

# Transforming Data into Information Experiences

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**Abstract.** The focus/perspective described in this paper relies on the different experiences visitors have through the interaction with an information space, in this case an exhibition on social mobility. Two levels of knowledge appropriation are described. First, the exhibition takes visitors from a general / local environment; to an individual space; to an intimate introspection life and planning; and finally, to the integration with others. Second, the exhibition provides valuable information to understand social and economic issues; invites visitors to identify and see themselves reflected on the information; creates the environment to share ideas with others and learn from success stories; and lastly, the exhibition presents examples that show that social mobility is easier when one works within a group. Information design is at the core of the exhibition and brings together verbal graphic language using a variety of means to convey the message of social mobility through education.

**Keywords:** Information, interaction, knowledge appropriation, graphs, rhetoric.

## 1 Introduction

Mexico is a country with poverty and inequality. By 2006 it did not have, as many countries in the world, studies that show if there was any socio economic evolution between generations. The NGO Espinosa Rugarcía Foundation (ESRU) carried in 2006 and then in 2011, the only intergenerational social mobility surveys in the country. The studies offer data that show to what extent Mexican society has been moving in the socioeconomic ladder<sup>1</sup> in the last forty years. Data also depict the interaction among variables such as age, education, migration, intergenerational social movement, women status, and income level from different generations. The 2011<sup>2</sup> survey is the only study that provides data that differentiates roles between male and female as household heads, and in topics such as education, salaries, occupation, living conditions, etc. In this text, the main topic regarded is social mobility through education.

Results show that there are two factors that condition social mobility in Mexico [3]; on the one hand, public policies are essential, such as social infrastructure, teachers'

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<sup>1</sup> ESRU's Foundation definition of social Mobility is: 'the easiness with which a person can climb to a higher level in the socioeconomic ladder' [1]. (Serrano and Torche, 2007).

<sup>2</sup> The survey is referred to as EMOVI 2011 [2].

study levels, quality education and laws, etc depend on the government. On the second hand, the results show that personal and family context and decisions are crucial for a better outcome. Decisions such as whether to study or not, finish a whole educational cycle, hard work, discipline, and others, are in parents and children's hands. Sometimes, parents and even teachers do not grasp the importance of those decisions.

Looking at this panorama, and after several studies directed to public policies, ESRU decided to approach the second factor, namely the personal and family decisions and contexts, to enhance social mobility. Ordinary people, young people, parents and teachers were approached to convey the importance of education to enhance social mobility. The proposal was to develop an exhibition on the topic and to present it in various places in Mexico.

## 2 The Design Problem

The design problem consisted of developing an information system on how to communicate the main ideas behind social mobility and education. The results of the survey done by ESRU in 2011, suggest that people's attitudes are fundamental to promote social mobility. This was the basis for the exhibition, to address people's awareness and acknowledge the importance of education in order to achieve a better socioeconomic level. The solution should be easily understandable, effective, and should shake people's minds and attitudes. The design solution should empower users into new ways of viewing their future and foresee the possibilities they could have if they make a proper decision.

The solution should offer a new way to convey the importance of education to move in the socioeconomic ladder, and reach as many people as possible, especially those who have fewer opportunities. The goal was to have visitors appropriate the experiences and information presented at the exhibition and transform them into knowledge.<sup>3</sup>

Interactive graphs<sup>4</sup> previously designed [6] on this topic were the cornerstone for the itinerant exhibition that would travel throughout the country. The exhibition is the result of an interdisciplinary team who applied a thorough design process, from the conception of the project to the evaluation of its impact on visitors. It is relevant to say that there are no recollections of previous exhibitions on the topic.

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<sup>3</sup> Shedroff [4] explains this chain in his diagram 'The scheme of understanding' where data is transformed into information; information into knowledge; and knowledge into wisdom.

<sup>4</sup> A group of 7 graphs on topics such as perception of Mexicans on their socioeconomic level; indigenous jobs; children's education in relation to their parents' education, etc can be consulted at the Centro de Estudios Espinosa Yglesias' site [5].

### 3 Main Questions to Be Answered

There were main questions that had to be answered in order to design the exhibition such as, What for and for whom? Which data? How it should be transformed into information? What kind of media should be presented? Should interactions with the information be included? How visitors appropriate information?

#### 3.1 What for and for Whom?

The objective of the exhibition was to promote young people's awareness of the importance of education to improve their socioeconomic level. The exhibition should empower users into visualising new ways of imagining their future, as well as foreseeing the possibilities they could have, if they made a proper decision related to education. The exhibition was addressed to young people from 14 to 24 years old from low and medium income levels that might be at risk of abandoning their studies or who do not appreciate the advantage of studying. Teachers and parents should also be considered as important users (indirect users) involved in this project because they are direct influences, –and even decision makers–, on young people's development. Therefore, relevant materials should also be included in the exhibition for parents and teachers.

