RoomSense

Product Vision

Executive summary

This document provides a common vision of Team 3 and KdG for the RoomSense project. Here you will find the problem statement, the stakeholders and a summary of the requirements for the system under development. These elements are elaborated further in other documents.

Document management

References

Name	Source	Author	Version
[1]			
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Delivery

Name	confirms	Date	Signature
Abel Turlej *Jasper Marichal*	Correctness and completeness	25/09/2023	We agree
Roman Gordon	QA	08/10/2023	Agreed
Boldizsar Olajos *Anna Vorozhtsova*	Acceptance	08/10/2023	Agreed

Contents

1. Positioning

1.1 Problem statement

The problem of	*inefficient space and usage management in classes, offices etc.*
affects	*students, employees and other people occupying public limited spaces*
The impact of which is	*the users of the space are forced to work in a poor environment, leading to discomfort and decreased efficiency*
a successful solution	*provides an automated system indicating the most optimal usage of a given space, leading to a better usage of spaces, increased satisfaction and better efficiency*

1.2 Alternative solution

1.2.1 Legal regulations of the size of working/studying spaces

Crowded, uncomfortable spaces would be less of a problem if there was a legislation regulating the standard size of spaces, considering the amount of people located there. The recommendations could be based on experiments using measurements like air quality and psychological comfort of the subjects.

A positive side of this solution would be a standardised indicator to follow. That would remove the possibility of work abuse in the form of providing the workers with inadequate, harmful space to work in. Also, in case of schools, the legal indicators could take into consideration that children are more energetic and need more frequent breaks that include physical activities, so the classrooms should be adjusted to that.

The first issue with this solution is the limited space available in cities - sometimes companies/schools would benefit greatly from more offices/classrooms, however there is simply not enough available space to use. Buildings are limited by other ones.

The next issue is the costs - the more densely populated the area, the more expensive the land is. Small businesses and schools usually don't have the budget for additional space, which leads to even more additional costs like salaries for the increased cleaning staff. Especially schools and universities, dependent on public funding, wouldn't be able to comply with the new legislation, which would naturally favour large, private corporations.

Finally, the research needed to find the correct measures that could be used in the legislation would take a lot of time and money. The experiments would have to be conducted in varied spaces and during different seasons to capture the range of possible variables affecting the comfort in a given room. Also, "comfort" is a very subjective measure, so it would be difficult to come up with a universal standard.

1.2.2 Shorter working/study hours and more frequent breaks

The discomfort in limited spaces is often caused by the stuffy air linked to large groups of people sitting in closed areas for a long period of time. A possible solution would be to decrease the time workers/students spend in one place.

Introducing a shorter work week or a home office system would mean that the workers would have more freedom when it comes to the choice of the space they occupy. Not only would that prevent stuffy, crowded and uncomfortable spaces, but also it would lead to a more active and healthy lifestyle. Moreover, many studies already proved that shorter hours lead to an increased work efficiency. In case of students, especially children, it would favour the naturally more energetic lifestyle of young people, leading to an increase in general well-being.

Just as the shorter work week doesn't seem to have any significant downsides, limiting the study hours would affect the quality of education. Some of the material would have to be removed from curricula, meaning possible gaps in education. Already, schools face the problem of often not being able to execute their courses - limiting the hours would deepen the issue.

These changes would be a very serious legal venture. The topic of a shorter work week has been discussed in many countries, and it has a strong opposition, especially coming from the more conservative circles. If there was a nation-wide voting, there is a chance that the proposition would be rejected. And if there was no voting, there could be protests, especially supported by employers who would maintain that the work efficiency would drop. The law could be the source of another political division and controversy.

1.3 Better ventilation in limited spaces

A simpler solution to the problem of stuffy air would be popularisation of air conditioning in office/school spaces. Many offices are already equipped with it, however it's not always popular in some European countries, especially the ones that used to have a colder climate.

Schools usually don't have AC, so equipping them with modern air conditioning would improve the comfort of students.

The most important issue with this solution is the cost. As mentioned before, schools often struggle with poor funding, so they wouldn't be able to afford modern AC systems. Also, a lot of them are located in old, historical buildings that aren't designed for such technology.

Another issue is that AC solves only the problem of stuffy air, but doesn't do anything about crowds. Crowded rooms, even equipped with AC, remain uncomfortable and limit work efficiency.

Finally, air conditioning contributes to climate change. Just as it provides relief from heat, it consumes a great amount of energy and supports the green gas emission due to the chemicals used to cool down the air. Making it an even more common thing would mean a tragedy for the already strained environment. This might be the most significant disadvantage of this solution.

2. Stakeholders

2.1 Student planner

Description	The people that make the planning and timetables for school.
Responsibilities	- Allocates all rooms for every class - Helps to make switches in schedules
Success criteria	When the stakeholder can allocate the best room for every type and size of lecture.
Remarks / Issues	

2.2 Student

Description	They go to class to learn something in a classroom.
Responsibilities	- Pass all classes - Come to classes - Be focused in class
Success criteria	When they can focus a whole class and feel comfortable in a room without complaining it's too busy/hot etc.
Remarks / Issues	

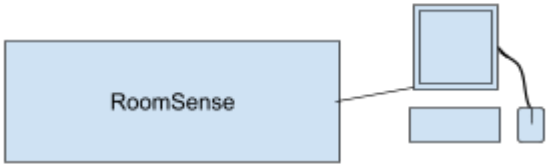
2.3 Companies

Description	Big companies with a lot of people working in different spaces
Responsibilities	- Providing comfortable work environments - Providing rooms for meetings and presentations
Success criteria	Happy employees, working in a comfortable work environment
Remarks / Issues	

3. Product overview

3.1 Product perspective

The product is connected to a pc. The Arduino gathers independent, all data from the sensor. We get the information out of the Arduino by connecting it to a pc with the program we wrote.



3.2 Summary of capabilities

- Measures how many people are in the room
- Measures the temperature level of a room
- Measures the humidity level of a room
- Measures the CO2 level of a room
- Warns, when there are too many people in the room and CO2 etc…
- Measures sound level of a room
- Calculates with all data the optimal capacity and use of a room. (Amount of people, type of lecture)

3.3 Architecture

- CO2 sensor
- Sound sensor
- Temperature/ humidity sensor
- Arduino board
- Bread board
- Resistor

3.4 Cost

- Lending the arduino box is free.
- Laptop we already have
- We bought a CO2 sensor for 40 euros.
- We bought 240 cables for 13 euros