Infection Safe Workplace Modelling

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Abstract

1. The Covid-19 pandemic has transformed the dynamics of the workforce and the workplace. Being affected by Covid-19, organizations had to mitigate the risks of workplace safety and their negative effects on the health of employees and society. A safe work environment is a critical factor in limiting the spread of infection and technologies can enable it. This paper describes a case study of 4EM method application for safe workplace modelling. The model is used for the communication and validation among different groups of stakeholders. It is the foundation for the Covid-19 safe workplace platform. The main goal of the spread of platform is to reduce the infection among employees on the workspace. The main sources of information for the platform are sensors, which are used to measure parameters of the working environment, such as CO2 ppm, the number of people in a room, the discipline of masks and the virus concentration levels of wastewater virus concentration. The 4EM (For Enterprise Modelling) diagram contains critical concepts that can allow minimization of infection risk in the workplace, which are entities, processes, business roles, and requirements of the information system.

Keywords

Infection-safe workplace, Covid-19, 4EM, IoT, sensors, enterprise modeling

1. Introduction

The Covid-19 pandemic has caused different types of challenges for organizations. Being affected by Covid-19, organizations had to substantially modify their operation patterns to avoid supply chain failures, adapt services to customer demand, and mitigate workplace safety risks and their negative effects on the health of employees and society in general [1].

The World Health Organization [2], highlights the importance of the safe work environment. A safe work environment is a critical factor in limiting the spread of infection. The safe work environment is particularly important for organizations that due to their specific nature cannot provide full or partial remote work; it is a prerequisite for maintaining their business and jobs to mitigate the economic downturn at the national and global level in the pandemic situation.

The safe workplace consists of many factors that include regulating both human resources and environmental resources. By the combination of monitoring the environment around the employees and the employees it is possible to create a safer work environment, but for that to happen, an autonomous solution is needed, which could be always available.

The 4EM (for Enterprise Modelling) is a well-known method for complex environment modelling, which facilitates the present situation and a future situation oriented to goals [3]. The method is an instrument for problem solving that supports enterprise transformation, IS design, and is useful in various other contexts [4]. This article describes a case study of the application of the 4EM method to modeling safe workplaces in an applied research project. The model was used as a common communication tool between various stakeholders with different concerns (IT consultation company, enterprises representatives etc.). The model will be used as basis for the platform for Covid-19 safe

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work environment design. The proposed 4EM diagram contains all critical parts of the platform that are needed to ensure that employees are as safe from Covid-19 at work as possible.

The rest of the paper is organized as follows. Section 2 reviews related existing work and Covid-19-safe workplace requirements, allowing one to better understand what needs to be ensured. Section 3 contains and explains the 4EM model and all entities included in the Covid-19 safe work environment platform. Section 4 contains the conclusions and future work regarding the created 4EM Covid-19 safe workplace platform.

2. Background

This section focuses on research papers that share the same goal of creating a disease-safe workplace environment. Similar articles were compiled and analyzed, allowing to combine all of the good practices into creating a universal platform that would decrease the risk of infections in the workplace.

2.1. Related Work

The safe work environment design is investigated in several research papers [1], [5], [6], [10], [19]–[22]. The research papers solution is aimed to increase the Covid-19 indoor safety. It succeeds by covering several aspects that influence the environment in the office, such as temperature detection, mask detection, and checking if social distancing is complied with [5]. By having these factors under control, it is possible to create a working environment with a lower chance of disease to spread. Through the effective usage of IoT devices, it is possible to manage and maintain the workplace according to the rules of the national legislation.

The use of IoT to ensure infection safe workplace is a globally identified opportunity [5]–[7]. IoT technology has been widely used in both – healthcare monitoring [8]–[10] and building and facilities management [11], [12], as it has capability to sense, share and transfer data trough interconnected devices network.

Otoom et al. propose the use of the IoT framework to collect real-time symptom data from people for potential infection identification and treatment response monitoring [6]. The solution analyzes potential Covid-19 case information and health records of confirmed Covid-19 cases. Symptoms and health record data are used as ground for a ma-chine-learning-based predictive model for disease and treatment response analysis.

Petrović and Kocić [7] introduce an IoT-based system for monitoring indoor safety. The system helps organizations ensure and control the Covid-19 safety rules and guidelines in order to reduce the spread of the disease. The system senses persons temperature, analysis social distancing and detects masks wearing discipline.

