# Concept Screening Worksheet

| **Overview** | |
| --- | --- |
| Need statement: | |
| There is a need to reduce the risk of contents in a controlled environment from being compromised due to unexpected, unwanted, or unintentional access in frequently accessed refrigerators. | |
| Description of concept: | Concept sketch: |
| The use of the laser sensor prevents the risk of the refrigerator of being left open for a long time preventing unexpected and unwanted access of the refrigerator. If the refrigerator is left open too long, a light and sound alarm will activate which will then turn off when the refrigerator returns closed.  Main components include:  -Laser  -Laser Padding  -Light and Sound Box w/ AA batteries  The laser will detect whether the door is closed by reflecting off the laser padding. If the padding isn’t present in the laser’s direction, then the laser sensor won’t pick up any light reflection and thus determine the door is open. Alarms will eventually ring after a certain amount of time |  |

| **Need Criteria** |
| --- |

| Must-Haves | Confidence in Ability to Satisfy |
| --- | --- |
| Ease of Use | □ High □ Medium □ Low |
| Ease of Manufacturing | □ High □ Medium □ Low |
| Practicality | □ High □ Medium □ Low |
| Ease of Handling | □ High □ Medium □ Low |
| Affordability | □ High □ Medium □ Low |
| Power Delivery | □ High □ Medium □ Low |
| Longevity | □ High □ Medium □ Low |
| Security | □ High □ Medium □ Low |

| **Greatest Concerns About Concept’s Ability to Satisfy Need Criteria** |
| --- |

| While the concept has a very low security and less than ideal longevity, the concept makes up with its quick and simple development and is very easy to understand since the user will barely notice the device operating due to its passive nature. |
| --- |

| **Technical Feasibility** | | | |
| --- | --- | --- | --- |
| **Favorability** | **Disease Process/ Mechanism of Action** | **Key Concept Mechanism** | **Concept Feasibility** |
| ... success growth graph | Well Understood | Well Established Technology | Similar Devices in Related Fields |
| Mostly Understood | Demonstrated in Related Fields | Similar Devices in Disparate Fields |
| Partially Understood | Demonstrated in Disparate Fields | Novel Approach |
| Not Understood or Well Known | Technology Not Yet Available | Novel, Risky Approach |
| **Critical Questions to Answer to Demonstrate Technical Feasibility\*** | | | |
| How do we make the laser precise enough to know when it's closed and when the refrigerator is slightly ajar?  Are there any similar laser sensors that have worked in the past in closing or opening doors?  What possible stimuli could interfere with the sensor and what could we do to prevent that? | | | |
| **Estimated Time and Resources Needed to Demonstrate Technical Feasibility\*** | | | |
| Will need a laser sensor, laser padding, and an alarm box with an LED, a speaker, and AA batteries. Will require learning how to combine all components in a useful way.  Estimated time to demonstrate technical feasibility is approximately four days to prototype and test.  If we have to make our OWN laser sensor this might take more time, but prototyping should be fast and simple. | | | |

\*Refer to your prototyping plan for the key take-aways to include in these sections

| **Intellectual Property** | | |
| --- | --- | --- |
| **Favorability** | **IP Landscape** | **Comments** |
| ... success growth graph | No existing prior art |  |
| Little existing prior art |  |
| Some existing prior art | While not applied directly to a locking system, there are previous prior art of laser sensors being used to monitor the open and closed status of doors |
| Extremely crowded |  |
| **In specific terms, what does your concept do?** | | |
| The laser sensor helps simply to know when the refrigerator is open with its easy installation. If cheap and easy to apply onto the refrigerator, it will help prevent extra high costs in buying a new refrigerator. With the device applied, we will be able to know when the refrigerator is left open for too long to sound an alarm and have someone nearby to close the refrigerator. | | |
| **What aspects of your solution are useful (utility)?** | | |
| The solution’s simplicity and quick-to-understand design is very useful for people to quickly adapt to the new installation of the device in the labs. Stating again, while the device may fall short in security and longevity, the device will still overall prevent refrigerators from being left open for too long in the case that someone is nearby. | | |
| **What aspects of your solution are non-obvious?** | | |
| Its lack of active use is an aspect that makes this solution non-obvious. While other concepts we developed might worry about having security identification (the use of a pin pad), this solution mainly helps with preventing the door from being open for too long without causing unnecessary hindrances for lab workers. | | |
| **What aspects of your solution are novel?** | | |
| Due to the integration of the alarm systems and laser sensors into a single physical system, this product is more applicable to doors and refrigerators in areas where network connectivity may suffer such as in underground laboratories. | | |

