A large number of units produced.

Cottage industry has the advantage of being able to fix mistakes during the manufacturing process and personal touches can be added. If a mistake is made during mass production then that batch being made may need to be disposed of.

Efficiency within a business is one area that is continually being improved upon, not necessarily by introducing only new pieces of equipment, but also by introducing new processes such as Key Performance Indicators and Process Mapping.

Review Questions – Industry Study – Technical Factors

1. What does CAD stand for and what software can it be used with to help make a product?
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2. What does CNC stand for and name two types of machines that may be CNC?
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3. List three advantages of using CNC machinery over traditional manufacturing processes.
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4. The operation of cutting and drilling holes and pieces from large panels is called what?
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5. What is used to hold the panel in place on a Point to Point Router system?
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6. Describe how the timber used in Colorply is given its colour.

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7. Describe the manufacture of Colorply.

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8. What traditional machine does a Beam Saw replace?

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9. What does an Edge Bander do?

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10. What activity are lasers very well suited for and why?

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11. How many holes can a Multi Borer drill at one time?

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12. Define: Mechanisation

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13. Define: Specialisation

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14. Define: Generalisation

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15. Define: Automation

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16. Define: Mass Production

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17. Define Cottage Industry

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18. Describe two advantages of Specialisation over Generalisation.

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19. Describe two advantages of Generalisation over Specialisation.

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20. Describe two advantages of Mass Production over Cottage Industry production processes.

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21. Describe two advantages of Cottage Industry over Mass Production manufacturing processes.

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22. In general terms, what types of machines are associated with Mass Production and Automation?

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23. Name two processes that can be used to measure and improve efficiency in production.

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