# Project Deliverable C- Design Criteria and Target Specifications

GNG1103 - Engineering Design

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**Introduction:**

At this project stage with AMBICO Ltd, our team has gained valuable insights into their requirements for a reusable jig. The initial client meeting allowed us to form a clear problem statement and understand their priorities. Now, our focus is on specific criteria: researching similar products, creating a priority ranking, setting a budget, and determining system requirements. These steps will guide our design process to ensure the jig aligns with AMBICO's key needs efficiently and effectively.

This document gives the design criteria for the jig. Furthermore, it tells you how our team did the benchmarking which led us to determine the target specifications. With this, it can be used in the development of our client-specific product.

**Prioritised Design Criteria: Technical/Non-Technical & Constraints:**

| ***Functional*** | ***Description and Design Criteria*** | ***Importance*** |
|---|---|---|
| Ease of use | The jig should not take more than 5 minutes to set up and should be easy to set up. Easy handling and minimal instructions needed to use are vital. | 3 |
| Adjustability | Due to variations in the backset, increments of ¼’ in variations, a factor of adjustability becomes important. There should be some function/mechanism that allows us to deal with these variations. | 2 |
| Built-in measurements | Knowing the exact measurements of the backset with the adjustability factor is needed to ensure precision. Standard inch/cm ruler measurements can be applied to an appropriate place on the jig. | 2 |
| ***Non-Functional*** | | |
| Longevity | The jig should last a minimum of 1 year or more. Replacement of the jig should be an absolute minimum. | 2 |
| Lightweight | Although not necessary, a lightweight jig enables easier handling. A jig over 2 kg of weight could be costly and impractical. | 1 |
| Size | Although size does not directly affect the performance, a chunky and large jig could be a hassle to set up. | 1 |
| ***Constraints*** | | |
| Cost | Cost is a high-priority constraint. Client limit is $100, prototype limit is $50. Most jigs used by the client are around ~$20. The cost of the jig should be proportional to its usefulness while staying under the $50 mark. | 3 |
| Material | Material correlates with longevity, however, there are no extreme requirements for the material. The material could be sheet metal, or 3D printed, and should not be affected by moisture, dust, or many other environmental factors. Any metals thicker than sheet metal require out-of-house construction and could increase costs. | 1 |

| | | |
|---|---|---|
| No Damage | Most importantly, the way the jig clamps down or attaches itself to the work surface must not leave any damage to the product. Built-in clamps are preferably the ideal method to lock onto the work surface. No methods, like nailing or screwing in the jig should be used. | 3 |

**Technical Benchmarking:**

1. **Adoles Jig:**

This jig is used specifically for cabinet door hinges, not exactly what our jig is meant to do; however, the ideas and design philosophy of the product match with what our team intends to implement. It offers adjustability, practicality, durability, and cost-effectiveness. Its adjustability to clamping onto different widths of work surfaces, 15-25mm, allows for flexibility of what panels of wood can be used; something that we should look to have in our product as well. From the instructions listed, the jig looks simple to set up; find a spot for the hinge and clamp down the jig for use. The simplicity and built-in clamps are a must-have for our design, the clamps also don't do damage to the work surface either. The durability of the jig is also considerably high, made with aluminium metal, and should last more than a year; this longevity is ideal. Most importantly, the cost of the jig is CAD $40.89, under the $50 mark.

**Specifications:**

- adjustable dial can adjust the distance with 3mm, 4mm, 5mm and 6mm hinge offsets.
- Clamps onto 15-25mm wood panels
- Surface mounted
- Has built-in clamps for convenience
- Made from aluminium metal
- 176.78 x 121.92 x 91.44 cm; 699 Grams

**User Reviews:**

| ***Positive Reviews*** | ***Negative Reviews*** |
|---|---|
| • Very easy to use<br>• Helped finish product faster<br>• Works as it should<br>• Clamps on very well<br>• Excellent results<br>• Material is good | • mechanism that aligns the jig against the wood is difficult to adjust accurately<br>• difficult to get an accurate measurement<br>• the drill bit that is part of the jig can burn the wood because if the blade is dull |

