

# Development of an interactive social tool for Mexican young adults to lower and prevent overweight and obesity

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**Abstract.** In this paper we analyze qualitative factors that are affecting employees from 29 to 35 years old that work in Santa Fe, a corporate sector located in Mexico City, that are leading to overweight and obesity problems. The research phase got as a result that there is a lack of information appropriation towards alimentary matters, mainly caused by their lack of spare time and heavy work loads. Having this in consideration, the proposal is an interactive social tool to aim this lack of information appropriation. Based on User-Centered Design, Information Visualization, Situated and Significant Learning, the tool displays interactive messages on a table, through sensors and video mapping, allowing corporate employees to assimilate information while eating at their work spaces. Methods used in prototyping and testing were helpful to evaluate not only the tool as in its hardware, also the relevance of the messages displayed and the graphic solution chosen to show them (infographics, diagrams, text).

**Keywords:** Media-Based Social Interaction, User-Centered Design, Information Visualization, Usability, Health Information Technologies, Health Communication, Obesity, Interdiscipline, Information Appropriation

## 1 Introduction

Overweight and obesity are health problems that are affecting life quality of mexicans and national economic development. They are also risk factors to develop chronic non communicable diseases and are responsible of millions of deaths annually. World Health Organization (WHO), defines these terms as an abnormal or excessive fat accumulation that present a risk to health.

In section two, we analyze the State of the Art related to campaigns to lower and/or prevent overweight and obesity in Mexico and Latin America; also strategies and tools used to aim these problems, such as technologic devices, apps, online programs and even traditional mass media approaches.

The third section concerns to the contextual study and the qualitative research. This section explains the process and methodology followed for gathering information, understanding corporate employees needs and coming up with a proposal.

In section four, we present the prototype developing and the results of the evaluation phase: Usability and User Experience (UX) testing, with final users. Finally, conclusions and future work.

## 2 Background and related work

In 2014, the OCED<sup>1</sup> Health Statistics shown that Mexico was the country with more

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<sup>1</sup> Organisation for Economic Co-operation and Development

cases of obesity around the world. In November 2016, Secretaría de Salud, a Mexican Federal Institution of Public Health Care, launched a countrywide epidemiologic warning because of obesity. Most of actual national campaigns are built with massive communication messages that hampers information appropriation from specific groups population.

According to WHO's 2016 Global Report on Urban Health, there are some factors related to urbanization that affect and increase overweight and obesity cases: transportation issues (use of motorized vehicles because of distance or geographic inaccessibility); longer commutes and work days; replacement of home made meals by industrialized and street foods.

In a first approach to the problem, we reviewed the State of Art, mainly with Mexican population, but also researches and papers from abroad, that could gave us a glance of how overweight and obesity affected other countries. Also the reviewing of public and federal strategies and a selection of existing tools commonly used<sup>2</sup>.

Most of the researches [1, 2, 4, 7, 10] urge Mexican Government to promote effective and efficient strategies to prevent overweight and obesity and to evaluate their results. One of the problems is that every federal prevention campaign that has seen light in Mexico falls into oblivion because of the change of political parties in Government. There is no concern for evaluating past strategies and campaigns.

Statistics from Mexican and International entities show the importance of the problem and its constant growth, but most of the researches are based on quantitative approaches [4, 7, 13, 14, 15, 21, 22, 23], difficulting the understanding of the problem in different contexts. This generalization of information based on quantitative results, leads to strategies and campaigns based on mass-communication, difficulting messages appropriation from specific groups. Qualitative approaches in research are needed to understand specific groups behaviours and problems to propose functional tools and messages for them.

### 3 Contextual Study and Qualitative Research

We integrated a research team from different disciplines: Information Technologies, Information Design and Communication. We worked with 58 corporate employees from 29 to 35 years old with medium-high socioeconomic status with jobs at a corporative sector from Mexico City, Santa Fe, an urban area that went from being the city's dumping site to one of the most exclusive and wealthy sectors. We selected this geographic and demographic sample because of the raising of the problem in this group, according to mexican federal inquiries<sup>3</sup>, and the urban factors described by WHO in the background section.