For the development of the exhibition, two focus groups were observed when general concepts for the exhibit were presented. It was important to see their reactions and listen to their opinions to enrich the initial proposal. The first focus group consisted of young university students and the second group consisted of young people who dropped out of school, mainly because of economic reasons. A strong comparison between groups was observed, from open beliefs and optimism to depression and failure. Both types of participants came from medium low socioeconomic levels, without training or the habit to read graphs or economic data. Their reading and language skills were in development, attracted to visuals, eager to interact with technology and sensitive to music.

The specific objectives of the project were:

- Visitors should develop awareness on the data presented.
- Visitors should understand the basic concepts on social mobility through clear and simple information.
- Visitors should be stimulated to change attitudes.
- Visitors should appropriate information for their lives.
- Policy makers should also become aware of the socioeconomic situation.

#### 3.2 Which Data? How should it be Transformed into Information?

The surveys on Social Mobility [7] were the main data source. The selection of topics, under the guidance of development economists, was carefully put together. The main topics selected for the exhibition were: data on poverty and inequality, social mobility and its relation to education, the importance of individual social mobility, and social mobility within the community.

The transformation of these data into information required careful consideration of users/visitors<sup>5</sup> as the centre of the exhibition. Visitors characteristics guided into design decisions, such as:

- The language should be simple, clear and concise, either in verbal or written texts.
- Narratives should be meaningful; some narratives should be addressed to young people, and others to teachers and parents.
- The images should help visitors identify<sup>6</sup> with the contents; images should complement and visualise the text.
- Use of innovative technology to surprise visitors.
- Interactions should be simple so as to let visitors share their opinions; interactions should enable them to achieve good results and feel successful.
- Storytelling as a means to connect with visitors.
- Music should appeal emotions.

There were other constraints related to the design of the structure and the space modelling. The exhibition should be inexpensive, but attractive; easy to pack and unpack, but strong, and light weighted for easy transportation. It should also be possible that the exhibition could be hosted in spaces with different shapes. Therefore, it was designed in modules that could be organised in different ways without losing its concept: as a square, as an L shape or in a linear way. The panels should carry their own lightning and electric power. The exhibition space should be covered to keep off from sunlight and give proper conditions for electronic equipment and video projections.

The exhibition space should invite people to go inside, provide environment for interaction, hold the groups of visitors together and should be meaningful to those who visit it.

### 3.3 Rhetorical Approach to the Exhibition

Visitors at the exhibition should react and respond to the different messages. The exhibition was planned to promote questioning, thought and change of attitudes. Aristotle defines three main ways of rhetorical communication: the appeal to reason and logic (logos); the appeal to emotions and feelings (pathos); and the appeal to moral and ethical values (ethos) [9]. Designed objects should have the three components to provoke a response.

The objects at the exhibition were carefully selected and designed to have a balanced combination of the three appeals, and for the different types of visitors (young people, parents and teachers).

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<sup>5</sup> In this information design project, 'visitors' will substitute the term 'users'.

<sup>6</sup> Shah and Hoeffner [8] distinguished three major processes of graph comprehension; first, users must identify visual presentation of the graph, second, viewers must relate the visual features to the concepts represented, and third, users should be able to identify the referent of the concepts in the graph.

## 4 How Visitors Appropriate Information?

Why appropriation? Appropriation entails taking something for oneself by own right, and it is considered a distinctive relationship than that of learning or assimilating [10]. The appropriation of main concepts is achieved through various ways and it can happen when people interact with objects of their interest. ‘Knowledge evolves through the interaction –reciprocal action- of an individual with other entities; information is conceptualised and used in an efficient way every time the person is confronted with new situations that require such knowledge’ [11]. Therefore, knowledge appropriation involves a person, a knowledge object, and a context of interaction.

In a similar way, Kosslyn [12] explained that for effective communication, designers should use familiar concepts and display formats to the user. He also refers to this as the Principle of Appropriate Knowledge: ‘Readers can know how to interpret a display only if they have already stored the necessary background in memory. [...] Know your audience, and present your information accordingly’.

