

# Social Data Analysis

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## I. INTRODUCTION

The goal of our project is to improve the office by utilizing smart and interactive technologies. This report will investigate different areas of interest in that goal.

One area of interest is to improve the efficiency of employees and the office itself which is investigated in section II-A. Better collaboration is a very important part of efficiency and will be investigated in section II-B. Section II-C will take a look at how a comfortable and enjoyable working environment can increase the productivity and creativity of workers. Finally, II-D reports shortly on how modern technologies can make the working environment safer.

### A. Related Research

Studies in real working environments are hard to do: the situation cannot be controlled and the study must impact the working people as less as possible. To conduct research, a controlled environment is needed. Researchers at the university of Kaiserslautern created the living lab to merge these requirements. The living lab is an open space office that was designed with the goal to conduct research in the area of Smart Offices [1].

The living lab has researched different types of technologies. Examples include electrochromatic glass which can be turned dark on demand to prevent sunlight from shining through or personalized air flow optimization for workers. The living lab tests these technologies in simulations and real life situations. Another area of research is light and acoustic optimization. Good lighting and acoustics cannot be measured directly as most people only notice bad lighting or bad acoustics [1].

## II. AREAS OF INTEREST

### A. Efficiency

Improving the efficiency of workers is one of the key drivers of change in workplace strategies according to [2]. A smart or interactive office can help with this goal. Tools and software can help to reduce the time employees spend on tasks that are not directly related to profitable goals of the company.

Both [3] and [4] describe that managing rooms is a tedious task. Roomzilla – a software company selling room booking software – estimates in [4] how much cost managing rooms without software can cause. The authors assume that office manager managing room bookings spends around 90 minutes per day to do so. Based on the average salary of an office manager in the US (20,65USD) the final estimate of this task is around 681,45USD per month. The authors also mention some problems that can cause hidden costs: both late running meetings and overbooked rooms prevent employees from using their time to do actual work.

The authors of this article instead describe how tracking room usage can lead to a better use of time. They propose a system that tracks room usage and makes the data available via Outlook or an appropriate alternative. This also helps employees to find a room when needed and therefore leads to less distractions and waste of time [3].

The tracked usage patterns can be utilized to save time and also to conserve energy. A smart or interactive office can turn on lights and devices in advance. In turn, the lights and devices can also be switched off when they are not needed anymore [5].

[5] also outlines how AI and machine learning could be used to save employee time. They use the example of a smart call system with an automated menu that learns to direct calls to the correct department. This will reduce the time that is spent on redirecting callers and therefore improve the employees' efficiency. However, machine learning could also be used to suggest the best meetings times or predict when rooms are available.

Some other causes of wasted time in companies are technical problems in [6]. Especially in meetings these problems can take up some time. Sub-optimal setups, used (but not booked) rooms, and technical failures can cause delay of the meeting start and as such potentially lead to long-running meetings. The authors of [6] propose streamlined processes to make meetings more efficient.

### B. Collaboration

Another key factor for innovation in the office outlined by [2] is the hunt for and utilization of talented people. One major factor of keeping employees happy is to support different styles of work. This includes silent working areas to focus on projects, rooms to receive phone calls, but also areas where “the atmosphere is conducive to innovation” [7].

If these areas are provided, the employees must be able to freely move between these areas. One solution for this are non-fixed working desks, i.e. employees pick their working place when after they arrive in the office. [8]. also outlines that flexible offices are needed as more employees work mobile and may rarely return to the office. In a flexible office environment with shared desks, the smart and interactive office must provide ways to find out where space is available and where colleagues are currently working [7].

Such technologies can also be utilized to improve working together. If a project requires specialists, spontaneous meetings can be held by seeing who's currently available, where they are and what meeting room can be used [7]. Similar results are mentioned [5] where the authors describe how streamlined communication and improved connectivity

leads to better and faster collaboration between organization experts <sup>1</sup>.

The importance of exciting workplaces for the creativity of employees is also mentioned in [6]. While typically it is assumed that such a playful environment may be detrimental to the productivity of employees, such environments can actually lead to a more creative and productive employees [9]. This in turn leads to better results and therefore a more successful business.

### C. Comfort

Modern LEDs provide great ways to improve the worker's productivity by adapting intensity and the color spectrum. It has been shown in recent research that the color spectrum directly influences the activity and biorhythms of people [1]. [3] also highlights, how smart lighting can be used to create a more comfortable working environment.

Another important factor of well-being is acoustics. Most open area offices are too quiet and as such talks between colleagues and phone calls distract other people. However, too loud environments are also detrimental to work. Therefore the right balance as to be found [1].

Another possibility of the smart and interactive office is the automatic regulation of room temperature based on the time of day. Both [3] and [1] outline the importance of temperature in the well-being of employees. People expect good thermal regulation in the office and it is also necessary to focus on work. But not everybody does feel temperature the same way. The living lab therefore developed and currently a "climatic chair" that helps each individual to regulate his or her working surrounding temperature [1].

### D. Safety

Industrial workplaces like factories can be dangerous. While this is not directly related to a smart or interactive office, it is nonetheless an important factor in a smart workplace. [10] lists a deadly accident which could possible have been prevented by utilizing modern technology.

In January 2012, one worker of the ArcelorMittal Burns Harbor steel-mill died while investigating noise in an oxygen furnace. The cause of death was a bursting pipe that released hot steam. The burst was caused by previously built-up pressure. A smart workplace could have prevented this accident by tracking pressure data in the pipe and warning workers to keep clear of the dangerous area.

Possible implementations of such a system could use apps, mobile devices, and wearables. In case of danger, acoustic and visual notifications could be send to the user. While such devices are widely available, [10] mentions that software is lacking behind. The software of such systems must be intuitive to use. Also, the whole office and workplace has to be integrated: IT, machines, sensors, and finally the workers' devices. Since sensors produce a lot of data, [10] also mentions that improved algorithms for streamed data analysis are needed.

## III. CONCLUSION

The smart and interactive can help to improve the well-being and efficiency of employees in various ways. One need that many of the papers outlined was the well-being of individuals as comfortable employees will deliver better results.

Collaboration and knowledge work can be improved by providing flexible working environments and better ways of communication. While some tools exist in this area, there is still way for improvement.

Another point is automation: much time is wasted by employees doing things manually that could be supported well by tools, e.g. room management. Many of these tasks may be repetitive and also prevent the employee from doing "actual work" – which in turn provides the chance to remove or simplify these tasks.

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<sup>1</sup>[5] also mentions how automation of heating and lighting can lead to a more "fun" office improving the well-being of employees.