The Covid-19 standard operating procedure compliance system enabled by IoT is proposed in [5]. The system counts the number of people in the premises, ensures physical distancing, monitors the body temperature of the employees, and warns responsible persons about violations of internal rules violations. The system processes real-time information from sensors and provides compliance measures in dashboard, which can be used to monitor and assist in Covid-19 standard operating procedure application across organization.

Al-Humairi proposes IoT based smart infrastructure monitoring system for suspected infection cases real-time identifying and tracking[13]. The system collects real-time symptom data collection via a thermal scanning algorithm, including a facial recognition algorithm; data is analyzed using an artificial intelligence algorithm.

Several research papers also investigate the use of technology in single risk factor measurement and monitoring, as discipline masks [14], [15] or CO2 level control [16].

Besides research results, also several commercial solutions use IoT for safe work-place provision, as Sensware platform [17] and Infogrid Healthy Building System [18]. The Sensware platform monitors air quality and generates warnings when air quality poses risks of COVID infection. The Infogrid Healthy Building System monitors the quality of air, the load / use of the building, the frequency of cleaning, the safety of water (water flushing needs, temperature) and the satisfaction rate of users. The

platform allows generating warnings and standard recommendations (e.g., to start venting, to discharge water, to perform cleaning).

The need for the Covid-19-safe work environment has arisen relatively recently; thus, the solutions currently on the market are generally still experimental and there are no strong market leaders in the supply of similar products. The solutions available in the market to support the Covid-19-safe work environment primarily cover one of the risk factors, such as air quality monitoring or monitoring of compliance with the distancing requirements. Monitoring models cannot be supplemented with new diffusion models and risk factors. The solutions do not provide recommendations for adjusting the set of measures according to the company topology. The existing solutions do not include early warnings about the approaching potential outbreaks, which are essential for enterprises to be able to limit outbreaks as soon as possible.

Various mobile applications have already implemented automated management of Covid-19 infection. The primary functions of these applications are to provide Covid-19 related information, check symptoms, and track proven and potentially infected individuals in order to track and control the spread of the infection. One of the primary features of such applications is a self-screening tool for detecting symptoms or exposure. By having an application where the employee inputs his current health status, it is possible to prevent spread of infections in the workplace.[19]

The Internet of Things (IoT) is particularly appealing for use in healthcare applications since it makes data exchange possible through connectivity [8], [20]. An advantage of the usage of IoT is that it enables remote health monitoring. IoT also enables human-to-human, machine-to-human, and machine-to-machine communication without any external intervention. Therefore, it can be a useful tool for implementing and monitoring human social interaction during Covid-19. [7]

Table 1

The main requirements of a Covid safe workplace

Requirement	Description
Mask wearing	Masks must be in place, only allowed mask types should be used, and masks must be properly worn properly [21].
Gathering limitations	Text Mutual meetings of different groups must be avoided, no gathering in places that are not related to the performance of direct work duties [21].
Distancing	the defined distance between persons in the workspace must be ensured and employee flow must be controlled to prevent crowding in premises [21], [22].
Ventilation	Regular ventilation must be performed.
Hand hygiene	availability of disinfectants must be ensured, hand disinfection must be encouraged [21].
Enhanced cleaning	Surfaces and cleaning and disinfection [21].
Area entrance eligibility	eligibility must be controlled (COVID-19 vaccination or recovery certificate validity checks, self-declaration checks) [21].
Employee health control	taking tests (rapid/antibody tests), providing valid vaccination or recovery certificate [21, 22].
Vaccination	Vaccination is recommended for the public [21].

Requirement	Description
Covid-19 certificate	Employer must check if employees have valid vaccination or recovery certificate [21].
Contact person detection	Employer should detect contact persons. The employees must take home quarantine [21].
Employees self-declaration	The employer must provide self-declaration forms & control their submission and content [21].
Responsible person	The employer must assign the responsible person. The employee (responsible person) must monitor and control the compliance of the organization with regulations and measures [21].

By having the key safe workplace requirements compiled from 01/01/2022 to 01/07/2022, it is possible to have the platform adapt to any kind of pandemic situation since it contains very strict pandemic measures and very loose measures.

3. Design of a Safe Work Environment

In addition, to better understanding of the platform, a 4EM diagram has been created. It consists of a goal model, actor and resource model, business role mode, business process model,, a concept model and a technical component and requirement model. Each of the previously mentioned models focuses on a particular aspect of the platform and by combining them together a complete platform can be created and understood. The model focuses the on both technical systems and on the available human resources. The developed model allows us to understand how the infection-safe work environment platform works. Showing what the goals are, how can the goals be achieved, which components and actors are responsible for it and showing the business process that should be done for the platform to work effectively. With the creation of such a model the whole process is better understood, and many vulnerabilities can be identified at an early stage. With the combination of all the models mentioned, a less infectious workplace can be achieved.