# Concept Screening Worksheet

### 

| **Overview** | |
| --- | --- |
| Need statement: | |
| There is a need to reduce the risk of contents in a controlled environment from being compromised due to unexpected, unwanted, or unintentional access in frequently accessed refrigerators. | |
| Description of concept: | Concept sketch: |
| The use of the weighted mechanism is so that the door can reliably shut when it is open (the weighted mechanism will use the weight on it to help close the refrigerator door). The use of a pin pad will ensure that the user can unlock and lock the door using a passcode as well as to shut off an alarm if it detects that the refrigerator is somehow open past a specified time usually if the weighted mechanism fails).  The components of this concept involve:  -weighted mechanism  -containing potentially a spring and a sensor  -pin pad lock  -sound/light alarms  If the refrigerator is opened without the pin pad being used to open the lock, a light/sound alarm will be triggered and it can only be stopped once a person closes the door. A person can access the refrigerator by typing the passcode on the pin pad lock. The weighted mechanism will sense that the door is not in the closed position if a person opens the refrigerator so the door can close on its own via the weighted mechanism’s weighting. | PIN pad with speaker and alarm on the side  Closing mechanism on the top of the PIN pad that has a spring and pinion like automatic door closers |

| **Need Criteria** |
| --- |

| Must-Haves | Confidence in Ability to Satisfy |
| --- | --- |
| Ease of Use | □ High □ Medium □ Low |
| Ease of Manufacturing | □ High □ Medium □ Low |
| Practicality | □ High □ Medium □ Low |
| Ease of Handling | □ High □ Medium □ Low |
| Affordability | □ High □ Medium □ Low |
| Power Delivery | □ High □ Medium □ Low |
| Longevity | □ High □ Medium □ Low |
| Security | □ High □ Medium □ Low |

| **Greatest Concerns About Concept’s Ability to Satisfy Need Criteria** |
| --- |

| While this concept may fulfill many Must-Haves, it ultimately might cause problems in its section for ease of manufacturing. It may be easy to understand and use, but it will take more time to develop on the design end. |
| --- |

| **Technical Feasibility** | | | |
| --- | --- | --- | --- |
| **Favorability** | **Disease Process/ Mechanism of Action** | **Key Concept Mechanism** | **Concept Feasibility** |
| ... success growth graph | Well Understood | Well Established Technology | Similar Devices in Related Fields |
| Mostly Understood | Demonstrated in Related Fields | Similar Devices in Disparate Fields |
| Partially Understood | Demonstrated in Disparate Fields | Novel Approach |
| Not Understood or Well Known | Technology Not Yet Available | Novel, Risky Approach |
| **Critical Questions to Answer to Demonstrate Technical Feasibility\*** | | | |
| How do we ensure that the pin pad can remember a specific code in order to open or close only when the specific code is activated?  How do we ensure that the weighted mechanism can actually close on its own?  How do we design a weighted door system that does not impede the ease of opening of the door? | | | |
| **Estimated Time and Resources Needed to Demonstrate Technical Feasibility\*** | | | |
| We will need to have an appropriate pin pad design, a designed weight mechanism, and a sound and light alarm system, which could take some time to design to combine all in an effective way, so it would take around four days to prototype and test this design. | | | |

\*Refer to your prototyping plan for the key take-aways to include in these sections

| **Intellectual Property** | | |
| --- | --- | --- |
| **Favorability** | **IP Landscape** | **Comments** |
| ... success growth graph | No existing prior art |  |
| Little existing prior art |  |
| Some existing prior art | There exists prior art for pinpads and weighted mechanisms, but it is hard to find a design that incorporates both. |
| Extremely crowded |  |
| **In specific terms, what does your concept do?** | | |
| The concept can be an effective lock system as well as having a way to close the refrigerator without human intervention in order to ensure the refrigerator can stay shut. The weighted mechanism ensures that the refrigerator can close on its own by having a weight system that naturally closes the refrigerator door when open past a specific length of time. The pin pad is there to ensure the refrigerator can only be opened when it is unlocked when a user types in a numeric passcode. Furthermore, the pin pads can be used for potential disarming of the alarm in the event that the closing mechanism fails. If the refrigerator is open for too long, the alarm will sound and the person will have to manually close the door and type in a code to stop the alarm. | | |
| **What aspects of your solution are useful (utility)?** | | |
| The aspects of the solution that are useful are that the weighted mechanisms automatically close due to its weight, so naturally the weighted mechanism will naturally go to its normal preferred state of being closed and close the door. Furthermore, the pin pad is a type of unlocking system to ensure that only the people who know the code can access the refrigerator and no one else can. The pin pad being on the design will also ensure a person is there to close the refrigerator if the alarm is triggered. | | |
| **What aspects of your solution are non-obvious?** | | |
| The weighted mechanism will change the status of the door on its own from open to closed so the user does not need to be notified if the door is open or not. | | |
| **What aspects of your solution are novel?** | | |
| While the idea of the weighted door is frequently used in regular doors, the solution of using weighted doors on refrigerators is not frequently used, especially since the goal of the device is to be easy to access and install. This solution is somewhat novel, yet commonly used in other aspects of life. | | |