The research methodology was divided in two stages: the research phase and the prototyping phase. In the research phase, we used ethnographic techniques for qualitative information gathering through interviews, surveys, discourse analysis, contextual and participatory observation. After that, we analyzed information to detect which factors were more relevant for corporate employees, where we identified cognitive, affective, physical and social factors involved in alimentary decision making. In spite of the multi-variable problem we were facing, some variables were highlighted by almost all participants.

Results obtained showed which variables were the most important for alimentary decision making, such as time (subordinated to amount of work load and an average of 10-12 hours worked daily) and peatonal accessibility to food establishments (made in a delimitation of a block from the office location). Also, times spent for food consumption, usually less than 1 hour (not only for eating, as well for finding an establishment, ordering and returning to office). Corporate employees perceive that they have poor/regular knowledge in alimentary matters and they feel they can't

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<sup>2</sup> Fitness Apps, Weight Watchers and coaching programs, gadgets.

<sup>3</sup> Young adults with medium/high income at urban locations, mainly Mexico City, *Health and Nutrition National Inquiry 2012*.

learn by themselves because online information is too chaotic and they don't have time to invest in their alimentary education. They consider their close social circles important to achieve behavioral changes, especially the ones that involve food.



**Fig. 1.** Informal street vendors are a popular way to get food in Santa Fe.

## **4 Prototyping an interactive social tool for alimentary information appropriation**

Once, factors and needs were detected, we were able to propose a tool. Our hypothesis is that communicating relevant messages through pertinent design and interactive technologies, could be more valuable for people to appropriate information. Our objective was to develop a tool to help them to learn about alimentary matters so they could prevent or lower overweight and obesity, but keeping in mind their lack of time due to their job responsibilities.

Our proposal focuses in the lack of alimentary information appropriation and the need of collaborative work to achieve goals, like information dissemination through community-guided strategies adapted to their lifestyles, specially in their tight schedules because of their workload and their geographic delimitation.

Through an interactive table with video mapping at their work space, we help corporate employees to learn about alimentary matters, to identify their own alimentary patterns and to relate them with their own everyday situations. Guided by User-Centered Design (UCD), User Experience (UX) and Data Visualization techniques, we worked in an iterative process with users to develop messages according to their needs, interests and their previous knowledge about alimentary information. This last part was really important to consider according to situated and significant learning, so the users can actually appropriate information. It doesn't matter how well messages are presented if people don't have cognitive references to link with the new information.

### **4.1 Technical Specifications**

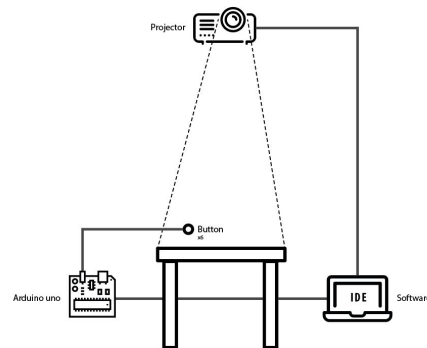
In terms of implementation, we divided the tool in 2 sections, the first one is the Electronic Technology, and this includes all the electronic elements that allow the interactivity on the table through wires and sensors. We used Arduino One, as the center of the system because of its open source nature. The arduino board controls all activities and events of our device.

The software that controls the arduino board its activated from a computer attached to the table. The code lives inside the computer in an integrated development environment (IDE) and is loaded into the Arduino board to enable events coded. The interaction is possible through pressure sensors attached inside of 3D printed, custom made tablecloths, and connected to the Arduino, and give the signal that someone put a dish over the table. This action triggers the displaying of

the information using the same table as the projecting surface. The sensors connected to the Arduino, allow the communication through MIDI language between the Arduino software and the display technology.