3.1. The Goal Model

The goal model is used to represent the goals that the platform is aiming to achieve. By creating this model, it is also possible to visually demonstrate the factors that prevent a goal from being achieved. The main goal was to limit the spread of the infection on the job (Goal 1). To achieve the main goal, it is necessary to set several subgoals that, if successfully achieved together, will also form the main goal.

In *Figure 1* the goals, threats, and vulnerabilities in the platform can be seen. Each color has its own purpose, blue represents the goals, red represents threats, and the yellow color represents weaknesses identified in the process. The goals and their description can be seen in Table 2.

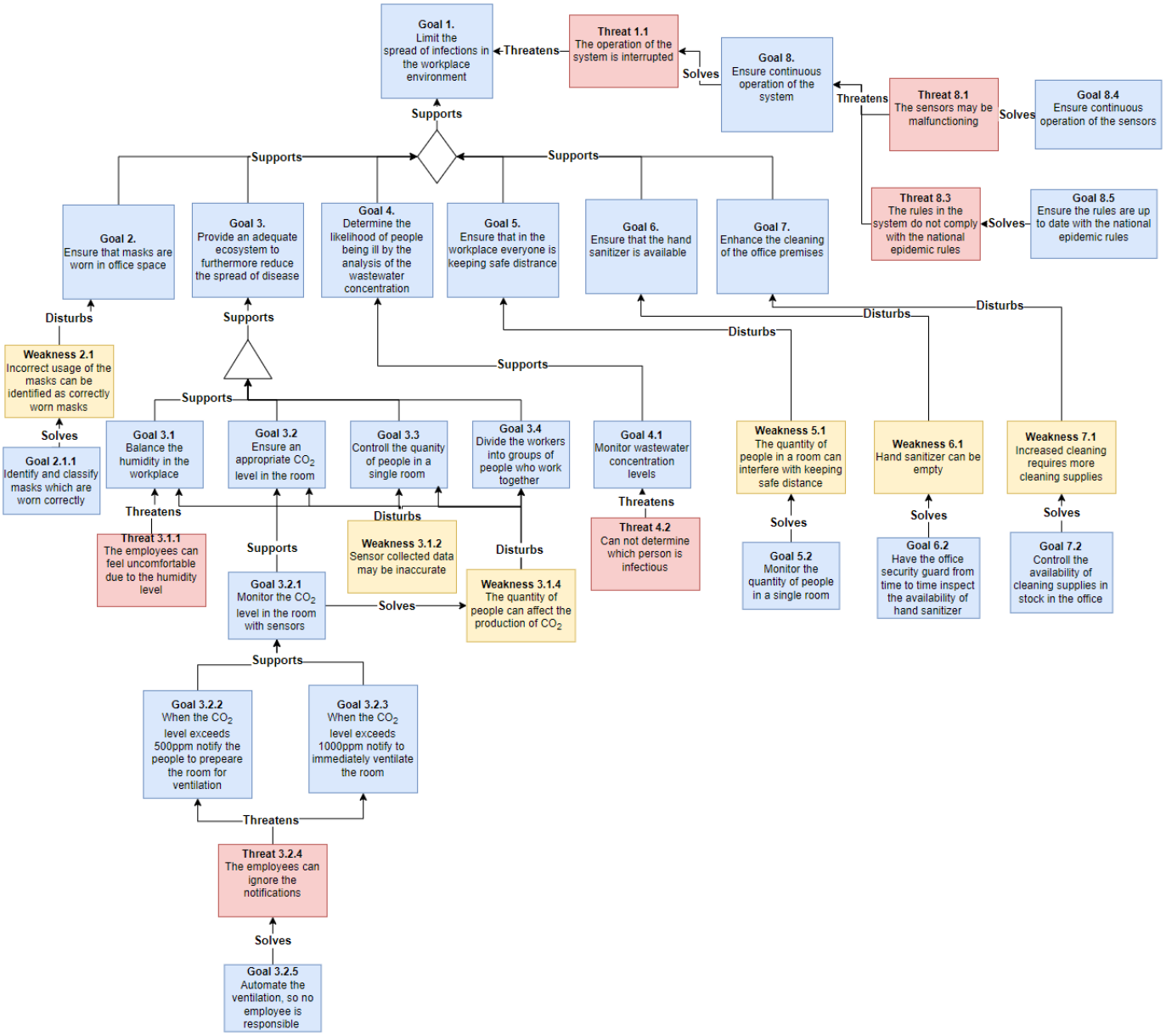

Figure 1: The Goal Model

The main goal of the model is *Goal 1*, which is to limit the spread of infections in the workplace environment. To reach the main goal, it is necessary to split it into several smaller subgoals, since limiting the spread of infections in the workplace environment not only requires environmental changes but also requires changes in human day-to-day behavior, by having rules which limit their encountering, quantity of employees in a single closed area, time spent in a room, ensuring that sanitizer is always available, and masks are worn in the office premises. The subgoals are a combination of safety requirements and environmental requirements in the workplace, and having the requirements set as goals is possible to reach the main goal.

