



Co-funded by the
Erasmus+ Programme
of the European Union



Project 2020-1-ES01-KA202-082778

INTELLECTUAL OUTPUT 01

INNOVATIVE OPEN TRAINING MATERIAL ON CIRCULAR ECONOMY AND DIGITISATION FOR VET LEARNERS IN THE WOOD&FURNITURE SECTOR

**Unit 4. Problems associated with the
manufacture, sale and maintenance of this
type of furniture. Possible solutions.
Adaptation to the applicable regulations for
electrical elements in furniture.**



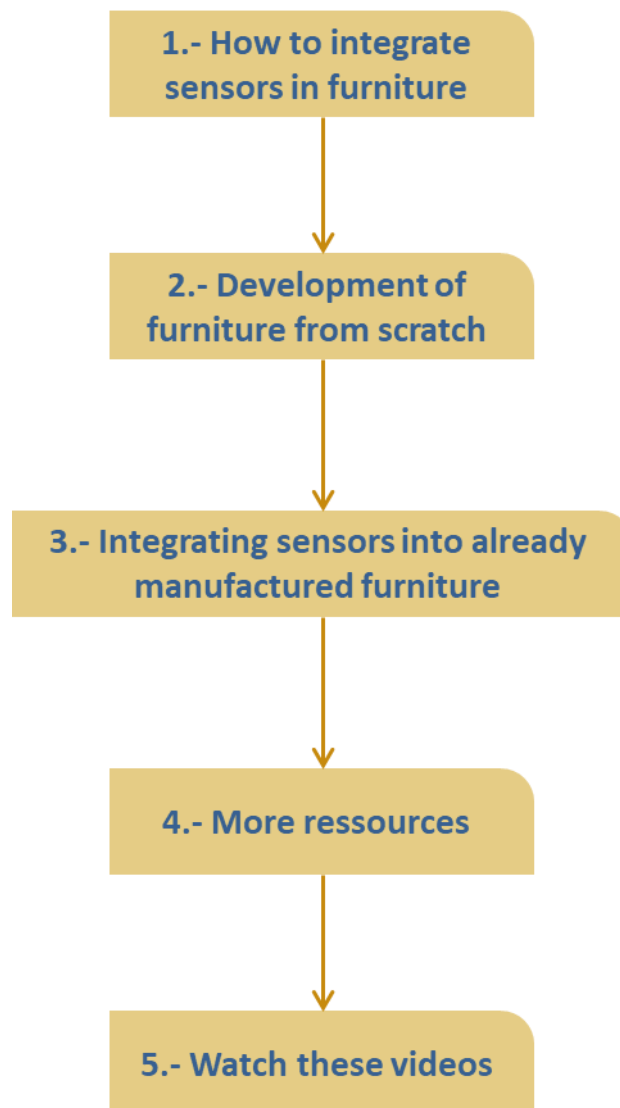
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1 MANUFACTURING, SALE, USE AND MAINTENANCE OF SMART FURNITURE

1.1 MANUFACTURING FURNITURE WITH ELECTRONIC COMPONENTS



In the integration of electronic components within the smart furniture, we can consider two different cases:

- We develop a piece of furniture from scratch.
- We include in already manufactured furniture.



1.2 DEVELOPMENT OF A PIECE OF FURNITURE FROM SCRATCH

In this case, if any kind of design process is followed from the initial phases of the design, the furniture to be developed and the sensors to be used will be taken into account, so in the concept design phases, the integration of the necessary elements will be considered.

