**(Added to Paper)**

**Manufacturability Constraints**

During the process of designing the S.M.A.R.T. Alarm system’s devices, an important manufacturability constraint to take into account is the availability of the selected components. This can be factor when selecting smoke and fire detection sensors, which are more rare and are often found to be on backorder, as well as the microcontroller that might be used for the Hub. This is important to consider, as using components that are harder to find, may really extend the time it takes to deliver the system for the client, which is not very good for marketability purposes. Using parts that are in scarcity will also make it more difficult to find good prices and to mass manufacture a device.

The availability of these parts while prototyping the devices will also be a constraint, as many components may not be as easy to obtain for the S.M.A.R.T. Alarm System team due to lack of stock or the expense of the component. One way to account for this is employing the use of 3D printed components that may be designed and printed in-house using the machine lab at the University of Central Florida. This will allow our team to create a prototype that’s representative of the final product while dealing with these manufacturability constraints.

**Sustainability Constraints**

The S.M.A.R.T. Alarm System has a sustainability goal to be able to guarantee a life span for the sensors and the system for at least 10 years under assumed normal conditions. The constraints on sustainability rely mostly on the level of maintenance the client can provide as well as the life of certain components of the system, such as the smoke detection sensor employed.

Regular maintenance will not be required for the system, as most components that require attention will be closely monitored by the Hub itself and if something is not working as it should be, notifications will be sent to the client so that they may be addressed. These may be include the backup battery dying, a disconnected Fire Alarm or even malfunction of the sensors. Any updates necessary to the Hub software will automatically update as well. Certain factors that will affect the sustainability and durability of the system, rely mostly on the exposure to extreme environmental conditions such as extreme heat caused by fire. Any physical damage can be avoided by placing the fire alarms in locations that are hard to normally reach, and thus placing it out of accidental harm’s way. The Hub should be housed ideally in an office or computer/server room, so that care may be taken with it and accidental physical damage does not occur that could lead to problems down the road.

Survivability of the product is another sustainability constraint that is taken into account when designing this system. The system is meant to last decades as clients will want to avoid upgrading their fire alarm system every few years, due to sheer inconvenience. This is why the components of the devices must be implemented with durability in mind, as well as the Hub and the software used to monitor the building should hold well over time, as the factors it takes into account do not rely on changes in technological advancements, and transcend time.

**Time Constraints**

Time constraints on this project are taken into account very closely, as there is a priority in ensuring that the S.M.A.R.T. Alarm System is finished by the end of Senior Design 2. This project is meant two last over two semesters of constant work, and any design and prototyping must be done with this in mind. A design that takes a long time to implement or debug can be detrimental to the success of this project and the S.M.A.R.T. Alarm System. There are many different features that could be added using this system as a base, however many of these features may reach outside the scope of this project, as they are not critical and may take too long to implement. These will be considered for the future and further development of the System beyond Senior Design. The priority is to implement the primary features.

Adhering to a strict project timeline will allow the team to address any time constraints, and should be followed as best as possible. The project timeline can be found under the Administrative section in this document. It is also important to also consider future steps, as many may require the ordering of parts and other such things that take time, and waiting for parts is not an efficient use of time.

**Testing/Presentation Constraints**

There are several constraints to address when it comes to testing and for the presentation. As our project deals with detecting smoke and fire, a sensor must be used that can detect either fire or smoke in a manner that avoids creating a large fire in order to maintain a safe and low risk testing environment. The presentation must also simulate the layout of a building without spreading out the Fire Alarms and rather setting it up in one room. This can be circumvented with using a white board where a fictional building layout can be drawn.