To better understand the goals, threats, and weaknesses, which are in the goal model, a brief description of the goal entities is available in Table 2.

Table 2

The goals and their description

ID	The Identified threats	Description
1.	Limit the spread of infections in the workplace environment.	This is the main goal, which is the target to be reached. Combining all the goals will lead to the main goal, which is limiting the spread of infections on the workplace.
2.	Ensure that masks are worn in the office space.	This is a subgoal to reach the main goal. Ensuring that masks are worn in the office space will comply with the national epidemic regulation and will help reduce the spread of bacteria in the workplace environment. This is a crucial goal, which needs to be met.
2.1	Identify and classify masks that are worn correctly.	The usage of masks can be interpreted in many ways, since the start of the pandemic many people wear it under the nose, which does not comply with the National epidemic regulation. Therefore, it is crucial to identify which masks are worn correctly and which not to furthermore decrease the spread of bacteria in the workplace.
3.	Provide an adequate ecosystem to further reduce the spread of disease.	This is a crucial goal which will help to reach the main goal, it includes many other sub-goals to be reached, since the ecosystem consists of many factors.
3.1	Balance humidity in the workplace.	This is a crucial subgoal that allows to reach the goal of providing an adequate ecosystem to reduce the spread of disease. Humidity is one of the factors that influences the spread of diseases.
3.2	Ensure an appropriate CO_2 level in the room.	This is a crucial sub-goal which allows us to reach the goal of providing an adequate ecosystem to reduce the spread of disease. Inappropriate levels of CO2 are one of the factors that influence the spread of diseases.
3.2.1	Monitor the CO_2 level in the room with sensors	To reach goal 3.2. It is necessary to automate the monitoring of CO_2. Automation would allow people to be notified when it is necessary to take a break and ventilate the room.
3.2.2	When the CO_2 level exceeds 500ppm notify the people to prepare the room for ventilation	Since 500ppm is not a danger zone, it would notify people to prepare the office for ventilation, so that the CO_2 ppm would decrease,
3.2.3	When the CO_2 level exceeds 1000ppm notify to immediately ventilate the room	This is already a danger zone, and the room where the CO_2 ppm reaches over 1000 ppm, should be immediately ventilated.
3.2.5	Automate the ventilation, so no employee is responsible	People can be notified that the CO_2 levels in the room exclude the limit and can easily be forgotten while working. An automated ventilation system that does not depend on the human is necessary.
3.3	Control the quantity of people in a single room	Since one of the national epidemic regulations is people in a single close area room. The number of people in a room should be limited.
3.4	Divide the employees into groups of people who work together	When employees are in working groups, their time spent together in a single closed area room can be longer as it does not pose a threat of spreading the infection to other groups of employees.
4.	Determine the probability of people being ill by analyzing wastewater concentration	Since it is possible to already know if the body is approaching the onset of the illness due to the concentration in the feces, it is possible to know in advance if some of the employees are approaching the onset of the illness.
4.1	Monitor wastewater concentration levels	With an automated solution of wastewater concentration monitoring, it can be seen when someone in the office is on the onset of the disease and puts the whole office in a work from home regime to lessen the spread of the disease.