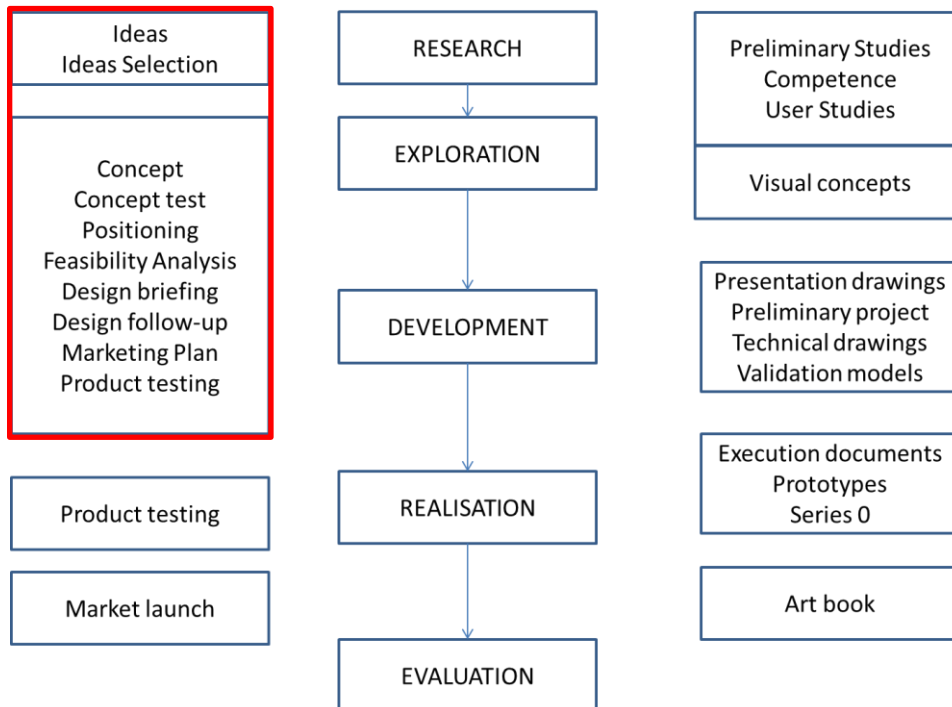


Figure 1. Lifecycle of a product

Developing a sensorised piece of furniture from scratch following a design process will allow for a final product with greater integration, where the elements of the system such as boards, cables, batteries, etc. will be hidden (or seen, if necessary or desired) in the structure of the furniture.

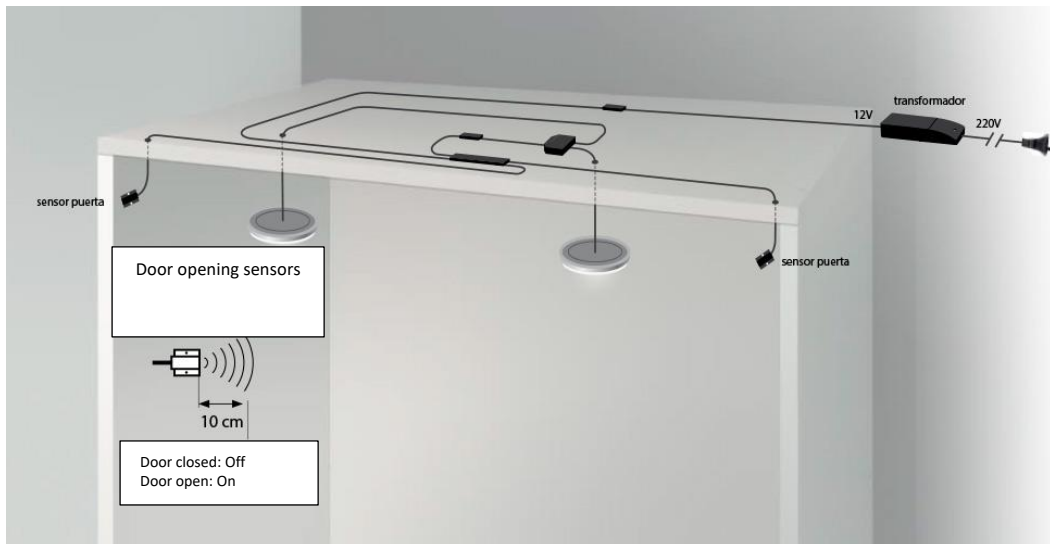


Figure 2 . Door opening sensors connected to lighting system. Source : <https://xn--baonysanchez-bhb.com/varios/iluminacion/lkit00102-detalle>

Likewise, in the development phases of the product, the possible replacement of system elements will have been considered, with easy access to them in the cabinet.

