



# A GEMA-BASED METHOD ENHANCED BY THE IoT AS A MODEL FOR EVALUATING GENERAL WELL-BEING IN OPEN SPACES VS PRIVATE OFFICES - (GEMANIOT)

Team: Dr. Harald Vranken, Dr. Nele Jacobs, Dr. Johan Lataster & Dr. Manuel Herrador - 22/10/2018 - ([gemaappou@gmail.com](mailto:gemaappou@gmail.com))

Ecological momentary assessment (EMA) is an effective method for gathering data in real time and in real-world settings in order to avoid retrospective biases, collect ecologically valid data, and study behavioural processes over time<sup>1</sup>. A step further comes with the Geographic ecological momentary assessment (GEMA)<sup>2</sup>, which combines EMA with global positioning systems (GPS) and geographic information systems (GIS)<sup>3</sup>. Nevertheless, the GEMA presents various shortcomings, first is the spatial accuracy of the GPS data gathered is not always correct<sup>2</sup>, a second one is the veracity of data<sup>4</sup> provided by the subjects. Additional reasons for developing and using the Geographic feature of the GEMA systems are: (1) validation that an individual is effectively where the experiment should be carried out, and (2) a better understanding of the technology for broader prospective projects using more than a single IoT device, in experiments to link data with outdoor environments.

The internet of things (IoT) is a global infrastructure for the information society, enabling advanced services by interconnecting things based on existing and evolving interoperable information and communication technologies<sup>5</sup>. For this project, a single device with sensors will measure parameters from the environment such as the Emotional levels of conversation (anger, happiness, fear, boredom and sadness), noises, temperature, humidity, air pollution, vibration, sunlight and presence.

Regarding an association with well-being as well as with work-related outcomes, the IoT can provide useful readings from the environment, as previous Research depicted:

1. 21C is the right temperature, creating discomfort when this is high(er) or low(er), therefore air temperature is negatively associated with well-being, productivity and positive emotions and is positively associated with negative emotions.
2. Sunlight have an effect on general well-being as well as on job-satisfaction.
3. Increased humidity tends to be related to decreased concentration and increased sleepiness.

A relevant factor to study at the workplace are the “open spaces” also known as “desk-sharing” or “hot-desking”. Employees without an assigned desk complain, difficulty find colleagues, waste time and there is a limited ability to personalise their space. Thus, it results in higher levels of distrust, fewer co-worker friendships and decreased perceptions of supervisory support, creating tensions between those who come into the office and use certain spaces regularly, and those who don’t<sup>6,7,8</sup>. In a different Research, *Kim and de Dear* compared satisfaction levels across diverse office configurations considering **noise levels**, sound privacy, ease of interaction, comfort of furnishing, **air quality**, **temperature** and even the amount of **light**. Enclosed private offices had the overall highest satisfaction rate and that open office plans had the lowest. A lack of sound privacy received the most negative responses from employees in open offices. Between 25 and 30% of in open-plan offices were dissatisfied with the level of noises<sup>9</sup>.

With all, mobility and open offices are part of the key values of the Open Universiteit (OU). The core idea of this project consists of combining both GEMA and IoT methodologies, in order to **evaluate the general well-being of the staff working at the OU Campus in open spaces vs in individual ones**. As a result, it will be possible to provide an answer to the following questions:

- *Is working in open spaces hitting the well-being as numerous articles point out?*
- *Which factors measured in the environment can affect the well-being at the workplace?*
- *Is this model an improvement over the mentioned paper by Kim and Dear, since real IoT data from the environment is measured, rather than subjective opinions?*
- *What can be done for improving the well-being for each of the office configurations?*

This 6-month research project will lead to the submission of a JCR-indexed article. Furthermore, it will be compulsory to extend this research with additional IoT devices allocated in a more wide and diverse areas. For this reason, the project will apply for National and International H2020 (Call [here](#)) funding.

<sup>1</sup> [oxfordhandbooks.com/view/10.1093/oxfordhb/9780199381708.001.0001/oxfordhb-9780199381708-e-1](https://oxfordhandbooks.com/view/10.1093/oxfordhb/9780199381708.001.0001/oxfordhb-9780199381708-e-1)

<sup>2</sup> <https://www.ncbi.nlm.nih.gov/pubmed/24883050>

<sup>3</sup> [ncbi.nlm.nih.gov/pubmed/28654871](https://www.ncbi.nlm.nih.gov/pubmed/28654871)

<sup>4</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1325062/>

<sup>5</sup> [itu.int/en/ITU-T/psd/iot/Pages/default.aspx](https://www.itu.int/en/ITU-T/psd/iot/Pages/default.aspx)

<sup>6</sup> <https://www.acuitymag.com/business/desk-sharing-hits-productivity>

<sup>7</sup> <https://theconversation.com/the-research-on-hot-desking-and-activity-based-work-isnt-so-positive-75612>

<sup>8</sup> <https://www.irishtimes.com/business/work/does-open-plan-get-the-worst-out-of-workers-1.2195271>

<sup>9</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0272494413000340>