5.	Ensure that in the workplace everyone is keeping safe distance	One of the National epidemic regulations was to keep safe distance between people.
5.2	Monitoring the quantity of people in a single room	Since it is a necessity to keep a safe distance, it can sometimes be impossible due to the quantity of people in a single room and the area of the room. To decrease the risk a solution to monitor the quantity of people is needed.
6.	Ensure that the hand sanitizer is available	The goal would let people disinfect their hands when they come in the office from outside and whenever they feel the need.
6.2	Have the office security guard from time to time inspect the availability of hand sanitizer	Since the office guard has to go around the office from time to time, it can be combined to inspect the levels of hand sanitizer and when it runs out, the person would be responsible for topping up the hand sanitizer. It does not require automation since the demand and usability of the hand sanitizer in the office is unknown.
7.	Enhance the cleaning of the office premises	Furthermore, to reduce the spread of bacteria in office premises, more cleaning is required, as it can improve cleanliness.
7.2	Control the availability of cleaning supplies in stock in the office	Since it is necessary to enhance the cleaning in the office and hand sanitizer is a necessity to always have in stock cleaning supplies according to the new cleaning schedule.
8.	Ensure the continuous operation of the system	This is a crucial goal, which needs to be reached, to furthermore increase the limitation of infection in the workplace, the platform must be always available.
8.4	Ensure continuous operation of the sensors	For the platform to work correctly, sensors are a crucial part, they need to be always available and providing data to the system for it to ensure continuous operation.
8.5	Ensure that the rules are up to date with the National epidemic rules	The constantly changing rules should always be up to date with the national epidemic rules since they are created to reduce the spread of diseases.

During the process of identifying the goals of the Covid-19 safe workplace platform, threats that interrupt the ability to achieve the set goals have also been identified as well. The identified threats and their descriptions are available in Table 3.

Table 3

Identified threats in the Goal model

ID	The Identified threats	Description
1.1	The operation of the system is interrupted	The operation of the platform can be disrupted, and it can malfunction. For it to have an impact on the office it is necessary for it to be always available.
3.1.1	Employees can feel uncomfortable due to the humidity level	Due to the automatic control of humidity, it is necessary to know if some of the employees might feel uncomfortable with the humidity level.
3.2.4	The employees can ignore the notifications to ventilate the room	Since it is a working environment, a notification might not be enough to alert the people in the room of the CO_2 levels, and they might forget it.
4.2	Cannot determine which person is infectious	The wastewater concentration would represent the situation in the entire office and it cannot determine which person is approaching the onset of the illness.
8.1	The sensors may be malfunctioning	Sensors could provide data that do not represent the situation in the office. In the dataset some anomalies can be identified.
8.2	The rules in the system do not comply with the national epidemic rules	For the platform to fully serve its potential, it needs to be always updated with the national pandemic rules.

Some of the less influencing factors on the model have been marked as weaknesses, which can be seen in the following Table 4.

Table 4
Identified weaknesses in the Goal model

ID.	The Identified weaknesses	Description
2.1	Incorrect mask usage can be identified as correctly worn masks	Since masks usage vary from people it should be controlled, because some wear it under the nose which provides less effect than a mask worn over the nose.
3.1.2	Sensor collected data may be inaccurate	The provided data of the sensors can be inaccurate thus giving false information about the office premises.
3.1.4	The quantity of people can affect the production of CO_2	Since the quantity of people can affect the production of CO_2 it needs to be taken in account that it could be not possible to reach optimal CO_2 levels.
5.1	The quantity of people in a room can interfere with keeping safe distance	Due to the lack of area in a room, it must be considered that maintaining distance between people is impossible.
6.1	Hand sanitizer can be empty	Since the usage of a hand sanitizer varies, it should be monitored from time to time, so it is always available to employees.
7.1	Increased cleaning requires more cleaning supplies	One of the goals is to enhance cleaning of the office, thus requiring more office cleaning supplies.

By having created the goal model, which contains goals, threats, and weaknesses, it is possible to have a clear vision of the Covid-19 safe workplace platform and which aspects of the platform need more attention in the creation process. The identified weaknesses and threats are not complete since the ever-changing legislation of epidemic rules can interfere with the platform. Therefore, the weaknesses and the threats must be updated simultaneously as the legislation rules.

3.2. Business role model

The business rule model shows to which goals it applies and supports. The business rule model allows to define activities – which must be followed, thus allowing to achieve the set goal. The rules show the goals they support and relate to, as well as link processes and controls to them.

Table 5
Description of the entities in the business rule model

ID	Business Rule	Description
1.	Periodically conduct a survey on the comfort of the premises	This survey would allow to identify whether the employees feel comfortable in the office, allowing to adjust the ecosystem in the office to make the employees feel more comfortable.
2.	Wastewater concentration being > 10^7 set work from for every employee	Wastewater concentrations greater than 10^7 is an indication that the office is infectious and setting up remote work could help prevent the disease from affecting it.
3.	Stock up on household supplies before they run out of stock in the office	Since the office requires more cleaning, it is necessary to stock up on them, to always be able to clean after the employees, thus reducing the spread of bacteria.
4.	Purchase disinfectants according to their mode of use	Hand sanitizer and other disinfection product usage may vary through the office and stocking up too much would be a waste.
5.	Maintain the premises according to the specified requirements	Maintenance should be done in accordance with the National Pandemic legislation. The maintenance of the premises according to them would create a safer workplace environment for employees.