The second section, the Display Technology, is used for information visualization and consists in the usage of a projector device to allow the projection over uncommon surfaces, called video mapping, a technique usually used in arts and entertainment. The projector is set with a vertical orientation to enable the displaying of the information over the table, and creating a multimedia environment, while corporate employees have their meals. The information is controlled and distributed using VDMX5, a specialized software for video and visual arts. This software allows an easy mapping of the table's surface and distributes the graphic elements in a practical way, allowing users to control and interact with the messages displayed. Any kind of projector can be used, specially if it connects via Bluetooth to avoid more wires.

As part of the prototype, we also designed and constructed the table where the tool was implemented on, so we considered special slots to place hardware and wiring but it is planned to fit in any kind of table.



**Fig. 2.** Connection diagram of implementation

## 4.2 Information Selection

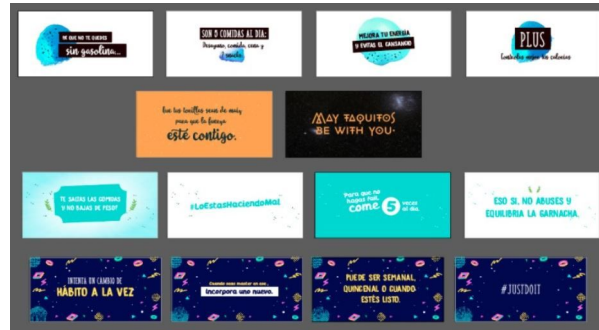
Based on findings in the research process, we worked with Nutrition specialists to develop a database of messages grouped according to objectives of habits modification: a)To increase plain water intake, b)To increase fresh fruits and vegetables intake, c)To decrease industrialized meals and fast food consumption, d)To decrease sugar consumption, e) To increase homemade traditional food preparation, f)To learn alimentary terms, meanings and portions, g)To reduce frustration while trying to change alimentary habits.

Using Natural Language Processing (NLP) techniques we identified some linguistic characteristics our population shared, such as commonly used vocabulary, slang, emojis, punctuation marks and symbols, such as the hashtag symbol. With this information we gathered a dictionary to establish the way we had to design messages, in order to be meaningful for corporate employees. NLP was also helpful to determine the length of sentences measured in amount of words<sup>4</sup>.

Seventy two messages were made for the prototyping phase that were displayed in different ways, depending on their purpose: infographics, charts and tables, text, animation and diagrams.

Graphic styles of messages were determined based on interests and trends detected on the research phase, giving every message a particular personality.

<sup>4</sup> Between 7 and 12 words per sentence.



**Fig. 3.** Sequences of animation in messages developed.

### 4.3 Usability and UX Testing

To place the tool on a working space where corporate employees do routinary activities was perceived as a good decision, mainly because it adapts to their lifestyle. At a first evaluation, people wished they could interact more with messages, not only to select going to the next or previous message. They found messages to be appealing and easy to remember, and probably to learn, through using the tool in a repetitive way. Time spent in each message needs to vary depending on how complex information on them is; infographics, for example, needed more time due the amount of elements and abstraction. Messages in hashtags were easy to remember.

We tested the tool in a prototype table made by us and with capacity for two persons, but we intend the tool to be adaptable for any kind of table, specially for more users to enrich interactions between them and to spread what they learned mouth-to-mouth with their immediate circle.

We need to solve some problems, like avoid using wires to connect the device to a computer and to the projector. There are new devices, such as projectors for smartphones, that could help us with wireless connections.

Individual silicone tablecloths were suggested to contain the pressure sensors because of their material's flexibility and heat resistance.

## 5 Conclusion

We conclude that lifestyles focused on professional responsibilities have affected other personal areas, such as health care, mainly in a preventive way. Alimentary decision making is based in consensus, this means, they decide what to eat with their colleagues. This lateral influence is an important factor to consider when trying to enhance alimentary habits or to disseminate information. Spatial appropriation through interaction and teamwork as a community is helpful in learning processes.

