Ambico has commissioned our team to create a reusable and portable jig for the installation of the hinges on their wooden doors, these doors are designed of steel on the inside and are covered with wood on the outside. There will be three steel hinges per door so the jig must be easy to employ. The jig must also be able to reduce the actual installation times of these hinges. In addition, the jig must be optimized for factory conditions and remain effective during extended use.

The entire process begins with routing, for which they create a cavity in the wood where the hinges will be placed. Next, they mark the precise location of the holes to be drilled. A worker drills the holes by hand, making sure the drill is at right angles. Next, the workers tap the holes so that the screws can be attached to the door. Fifth, they attach the screws to the finished product. The process after routing takes about 30 minutes per door, which is time-consuming and inefficient for Ambico.

Our task as a team is to develop a jig to optimize the manufacture of wooden doors. This jig should be used to prepare the door for hinges and speed up production by making marking, drilling, and tapping faster and more efficient for the workers, replacing the current manual process. It is important that this jig be reusable and durable. We are considering two options: create two different jigs or design one that will accommodate various size hinges. The jig must ensure that the drill remains perpendicular during drilling and must provide a clear indication for the worker to stop. It is important to note that the screws used have a diameter of 12 mm and a thread count of 24 threads per inch.

Ambico uses two different sizes of hinges; 5" long by 4.5" wide, there will be three different backsets for this hinge, they will be 9/16", ¼" and 11/16". The other hinge they need is 4.5" long by 4.5" wide with a ¼" backset. For the hinges, it is necessary to drill the holes at least ¾' deep in the steel inner door and then thread them so customers can put the screws in later. The hinges must also have the drilled and tapped holes completely straight, otherwise they will not be able to attach properly.

There are many things to think about during jig design. First, there are two different sizes of hinges, so an adjustable jig or two different jigs must be created. The jig must be able to assist the worker during the drilling process by keeping the drill bit at the correct angle. At the same time, soft materials, such as rubber or plastic, should be used on the contact surface of the jig to reduce friction with the wooden door, thus avoiding damage to the surface of the wooden door and maintaining its integrity. In addition, to improve the durability of the fixture, it is necessary to use strong materials. In the structural design of the fixture, a suitable support structure should be added that can effectively disperse the pressure, slow down the wear and tear, and prolong the service life of the fixture.

The client's goal is to create a jig capable of saving time and making the process of drilling holes for wooden door hinges more efficient. In trying to achieve this goal, there are some challenges to consider. These challenges can include many factors, such as the factory in which the operators' work is incredibly dusty due to other machines and processes taking place in the same factory and possibly even in the same room. This is important to consider because of the possible effect it could have on the life and durability of the jig, as the moving parts of the jig

could become clogged with dust and render it unusable. Another challenge is the jig's ease of use: if it is not simple and quick, workers are likely to ignore it. The goal is to save time and not to make the process difficult. This may mean that the jig must fit certain parameters, for example, that it can be used with one hand or that it attaches easily and quickly to the door. To get to the next point, the jig cannot take longer than the actual process and certainly cannot damage the wood structure, as reworking the entire door takes a considerable amount of time. The stability of the jig is also important because any inaccuracies in the jig or the way it is placed on the door could cause errors, which would mean that the door would have to be redone again, which would take a lot of time. This jig should be quick and easy, and should also take into account different hinge sizes, which may mean that there are two different jigs for each hole pattern.

NEEDS:

- Speed up production by making marking, drilling, and tapping faster and more efficient for the workers.
- Must be reusable and durable.
- Fit the different sizes of hinges.
- Ensure that the drill remains perpendicular during drilling and must provide a clear indication for the worker to stop.
- soft materials, such as rubber or plastic, should be used on the contact surface of the jig to reduce friction with the wooden door.
- Use strong materials.
- Simple and quick