ID	Business Rule	Description
6.	Ensure that people in the office keep a distance at least of 1m.	Since the room vary in area, it is necessary to set a rule for the employees to keep at least 1m between them.
7.	Monitor the workload of the office and divide people in groups	Dividing people into workgroups would allow more of them to be in the same room for a long period of time, since they would be together for the whole day, thus limiting the spread of disease between the group.
8.	Calibrate the sensors if an anomaly in the data has been detected	Since the platform depends on the information the IoT sensors provide it is necessary to calibrate them, for them to provide more accurate information.

The business rule model allows to better understand what actions must be taken to reach the goals that have been set initially. The business rule model limits the possibility of malfunctioning on the platform.

3.3. Concept Model

The concept model is used to precisely define thing and occurrences, as well as to define data and concepts. The model shows the relationships in the organization and their properties. It is intended to reflect the reality of the system. There may be a variety of links between multiple realities in the concept model. There are two key elements in the concept model, the concept and reality. The concept is located in a modeling area and is desired to analyze and characterize through attitudes with other realities. Reality is an attribute indicating the characteristics of a given reality. Attitudes are a certain type, which is the link between realities. The created concept model for the Covid-19 safe workplace can be seen in Figure 2.

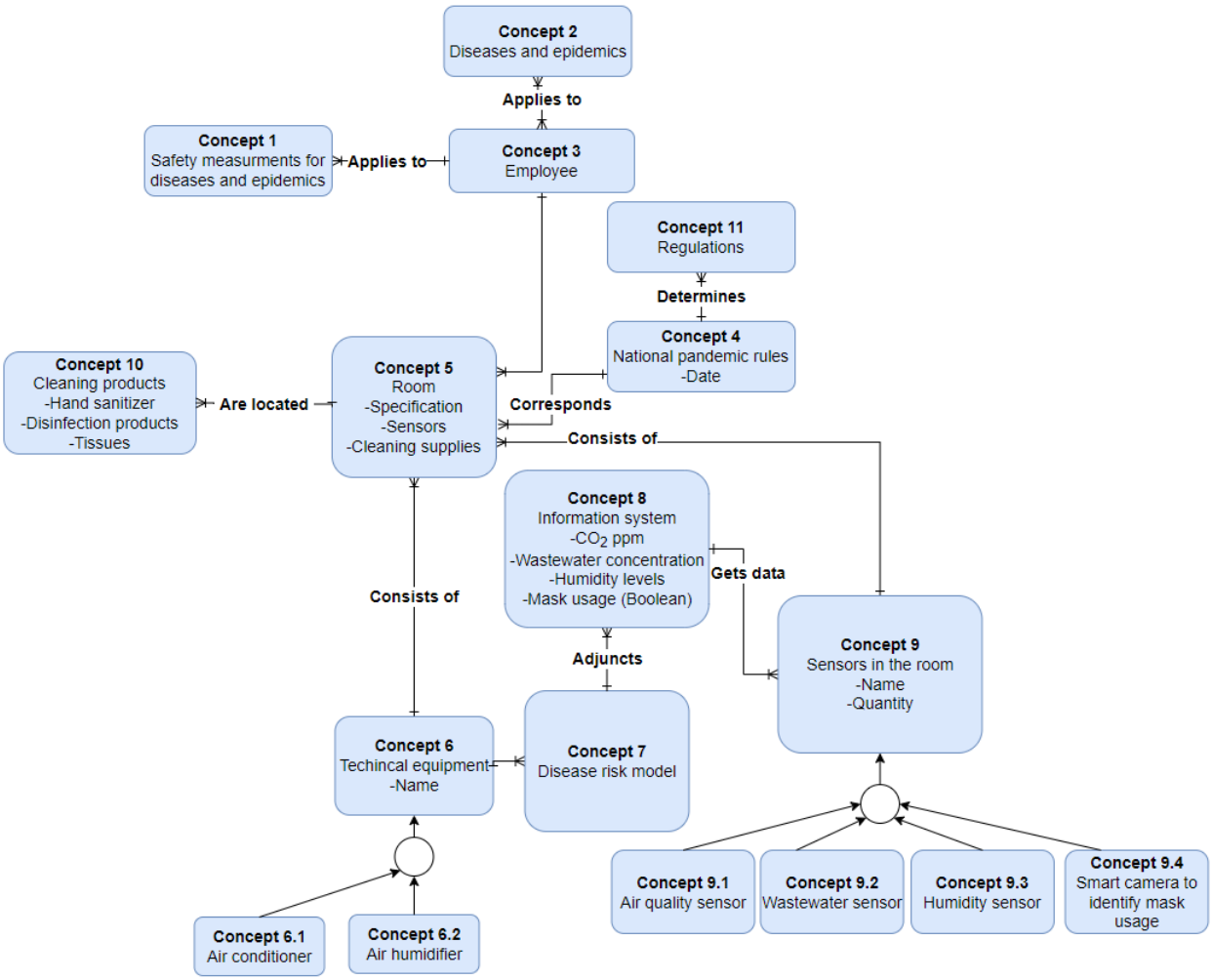

Figure 2: Concept Model

The concept model contains entities that are fundamental in the creation of the Covid-19 safe workplace platform. A brief explanation of the concepts can be seen in Table 6.

Table 6.
Concept model entities and their description

ID	Concept	Description
1.	Safety measurements for diseases and epidemics	This concept shows that safety measurements apply to the employees.
2.	Diseases and epidemics	This concept shows that the diseases and epidemics apply to the employees.