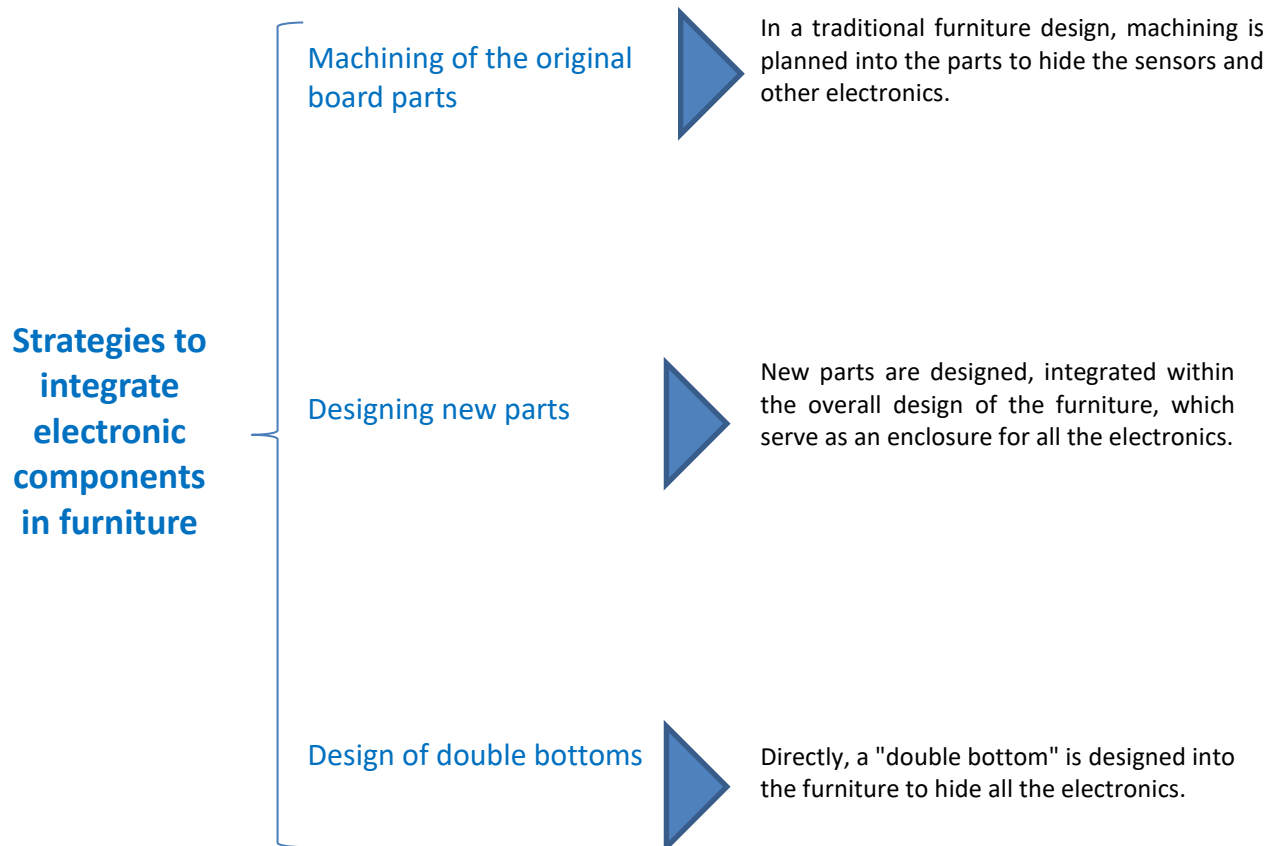


Figure 3. Example of a wall mounted tv cabinet

Currently, the most common methods of integrating (hiding) the electronic components into the furniture are drilling and machining holes to house electronic components, mounting



additional parts to hide the electronic components, and designing double bottoms to include all the electronics.