At the beginning of the research we thought an app could be a helpful tool, but through the ethnographic exercises we noticed that corporate employees didn't want that, mainly because it required an extra effort from them to use it and also required time from them, so it could really work.

We strongly believe more qualitative studies are needed to solve mass problems by aiming specific population at a time. It is vital for developing effective strategies to know the user in every way: their needs, habits, wishes, feelings.

In a future work, we want to enhance the tool's hardware so it can be easier to merge with the dining spaces, and not to require special features in the furniture. Also to develop a website to gather all information there, so if someone wants to learn more, he or she could access that information anytime and anywhere.

## References

1. Alianza por la Salud Alimentaria. (2016) Three years from the National Strategy to

- Prevent Overweight, Obesity and Diabetes must be checked to accomplish its objectives. *El Poder del Consumidor*. Mexico. Retrieved from: <http://elpoderdelconsumidor.org/wp-content/uploads/2016/10/b-3aniv-estrategia-obesidad.pdf>
2. Amancio, O., Ortigoza, J., Durante, I. (2007) Obesity. *Seminar: Medicine's Actual Practice*. Universidad Nacional Autónoma de México. Mexico. Retrieved from: [http://www.facmed.unam.mx/sms/seam2k1/2007/may\\_01\\_ponencia.html](http://www.facmed.unam.mx/sms/seam2k1/2007/may_01_ponencia.html)
  3. Andrews, K. (2016) Human Computer Interaction: Course Notes. Graz University of Technology. Retrieved from: <http://courses.iicm.tugraz.at/hci/hci.pdf>
  4. Barquera, S., Campos, I., et al. (2013) Obesity Prevalence in Mexican Adults, ENSANUT 2012. *Salud Pública de México*, Vol. 55, 2nd supplement. Mexico.
  5. Bruhn Jensen, K. (2014) A Handbook of Media and Communication Research: Qualitative and Quantitative Methodologies. Fondo de Cultura Económica.
  6. Cobo, C., Moravec, J. (2011). Invisible Learning. Barcelona: UBe.
  7. Comisión Federal de Mejora Regulatoria. (2012) The Problem of Obesity in Mexico: Diagnosis and Regulatory Actions to Deal with it. Mexico. Retrieved from: [http://www.cofemer.gob.mx/Varios/Adjuntos/01.10.2012/COFEMER\\_PROBLEMA\\_OBESIDAD\\_EN\\_MEXICO\\_2012.pdf](http://www.cofemer.gob.mx/Varios/Adjuntos/01.10.2012/COFEMER_PROBLEMA_OBESIDAD_EN_MEXICO_2012.pdf)
  8. Dimitropoulos, G., Toulany, et al. (2015). A Qualitative Study on the Experiences of Young Adults With Eating Disorders Transferring From Pediatric to Adult Care. *Eating Disorders*, 23(2), 144-162
  9. Furman, S., Theofanos, M., Wald, H. (2014). Human Engineering Design Criteria Standards Part 1: Project Introduction and Existing Standards DHS S&T TSD Standards Project. *National Institute of Standards and Technology*, US Department of Commerce. United States. Retrieved from: <http://nvlpubs.nist.gov/nistpubs/ir/2014/NIST.IR.7889.pdf>
  10. Gómez-Dantes, H., Fullman, et al. (2016). Dissonant health transition in the states of Mexico, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013, *The Lancet*. Retrieved from: [http://dx.doi.org/10.1016/S0140-6736\(16\)31773-1](http://dx.doi.org/10.1016/S0140-6736(16)31773-1)
  11. Hernández, R., Fernández, C., Baptista, P., (2010), Research Methodology. McGrawHill. Mexico.