3.	Employee	An employee is the one who applies the safety measures for diseases and epidemics to.
4.	National pandemic rules	This concept has an attribute, the date. Where the rules applied to could be sorted by date.
5.	Room	This concept has 3 attributes. Specification, which describes the room, sensors, which describes what kind of sensors are in the room and cleaning supplies to know what supplies are needed to disinfect the room.
6.	Technical equipment	This is one of the most important attributes, since it shows what kind of technical equipment is in the room.
6.1	Air conditioner	Type of technical equipment, which is related to Concept 6.
6.2	Air humidifier	Type of technical equipment, which is related to Concept 6.

ID	Concept	Description
7.	Disease risk model	The risk model is a crucial part, since it regulates technical equipment based on IoT data.
8.	Information system	This is a crucial part, it has attributes, such as Co_2 ppm, wastewater con centration, humidity levels, and mask usage which is a Boolean value. The values pass through the risk model and adjust the technical equipment in the room.
9.	Sensors in the room	This is one of the most important attributes, since it shows what kind of IoT sensors are in the room.
9.1	Air quality sensor	Type of sensor, which relates to Concept 9.
9.2	Wastewater sensor	Type of sensor, which relates to Concept 9.
9.3	Humidity sensor	Type of sensor, which relates to Concept 9.
9.4	Smart camera to identify mask usage	Type of sensor, which relates to Concept 9.
10.	Cleaning products	It shows what kind of cleaning products and sanitizers are available to a room.
11.	Regulations	The national pandemic legislation determines the restrictions, which directly apply to concept 4, and the date on which they are accepted.

3.4. Actor and Resource Model

The actor and resource model defines every single entity which is included and involved in the platform's activities. This is a crucial model since the roles in the Covid safe workplace platform must be complied with. The actor and resource model can be seen in *Figure 3*.

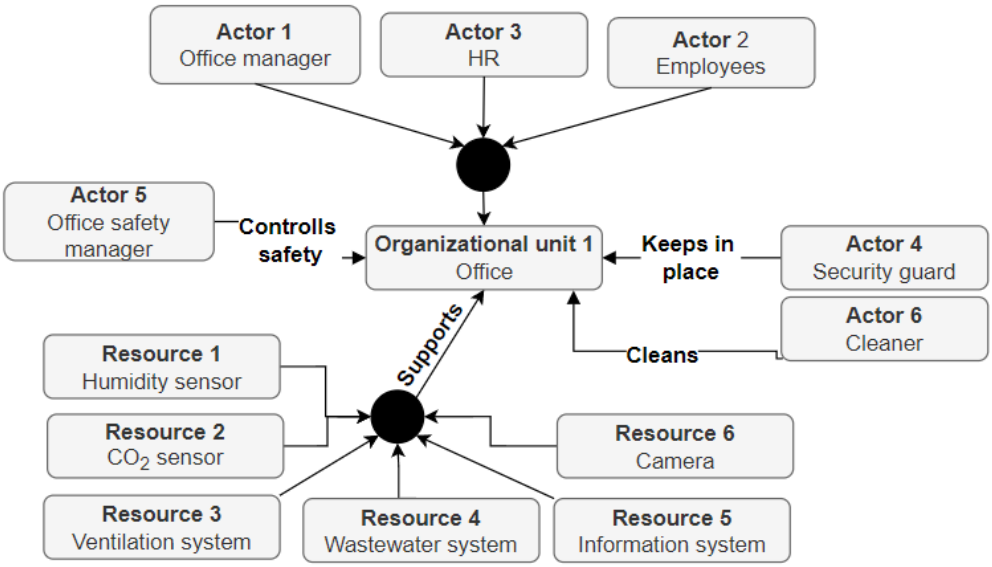

Figure 3: Actor & resource model.