*Note: reviews taken from amazon page of product*

2. **Duebel Jig:**

This jig is almost exactly what our team is looking for, the adjustability being the main key point of this product. This product is not exactly the jig that needs to be produced, but the working mechanisms and features are what need to be in our product, it meets our design criteria on many points. The jig offers accuracy/precision, good durability, practicality, and the main feature, adjustability. The built-in measurements on the tool allow for more precise and accurate placement, the horizontal guides allow for the router tool to create an almost perfect cutout. The material is of aluminium metal, which is durable enough for the dusty environment of a workshop. The adjustable clamps allow for up to 6 cm of width, built with an anti-skid rubber to prevent damage to the wood, good for practicality. Offers fast clamping; enabling fast setup. The one thing holding this product back is the price, CAD $69.99, above our $50 budget.

**Specifications:**

- Clamps onto surfaces up to 6 cm of width
- Built-in measurements on tool
- Surface mounted
- adopts rubber anti-skid design for clamps
- Made from aluminium metal
- 49.5 x 22 x 11 cm; 1.78 Kilograms

**User Reviews:**

| ***Positive Reviews*** | ***Negative Reviews*** |
|---|---|
| ● Pretty durable<br>● Very accurate<br>● Fast and easy to use<br>● Material if of good quality<br>● Does exactly as described<br>● Excellent results | ● Aluminium guide plates are of poor quality, difficult to slide<br>● Adjustment is not fast<br>● Presumable bending of guide plates did not allow for a even placement of router |

*Note: reviews taken from amazon page of product*

**Target Specification:**

| | **Design Specification** | **Relation (=,< or >)** | **Value** | **Units** | **Verification method** |
|---|---|---|---|---|---|
| | **Functional Requirements** | | | | |
| **1** | Easy to use | = | Easy for labourer to figure out how to use | N/A | Testing/ Team feedback |
| **2** | Adjustable to fit any door size | = | Should be able to fit different door thickness. | N/A | Testing / Team feedback |

| | | | | | |
|---|---|---|---|---|---|
| **3** | Quick to use | = | Should have built in measurements to save time | N/A | Testing/ Team feedback |
| | **Non-Functional Requirements** | | | | |
| **1** | Longevity | > | 1 | year | Researching |
| **2** | Size | = | Cutout height - 6 ¾<br>Cutout width - 1 | Inch | Testing / remodelling |
| **3** | Lightweight | < | 2 | kg | Testing/ remodelling |
| | **Constraints** | | | | |
| **1** | Cost | < | 50 | CAD | Calculations/ verifications |
| **2** | Material | = | Durable not work | N/A | Researching |
| **3** | Not damaging to door | = | Clamp does not damage door | N/A | Testing/ Remodelling |

**Reflection:**

The client meeting with AMBICO Ltd provided valuable insights into their requirements for developing a reusable jig tailored for routing flush bolt cutouts in door manufacturing processes. A key takeaway was their emphasis on cost-effectiveness, necessitating a solution that not only fits within a strict budget but also significantly reduces setup time. Additionally, the client highlighted the importance of ease of installation, precision, durability, and adjustability for different door backsets. These priorities underscore their focus on practicality, reliability, and versatility in their manufacturing operations. Integrating these considerations into our development process will be crucial to delivering a jig that effectively meets their specific needs while enhancing productivity and streamlining processes on the manufacturing floor.

**Conclusion:**

Our team's rigorous examination of client needs and note-taking, as well as research into similar products and designs, has allowed us to formulate an in-depth analysis. This includes design criteria, technical benchmarking with similar products, target specifications, and an understanding of what needs to be done. The reflection states what needs must be met and what needs to be done to meet the client's desired vision of the end product. To ensure we meet all of our targets on time and with expected (if not exceeded) results, a Trello board for this project was made. This will allow for task-keeping and organisation; crucial for this time-sensitive project. The next steps to be taken will be the creation of plausible conceptual designs, many different designs will be explored until one is found that meets the requirements listed and/or our problem statement.