USE OF CLOUD APPLICATIONS FOR DATA MANAGEMENT, PROCESSING AND INTERPRETATION IN RESEARCH TEAMS.

UTILIZAREA APLICAȚIILOR IN CLOUD PENTRU GESTIONAREA ŞI INTERPRETAREA DATELOR ÎN CADRUL ECHIPELOR DE CERCETARE

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Abstract: *Cloud applications help research teams by providing the ability to easily share experimental data, in real time, at any time of the day, on a wide variety of terminals and from locations in different areas. Data storage is done in an environment accessible to the entire team, removes the danger of data loss due to human error or equipment failure.Data is also kept safe from cyber-attacks. The data analysis process is much faster, it can be done by several team members simultaneously and the construction of research reports can be done by combining the ideas of all members in an online discussion.*
Key words:cloud application, statistical analysis, data collection

Rezumat: *Aplicațiile în cloud vin în ajutorul echipelor de cercetare prin oferirea posibilității de partajare cu uşurință a datelor experimentale, în timp real, în orice moment al zilei, pe o mare varietate de terminale şi din locații aflate în zone diferite. Stocarea datelor se face într-un mediu accesibil întregii echipe, înlătură pericolul pierderii datelor din cauza unei erori umane sau prin defectarea unui echipament. De asemenea, datele sunt păstrate în siguranță față de atacuri informatice. Procesul de analiză a datelor este mult mai rapid, poate fi făcut de către mai mulți membri din echipă simultan iar construcția rapoartelor de cercetare se poate face prin îmbinarea ideilor tuturor membrilor într-o discuție online.*
Cuvinte cheie: aplicație în cloud, analiză statistică, colectare de date

INTRODUCTION

Cloud technologies provide users with applications to store and process a large amount of stored data. Cloud computing is divided, according to the main services provided, in three categories (www.microsoft.com/education): Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), Infrastructure-as-a-Service (IaaS). Each of these categories tries to find the best solution for each user. In the case of SaaS the customer uses the applications, in PaaS the platform provides customers with tools to develop applications while in IaaS the customer uses the components of the infrastructure provided but manages and configures himself the applications used.

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Researchers in all fields can benefit from using these technologies in order to be able to collect, archive, manage and process large amounts of data. In order for a researcher to have access to these technologies, he only needs the computing device connected to the Internet and through a browser he can have access to both the stored data and the applications with which he can process that data.

The first steps towards these technologies were taken when researchers found that these technologies reduce the costs of a project related to hardware and software infrastructure. Other advantages found after use would be the synchronization of data (Talia *et. all*, 2015) on several devices connected via the Internet to the cloud and the impossibility of losing data by damaging the storage equipment.

Within teams of teachers from different countries, research can be done quickly and safely. The activity of cloud storage consists in archiving, organizing and distributing data into storage volumes. The most used data storage mode is currently the file mode, along with the block mode and the object mode.

It is more advantageous for a researcher to use cloud facilities than to purchase a database, a dedicated software or the necessary equipment to be able to cover the needs for a complex project. One can choose between three types of cloud depending on the type of management and the level of data security (www.microsoft.com/education) (www.investopedia.com): public cloud, private Cloud, hybrid Cloud.

However, there are some issues to consider that some of us would call a disadvantage, namely: not knowing the location of the servers and the means of data protection stored in the cloud and the internet connection must be stable and fast.

At this moment a user can choose between different cloud storage services: Dropbox - offers only 2 GB of storage space that can increase for a cost of up to 1 TB;Google Drive - offers 15 GB of free storage and Gmail, Google Docs, Google Maps; Microsoft OneDrive - offers 15 GB and access to the Office 365 application package and iCloud - is a service for Apple system owners.

MATERIAL AND METHOD

This material presents how our team used, in a research project, these facilities for collecting data, archiving them as well as processing information in order to disseminate the results in a modern and accessible to all.

Given the many negative effects that excessive urbanization has generated in recent times, the fight against urban pollution has become an increasingly intense concern for many researchers. In this sense, numerous researches have been carried out during the last years, which have proved that green facades raise the performance of buildings and directly contribute to the consolidation and restoration of the urban environment(Manso and Castro-Gomez; 2015**)**. Vertical greening of urban buildings is not only an effective but also an aesthetically pleasing way to save many cities from pollution and aridity (Dascalu and Cojocariu; 2016). Also, the fact that at the level of cities, the expansion of green spaces horizontally is practically not possible due to the

lack of free land, makes this idea an option with great potential in greening habitats (Francis and Lorimer; 2011).

Fig. 1a) The experimental module

Fig. 1b). How to use the device

Fig. 1c). Device for measuring Ph, temperature and humidity

Fig. 1d). Device for measuring indoor and outdoor temperatures

The experiment of the above-mentioned project was established in order to monitor the vertical behavior of some flower species, in the climatic conditions of northeastern Romania, which can be used later in various systems to cover the facades of buildings in this area.In this sense, two experimental schemes were built, with 4 equal levels, arranged in height, on each facade separately, directed towards the four cardinal points North, East, South and West. These modules simulate the integral covering with green systems of the facades of some closed and unheated buildings (see fig. 1a).

In order to determine the influence of environmental factors and the substrate used on the behavior of plants, outdoor and indoor temperatures, light intensity and pH, humidity and temperature of the substrate in which the flower species were planted were monitored (see fig. 1b. and 1c.).The monitoring was done every three days, with two different devices, in the same time interval, on each level, which led to a large number of data to be managed.