A brief description of the actors involved in the model can be found in Table 7. And the resources available can be seen in
Table 8.

Table 7
Actors and their description.

ID.	Actors	Description
1.	Office manager	The main responsibility is making sure the cleaning schedule is up to date for the office and making sure cleaning supplies are always available.
2.	Employees	The main actors the platform is aimed at, they are responsible for answering the survey and responsible to take notice of the rules in the office.
3.	Human Resources	The person responsible for conducting and collecting the employee survey.
4.	Security Guard	Is responsible for keeping the office safe and replenishing the hand sanitizer when its low.
5.	Office Safety manager	Is responsible for updating the rules in the office according to the National Pandemic legislation and as well as introducing them into the office
6.	Cleaner	Is responsible for enhancing the cleaning of the office.

Table 8
Resources and their descriptions

ID.	Resources	Description
1.	Humidity sensor	The humidity sensor is responsible for keeping the humidity in the office at a set level, which would decrease the spread of bacteria.
2.	CO_2 sensor	The CO_2 sensor is responsible for notifying the employees when the room is ready for ventilation due to too much CO_2 in the room.
3.	Ventilation system	When CO_2 levels have been exceeded and employees have been notified, the ventilation system is activated to dispose of the generated CO_2.
4.	Wastewater system	The analysis of wastewater concentration would allow us to have a better understanding of the current health situation in the office. Allows the user to know ahead of time whether someone in the office is on the edge of becoming ill.
5.	Information system	Contains data of employees, current regulations, past regulations, CO2 levels in the office, humidity, quantity of people in a room, and when it was last cleaned.
6.	Camera	Allows detecting the temperature of people, whether social distancing is in place, and the quantity of people in a single closed area room.

3.5. Platform Requirements

The model shows the objectives and requirements of the platform and allows one to see every connection with the platform. The model consists of goals and requirements.

As the main goal is to store data on employees and on epidemic limits. The requirement to achieve this objective is to comply with the GDPR for storing information about the employee, as well as the rules of all previous for the epidemic. The model helps to understand very well what the system needs to progress and where to focus. As well as the requirement for risk monitoring, which consists of several requirements: to determine risk monitoring, to determine the humidity of the air, to determine the quantity of people in a single room, to determine employee time spent together, to determine the CO_2 levels in a room, to determine whether a mask is worn, to determine whether an employee frequently touches his face, to divide people into workgroups, to determine the occupancy of a room, to monitor the concentration of wastewaters and to ensure safe distance keeping between the employees.

4. Conclusions and Future Work

The article presents the usage of the 4EM method for Covid-19 safe workplace modelling in an applied research project. When creating the Covid-19 safe workplace environment model, a clear flaw of the 4EM modelling method was noticed. Since the pandemic rules are constantly being changed and updated, it means that the model has to be adapted to the current rules as well.

By combining the risk model and key safe workplace requirements, it is possible to be led in the right direction into creating a Covid-19 safe workplace. Since the period of time includes both strict and loose rules, it is possible to adapt these rules to create a safe workplace environment, and by measuring the effectiveness of the rules, it is possible to adapt them more to the situation in which it is needed.

The created 4EM model promoted problem investigation and allowed us to better understand how the Covid-19 safe workplace platform must work. Showing what the goals of the platform are and how are they reachable, which components and actors are responsible for certain activities as well as showing the business process model with the tasks that must be done in order to create an infection safe workplace.

The 4EM method usage enabled transparency and communication between the stakeholders with different concerns – researchers, IT consulting company and enterprises representatives. The model was used as a communication vehicle to ensure common understanding and support to consider different viewpoints. It was concluded that the 4EM method enables multidimensional solution design for a particular problem domain and, in the meantime, it is easy to understand for different stakeholder groups.

The model will be used as the foundation in the applied research project for the development of the Covid-19 safe workplace platform. The next activity will be a detailed design of the Covid-19 safe work environment platform**.** The aim of the activity is to develop specific analytic models of the platform and to prepare the system design. The Covid-19 safe work environment platform design will consist of a work environment monitoring design based on sensors and mobile devices and early warning signal monitoring based on wastewater analysis, integrating progressive IT technologies and biotechnology.

5. Acknowledgements

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