

## Your building designs – a unique source of data to fight COVID-19 using Decision Intelligence.

By Robert Walker, Chief Advocacy Officer of Data Innovation.AI Ltd.

Humans excel at causal reasoning, however our "neurological machinery" has limitations especially when trying to make decisions in situations of elevated risk, complexity and uncertainty: in these circumstances we resort to biases and heuristics, for example we can see the "follow the leader" approach (aka *prestige bias*) to decisions being made by US citizens today.

Artificial Intelligence can provide predictions or classifications but is far from being "intelligent" in the human sense. However, good news for us dumb humans, the emerging discipline of **Decision Intelligence** (DI) seeks to overcome both the constraints of the human brain and the cognitive limitations of AI, and adoption is becoming more widespread since the discipline's inclusion in Gartner's Key Trends for the last 2 years:

<https://www.gartner.com/en/newsroom/press-releases/2020-06-22-gartner-identifies-top-10-data-and-analytics-technolo>.

The current COVID-19 pandemic is an exemplar of how Decision Intelligence can be applied in a real-world situation, where businesses need to make informed, high-stakes decisions about which mitigation strategies to invest in. But, to know they are making the right decisions around the novel coronavirus, they need to explore volumes of data, multiple epidemiological and infection models, and work out how those apply to their particular workspace. In most cases it's just easier to apply the minimum regional government guidance and **hope** this will be sufficient.

The science is pretty conclusive that COVID-19 is transmitted through exhalation of respiratory droplets by an infected person. While large droplets fall on surfaces, small droplets or particles can be suspended in the air for hours causing a significant risk of airborne transmission and made worse by "breathing the same air" as other people in inadequately ventilated, indoor spaces.

While this risk is relatively easy to imagine in small offices or shops, you may think that large office spaces are safer given extensive air conditioning. However, the features of buildings and their influence on air flows could be causing concentrations of COVID-19 in certain parts of these facilities. Just as facilities where many people congregate, potentially expose their occupants to fire risk, air quality risk and water safety risk, it is now clear that any large, enclosed structure may pose a **bio-safety risk** to its occupants under epidemic or pandemic conditions.

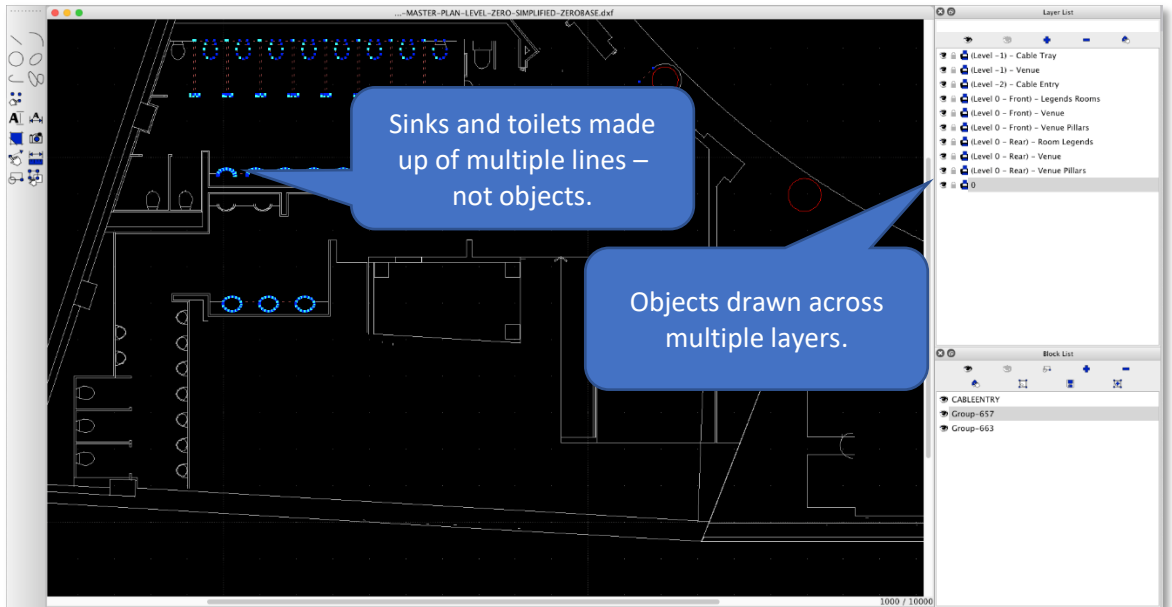
Our initial project work in this area, has revealed that these risks have been continuously present but overlooked until now. This has only really been exposed through the running of AI over thousands of simulations of the building in question. There are four key building blocks to our solution and we've already posted some articles on these to our LinkedIn page:

<https://www.linkedin.com/company/data-innovation-ai/?viewAsMember=true>, however we'd like to share some insight on the two data-driven aspects of any potential solution.