1.2.1 MACHINING OF THE ORIGINAL BOARD PARTS

In a traditional furniture design, machining is planned into the parts to hide sensors and other electronics.

Drilling and milling operations are carried out on boards derived from wood and metal profiles that serve as supports for tables or chairs to create holes of different shapes and dimensions to house different electronic components or to pass cables between two interior surfaces.



Figure 4. Examples of sensors and devices integration

In this example, a cut-out has been made in the table top to integrate an audio system that receives signals wirelessly from an App.



Figure 5. Example of furniture with electronic devices. Source: <https://www.makuake.com/project/kamarq/>



In this other example, a cut-out has also been made in the top of the table top to integrate a large touch screen.



Figure 6. Example of furniture with electronic devices. Source: <https://www.onesmartcrib.com/smart-home-furniture/>

1.2.2 DESIGN OF DOUBLE BOTTOMS

Directly, a "double bottom" is designed into the furniture to hide all the electronics.

Another way to hide cables and electronic components is to design additional parts that hide these components, but at the same time allow access to them for maintenance activities (charging/changing a battery, disconnecting, etc.).

This type of solution is tailor-made for each product by the company's design team, trying to minimise the aesthetic impact. Therefore, the possibilities are numerous.

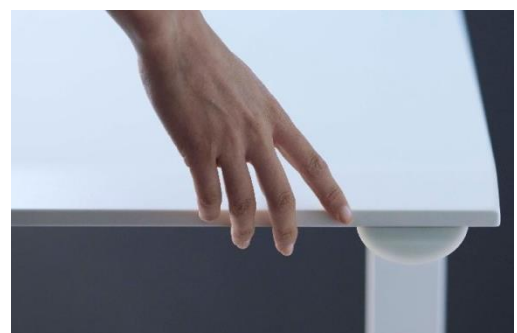


Figure 7. Example of furniture with electronic devices. Source: <https://designbuzz.com/herman-miller-rolls-out-iot-furniture/>



When the number of electronic components is large or the size of the components is bulky, design teams often resort to using double bottoms to house all the electronics in the product.

From a manufacturing operations point of view, this is the simplest way to incorporate the electronic components. However, from a design point of view, it increases the size of the product.

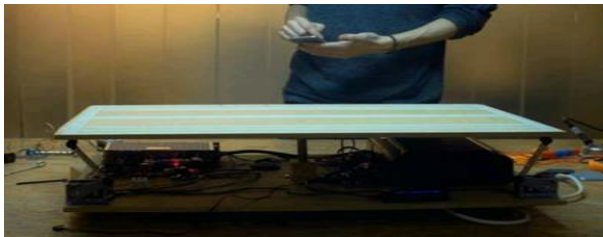


Figure 8. Example of furniture with electronic devices. Source: Ford Motor Company

1.2.3 DESIGN OF NEW PIECES

New pieces are designed, integrated into the overall design of the furniture, to serve as a surround for all the electronics.

In this other example, a new piece is added to serve as an enclosure for a lighting system for the table.



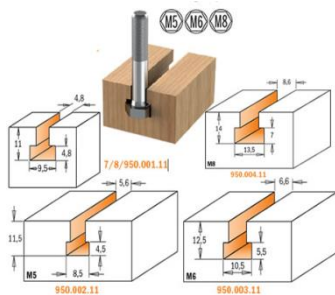
Figure 9. Example of furniture with electronic devices. Source :
AIDIMME



1.3 INTEGRATING SENSORS IN ALREADY MANUFACTURED FURNITURE

In this case, once the sensors and the type of furniture are known, it will be necessary to carry out a study of how to integrate the sensors and their components, taking into account where they will be installed.

This study will detail the operations to be carried out for the integration of the system. On some occasions these may be hidden by carrying out machining operations such as:



Grooving



Drilling



1.4 MORE RESSOURCES

Example of how to transform a "traditional" table from the IKEA furniture retailer into a table with a panel displaying musical sounds.