# Concept Screening Worksheet

### 

| **Overview** | |
| --- | --- |
| Need statement: | |
| There is a need to reduce the risk of contents in a controlled environment from being compromised due to unexpected, unwanted, or unintentional access in frequently accessed refrigerators. | |
| Description of concept: | Concept sketch: |
| This will be a PinPad and Angle Sensor combination. This design will use a PinPad to disarm the alarms built into the product that would sound and flash when the Angle Sensor detects the door opening without a passcode. Inputing a passcode will enable a length of time in which users can open the door without the alarm sounding. The Angle Sensor will use a potentiometer on the hinge side of the door to monitor the open and closed status of the door. If the door stays open for a specified amount of time, the alarms will also sound and flash.  Main components include: -motherboard  -pinpad with LED  -a potentiometer  -speaker box w/ AA batteries  The angle sensor will utilize a potentiometer in order to modulate electrical resistance and thus change the voltage reading into a voltmeter. Different voltages will correlate to different degrees of door openness, and if the degree is too high for past the specified appropriate time for a refrigerator to keep open, the alarm will sound. |  |

\*Potentiometer part file was created by Oleksandr Velykyi on grabcad.com

<https://grabcad.com/library/potentiometer-10k-2>

| **Need Criteria** |
| --- |

| Must-Haves | Confidence in Ability to Satisfy |
| --- | --- |
| Ease of Use | □ High □ Medium □ Low |
| Ease of Manufacturing | □ High □ Medium □ Low |
| Practicality | □ High □ Medium □ Low |
| Ease of Handling | □ High □ Medium □ Low |
| Affordability | □ High □ Medium □ Low |
| Power Delivery | □ High □ Medium □ Low |
| Longevity | □ High □ Medium □ Low |
| Security | □ High □ Medium □ Low |

| **Greatest Concerns About Concept’s Ability to Satisfy Need Criteria** |
| --- |

| The greatest concerns for this design were affordability and power delivery. The use of the pin pad, speaker, LED, and potentiometer circuit may require more power than is necessary for the other designs. Affordability was a concern due to the need to purchase a pin pad, potentiometer, and hardware to have the individual components communicate with each other. |
| --- |

| **Technical Feasibility** | | | |
| --- | --- | --- | --- |
| **Favorability** | **Disease Process/ Mechanism of Action** | **Key Concept Mechanism** | **Concept Feasibility** |
| ... success growth graph | Well Understood | Well Established Technology | Similar Devices in Related Fields |
| Mostly Understood | Demonstrated in Related Fields | Similar Devices in Disparate Fields |
| Partially Understood | Demonstrated in Disparate Fields | Novel Approach |
| Not Understood or Well Known | Technology Not Yet Available | Novel, Risky Approach |
| **Critical Questions to Answer to Demonstrate Technical Feasibility\*** | | | |
| Since the pin pad might be left at the hinge side of the refrigerator there might be a problem in ease of handling since it is far from the door handle.  There is a chance that many different refrigerators may have different hinge designs making it harder to install.  How much power is necessary to power up the angle sensor? | | | |
| **Estimated Time and Resources Needed to Demonstrate Technical Feasibility\*** | | | |
| We will need an angle sensor (potentiometer), a pinpad, an LED, a speaker, AA batteries, and a motherboard.  The estimated time to put it together and properly code the sensor and alarm would be about a week. | | | |

\*Refer to your prototyping plan for the key take-aways to include in these sections

| **Intellectual Property** | | |
| --- | --- | --- |
| **Favorability** | **IP Landscape** | **Comments** |
| ... success growth graph | No existing prior art |  |
| Little existing prior art | Not many products use a potentiometer system to measure the degree to which a door is open. |
| Some existing prior art |  |
| Extremely crowded |  |
| **In specific terms, what does your concept do?** | | |
| The angle sensor measures the angle between a door and the side of the refrigerator. The angle sensor then compares this against a calibrated value of when the refrigerator is closed. If the angle sensor reads that the door is open without someone having put in a valid code on the pin pad, it will set off an alarm. | | |
| **What aspects of your solution are useful (utility)?** | | |
| Since the installation of this device is at the location of the hinge, the device will clearly not be obstructive to the user at all. | | |
| **What aspects of your solution are non-obvious?** | | |
| The non-obvious aspects of the solution are the calibration of the sensor in the closed position, and the desired timings for the alarms. In addition, the ability to know the degree to which the door is open can also alert users in cases where the door may be slightly open. | | |
| **What aspects of your solution are novel?** | | |
| There are no products currently fitted for refrigerators that use a potentiometer as a sensor to determine if the door is open. This allows for a novel solution that will be very sensitive and will have a more true to life digital image of how much the door is open as opposed to a binary open or closed. | | |