  12. Hettema, J., Ernst, D., et al. (2014). Parallel processes: Using motivational interviewing as an implementation coaching strategy. *The Journal of Behavioral Health Services & Research*, 41(3), 324-36. Retrieved from: <http://dx.doi.org/10.1007/s11414-013-9381-8>
  13. Instituto Nacional de Estadísticas y Geografía. Medium-income sectors quantification in Mexico: An exploratory exercise.
  14. Instituto Nacional de Estadísticas y Geografía (2010). Population, Home and Housing Inquiry.
  15. Instituto Nacional de Salud Pública (2012) Health and Nutrition National Inquiry. Mexico. Retrieved from: <http://ensanut.insp.mx/>
  16. Interactive Advertising Bureau México, Millward Brown. (2016) Media and devices study between Mexican Web-surfers. 8th edition. *Interactive Advertising Bureau México*, Millward Brown. (2015) Meet Millennials Segment.
  17. Keim, D., (2002) Information Visualization and Visual Data Mining. Retrieved from: <http://nm.merz-akademie.de/~jasmin.sipahi/drittes/images/Keim2002.pdf>
  18. Lazar, J., Heidi, J., Hochheiser, H., (2010) Research Methods in Human Computer Interaction. John Wiley & Sons, Ltd. 1st Ed. Glasgow, United Kingdom.
  19. Lindlof, T. R., Taylor, B. C. (2010). Qualitative communication research methods. Sage.
  20. Lister, M., Dovey, J., et al. (2009) New Media: A Critical Introduction. Routledge. 2nd Ed. New York, United States of America.
  21. Radilla, C., Vega, S., et al. (2015) Prevalence of risky alimentary behaviour and its association with anxiety and the nutritional status in teenagers from technical-junior highs in Distrito Federal, Mexico. *Communal Nutrition Spanish Magazine*.
  22. Secretaría de Salud (2013) National Strategy for Overweight, Obesity and Diabetes Prevention and Control. Mexico. Retrieved from: [http://promocion.salud.gob.mx/dgps/descargas1/estrategia/Estrategia\\_con\\_portada.pdf](http://promocion.salud.gob.mx/dgps/descargas1/estrategia/Estrategia_con_portada.pdf)
  23. Organisation for Economic Co-operation and Development, (2014) OECD Health Statistics 2014. Retrieved from: <https://www.oecd.org/centrodemexico/medios/Briefing%20note%20-%20Mexico%202014.pdf>
  24. Pérez, S. (2014) User Interfaces: Human-Computer Interaction. Universidad Autónoma Metropolitana, Cuajimalpa. Mexico. Retrieved from: <http://computacion.cs.cinvestav.mx/~sperez/cursos/ui/Interaccion.pdf>
  25. Swan, M. (2012) The Quantified Self: Fundamental Disruption in Big Data Science and

Biological Discovery, MS Futures Group, Palo Alto, California.

26. Torres, J., Sánchez, C., Villatoro, E. (2014) Online laboratory for document automatic processing. *Journal of Research in Computing Science*, Vol. 72, pp. 23-36. Retrieved from: [http://www.rcs.cic.ipn.mx/2014\\_72/Laboratorio%20en%20linea%20para%20el%20procesamiento%20automatico%20de%20documentos.pdf](http://www.rcs.cic.ipn.mx/2014_72/Laboratorio%20en%20linea%20para%20el%20procesamiento%20automatico%20de%20documentos.pdf)
27. World Health Organization. (2016) Global report on urban health: equitable, healthier cities for sustainable development. Geneva. Retrieved from: [http://www.who.int/kobe\\_centre/measuring/urban-global-report/ugr\\_full\\_report.pdf](http://www.who.int/kobe_centre/measuring/urban-global-report/ugr_full_report.pdf)
28. World Health Organization (2016) Press notes about overweight and obesity. Retrieved from: <http://www.who.int/mediacentre/factsheets/fs311/es/>