Firstly, this is all made possible by technology advances and a unique approach to simulation. We are used to seeing immersive environments in computer games and we have adapted this for the business world. Computer-Aided Design (CAD) has been used for many years in the construction industry, so any modern facility is likely to have multi-layer electronic CAD drawings. As well as the dimensions of the building and interior, these drawings usually contain information on important features such as air conditioning vent locations, and that information is relatively easy to access via engineering drawing packages.

However, our experience has shown that it's not just as easy as taking the CAD drawings for a particular building and importing to a 3D modelling engine such as Unity. Standards for CAD,

including which layers are applied to which construction artefacts, have been developing over the years and in fact some objects in a building might be created with artefacts spread over multiple layers. Hence ingesting CAD drawings is currently a highly manual process – a barrier to automation of the process and an expensive, no value add, stage of the solution.



**Figure 1 – Example of Construction Drawing issues for CAD Ingestion.**

Hence in our follow-on activity we are focusing on Building Information Modelling (BIM) – the standard for 3D modelling of new building designs. Using this standard, we will be able to more readily automate the creation of the simulation environment, creating a very concise means to deliver our WorkSafeAI solution.



**Figure 2 – 2D CAD converted to 3D simulation environment in Unity™**

Secondly, our objective is to advise business leaders on what they can do to prevent COVID-19 transmission through their facilities, hence we needed a model for how infection spreads within indoor spaces. Although we can see that a large volume of research has been done on the epidemiology of the virus, no single efforts have integrated infection, human movement and facility engineering modelling which can be instantly applied to workspaces. Creating this holistic view has been a key product of our prototype development.

Key to being able to suggest effective mitigation advice is understanding the business operation and objectives. From this we can create an Agent Based Model for occupant movement within the facility. Having built a number of standard mitigations into our simulation, including what the research says about their effect on COVID transmission, we can run thousands of simulations at a wide range of values of the mitigation parameters to observe the effect and model the outcomes over time.



**Figure 3 – The Interactive Dashboard and Results**

I mentioned earlier that our next round of investment is being used to focus on the design of new buildings. However, it is also more broadly applicable to other infections transmitted through workplaces. While COVID-19 is an immediate threat, it is just the latest in a series of epidemics across the globe: we have just seen the 11th outbreak of Ebola being fought in Africa, Europe is recovering from a 3-year outbreak of measles and a peak in West Nile fever across Turkey and eastern Europe. SARS-COV-2 has made it to “pandemic” status and has cost the world economy trillions of pounds and according to experts such as World Health Organisation (WHO) Emergencies Director Dr Mike Ryan, “...this virus may never go away”.

If COVID-19 creates a worst-case scenario for pathogens in humans, we already live with the seasonal flu epidemics which, again according to the WHO, costs over 650,000 lives each year for both the flu itself and complications. Although we currently accept these impacts and may have historically lacked the tools to mitigate them, we now have evidence from the southern hemisphere that it largely avoided its flu season due to implementing the same mitigations as have been proven to be effective at COVID transmission. AI now provides us with the tools to counter the impacts of transmission through the workplace, which also benefits businesses in terms of lost productivity and society as a whole in terms of statutory sick pay and healthcare costs.

These may seem like lofty goals to go after however we see the capability to plan for, mitigate and continue our lives even in epidemics, as a beneficial outcome from applied AI, or more accurately **Decision Intelligence**.

**About Data Innovation.AI**

**Data Innovation.AI's** core expertise is in applying AI and Decision Intelligence to large-scale business problems, allowing leaders to make higher quality decisions when there is greater complexity or uncertainty, limited visibility of the outcomes and elevated aspirations for the results. Contact them at [www.datainnovation.ai](http://www.datainnovation.ai)