<https://makezine.com/projects/ikea-music-table/>

1.5 LOOK AT THESE VIDEOS

<https://www.youtube.com/watch?v=fADqocsDxbw>

https://www.youtube.com/watch?v=mmcgTaE45_Y

<https://www.youtube.com/watch?v=8E0SeycTzHw>



2 REGULATION OF ELECTRICAL ELEMENTS IN FURNITURE

2.1 MACHINE DIRECTIVE 2006/42/CEE

Directive 2006/42/EC, the EU Machinery Directive was passed by the European Parliament and European Council in 2006 and amended, most recently, in 2017. It describes the essential health and safety requirements that apply to all machinery offered onto the EU market.

This amendment identified, for the first time, **electrically actuated motorized domestic furniture** as falling within the scope of the Directive, meaning electrical furniture must now carry the CE mark.

Types of furniture that may come under the scope of the Machinery Directive, include:

- Height adjustable desks/tables
- Operated seating
- Operated beds
- Beds with TV lift systems
- Air mattresses with pumps as part of the product package
- Adjustable storage unit
- Door/drawer
- Massage chair

To comply with the requirements of the Machinery Directive, the manufacturer must prepare the TCF (Technical Construction file) according to ANNEX VII of 2006/42/EC. This mainly includes the following files:

a) a construction file including:

- A general description of the machinery
- The overall drawing of the machinery and drawings of the control circuits, as well as the pertinent descriptions and explanations necessary for understanding the operation of the machinery
- Full detailed drawings, accompanied by any calculation notes, test results, certificates, etc., required to check the conformity of the machinery with the essential health and safety requirements
- The documentation on risk assessment demonstrating the procedure followed the standards and other technical specifications used, indicating the essential health and safety requirements covered by these standards



- Any technical report giving the results of the tests carried out either by the manufacturer or by a body
- A copy of the instructions for the machinery
- A copy of the EC declaration of conformity

b) For series manufacture, the internal measures that will be implemented to ensure that the machinery remains in conformity with the provisions of this Directive

2.1.1 CE MARKING

European Directives are the legal basis for CE marking, which aim to promote and harmonize the requirements for free trade within the EU – a product with a CE Mark has free movement for the purposes of trade within all the countries of the European Economic Area (EEA). They signify that products sold in the EEA have been assessed to meet high safety, health, and environmental protection requirements. When you buy a new phone, a teddy bear, or a TV within the EEA, you can find the CE mark on them. CE marking also supports fair competition by holding all companies accountable to the same rules.

Responsibility for gaining the CE Mark rests with whoever first places the product onto the market in the EU.



Furniture manufacturers have traditionally only considered the scope of the General Product Safety Directive (GPSD), which does not require CE marking. However, with the inclusion of furniture with an electrical function in the new guidance for the Machinery Directive, this form of furniture does now may require CE marking.



2.2 THE LOW VOLTAGE DIRECTIVE (LVD) (2014/35/EU)

The purpose of this Directive is to ensure that electrical equipment on the market fulfils the requirements providing for a high level of protection of health and safety of persons, and of domestic animals and property, while guaranteeing the functioning of the internal market.

This Directive ensures that electrical equipment within certain voltage limits provides a high level of protection for European citizens, and benefits fully from the single market. It has been applicable since 20 April 2016. The LVD covers health and safety risks on electrical equipment operating with an input or output voltage of between

- 50 and 1000 V for alternating current
- 75 and 1500 V for direct current

It applies to a wide range of electrical equipment for both consumer and professional usage, such as:

- household appliances
- cables
- power supply units
- laser equipment
- certain components, e.g. fuses

The general product safety directive (2001/95/EC) covers consumer goods with a voltage below 50 V for alternating current, or below 75 V for direct current. It aims to ensure that only safe consumer products are sold in the EU.

3 REFERENCES

Accessing the EU Market: CE Marking for Electrical Furniture Falling under the Machinery Directive. <https://www.sgs.com/en/news/2018/10/ce-marking-for-electrical-furniture>

New guidance for the application of the European Union's (EU) Machinery Directive 2006/42/EC.

<https://ec.europa.eu/docsroom/documents/24722/attachments/1/translations/en/renditions/native>