The first device (fig. 1b., 1c.) used to monitor the above mentioned parameters provided 4 different measurements of the pH, humidity and temperature of the substrate as well as the light intensity from the external environment. The second one

(fig. 1d.) provided two other values, namely: the temperature inside the experimental structures and the outside temperature of the environment, both recorded at the time of performing the whole set of measurements.

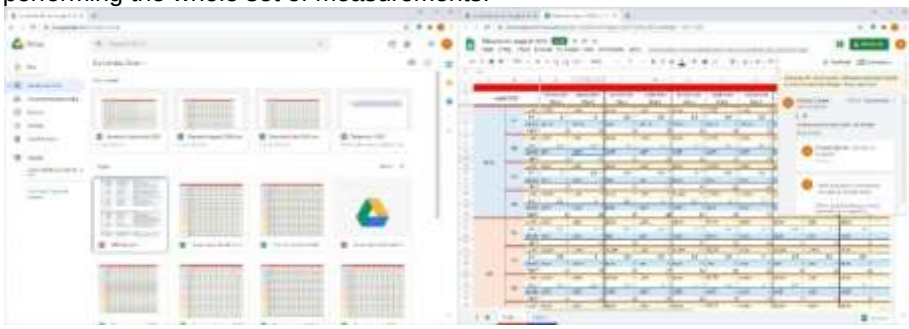

Fig. 2 Tables of measured data

The tables (see fig. 2) were designed in the laboratory and then completed by the team member who performed the measurements and saved the file in the cloud, from the personal device (tablet, phone or laptop).

Due to the fact that a single measurement involved the collection of a large number of data, there was a danger of human errors creeping into the data recording. This was removed because the cloud application gave us the opportunity to choose from a list of options, the data collected from the field (see fig. 3). This greatly facilitated the data collection work and also led to a good organization of the data from the beginning.

Fig. 3 How to enter data using option lists

Another advantage of using the application in the cloud was that all members of the research team had real-time access to data collected for corrections, assessments, comments or processing and graphical representation (see Fig. 4).

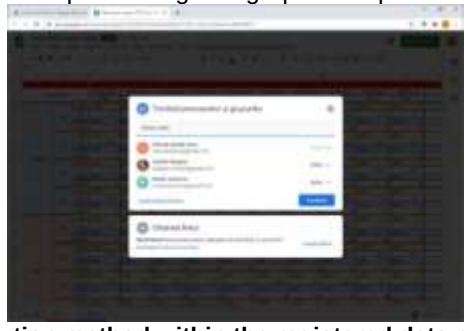

Fig. 4 Distribution method within the registered data research team

RESULTS AND DISCUSSIONS

After entering the data in the tables, the data analysis can be done unilaterally by each team member or in online discussions using either a communication platform or e-mail.

Thus, the temperatures and humidity of the substrate on the facades located on the East - West direction were analyzed. The results were represented graphically (see fig. 5) and, from their analysis, it was observed that the temperatures recorded on the east facade, in the time interval in which these measurements were made, were always higher than the temperatures on the facade West.Also, the humidity of the substrate on the West facade recorded higher values than the humidity measured on the East facade. When temperatures dropped in May 2020, the humidity remained constant on the west side but not on the east side. The conclusion is that, in this case, for the East facade a higher temperature is doubled by a lower humidity.

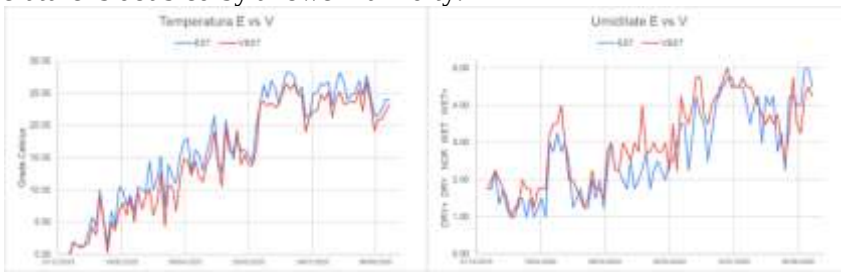

Fig. 5 Method of analysis of data collected from research

Another analysis performed using the Google Drive application was the correlation and regression between temperature and humidity on the East facade. The correlation (Chiruță, 2019) between temperature and humidity is 0.75 which means that the two characteristics are very well correlated with a positive sign. The regression equation being $y = 5.27x + 2.45$ and the coefficient $R^2$is 65%.

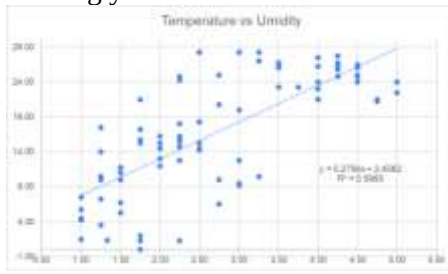

Fig. 6 Correlation of data between temperature and humidity

CONCLUSIONS

1. Cloud applications help research teams by providing the ability to easily share experimental data, in real time, at any time of the day, on a wide variety of terminals and from locations in different areas.

2. Data storage is done in an environment accessible to the entire team and removes the danger of data loss due to human error or equipment failure. Data is also kept safe from cyber-attacks.

3. The data analysis process is much faster, it can be done by several team members simultaneously and the construction of research reports can be done by combining the ideas of all members in an online discussion.

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