These premises were applied to the exhibition. Besides, a trained guide accompanied each group of visitors through the exhibition to assure understanding and appropriation. In each room knowledge objects were placed with significant information, such as visual graphs, videos, texts to appeal in various ways to visitors. The exhibition guide facilitated with explanations, discussions and interactions. As a result, in each room there was a different and unexpected way to approach visitors. The initial pieces presented theoretical and objective information about the topic. Whence this information was presented, visitors were expected to think about the information, question it, relate to it, and wrap up the experience with interaction. Through this process of appropriation, the person built, constructed new representations or interpretations, and new perspectives emerged. While visiting the exhibition, ‘it is important to facilitate emotional experiences and conversations, fun, interaction, make feasible that visitors interpret meanings, analyze them, make inferences and give explanations’ [13].

Information and interactions were structured in two different levels, related to the type of contents presented at the exhibition and the type of experiences visitors could have.

### 4.1 First Level

What the contents of information should be? What cognitive processes should visitors experience in each of the four rooms of the exhibition? In the first room, the information space should take visitors through a narrative that makes them face and understand the information provided. In the second room, visitors should identify their family situation with the graphs and images shown, and develop relationships to their family social mobility. In the third room visitors should question themselves and answer specific issues. Lastly, in the fourth room, visitors should confirm what others have achieved working together.

### 4.2 Second Level

What visitors should experience at the exhibition? What other cognitive and emotional processes should visitors go through at the exhibition? This could be explained

as a trip from general information to its appropriation, and then to personal insights. In the first room, the information space should make visitors glance through the national socioeconomic situation to become aware and sensitive to the problems depicted. In the second room they should arrive at their immediate living conditions of their own family and project themselves in the graphs and images shown. In the third room visitors should think about their intimate life; they should go through introspection and imagination of their own future. Finally, in the last room visitors should foresee their connection to others.

Information design underlies the four exhibition rooms, but the degree of logical and objective explanations varies from room to room. There are some pieces that are more directed to the emotional or pathos appeal, and others to the ethical one. Here is a description of the two levels in which visitors engage in the information space:

When visitors arrive at the exhibition, they have to separate themselves from the outside world and immerse in a new space and into the same reality, here and now. Visitors start their engagement in the first space by viewing Mexico's contrasts, poverty and inequality. For example, they are faced with the crude reality that is ignored from everyday life's sight, they see graphics that show the slow evolution of Mexico in comparison to a rich country such as Sweden<sup>7</sup>, inequality between boys and girls' education, men and women salary differences, and income inequality between rich and poor Mexicans. During the explanation, the guide asks questions to assure that visitors understand the concepts and are engaging in the topic. Awareness of the country's situation is the main objective of the information presented.

While looking at the different pieces, visitors perform various mental operations such as: making comparisons, questioning issues, contrasting information, making relations to personal situations, and making logical operations such as understanding definitions. The first space is key in preparing visitors' consciousness for the next exhibition room.

In the second space, visitors are taken from the general depiction of the country, to their local family situation throughout time. They are presented with few basic definitions of social mobility, absolute and relative mobility; graphic descriptions that relate income level to education level; quotes addressed to teachers; graphs that show students performance in relation to the teacher's involvement. Visitors have to identify publicly or privately what kind of living conditions had their grandparents and which is their present living environment. Through these selections they figure out if their family has moved in the socioeconomic ladder, either upwards or downwards. In this space they focalised from general situation to their close and immediate environment. The information objects make them understand social mobility, identify their home situation, know how education influences income level and project themselves in the different cases depicted.

In the third space, after being in touch with their immediate reality, and having familiarized with topics on poverty and inequality, and education and social mobility, visitors are asked to go through an introspective phase. They are asked to share with

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<sup>7</sup>Sweden was in a similar situation as Mexico 75 years ago, but with the government's action to educate people, they became in one of the most equal societies [14] [15].

the group their thoughts and insights to plan their future through an interactive experience<sup>8</sup>. The guide poses four questions to the group, such as: who they are, what they want to achieve, what are the obstacles and opportunities they face in order to achieve their goals. Visitors are invited to answer one question at a time. They write the answer in tablets and when they are satisfied with the text, they publish their thoughts and feelings. Their answers appear on an interactive touch table, which is at the centre of the room. The answers are then shown on a screen as a word cloud that expands as words are repeated. The guide's role is very important because he/she gives visitors the confidence to share their thoughts and discuss them openly with the group.

After sharing their views and discussing how they would like to see themselves in the near future, visitors listen to recorded testimonies of people who have moved into a better life.

In the fourth and last space, visitors realise the importance to be in contact with others. They go from their intimate reflection and examples of people who achieve a higher socioeconomic level in the previous space, to the importance of considering and connecting to 'the others'. Participation of the transformation of public space is the first example they see. People from a small community changed their street by painting their houses and dignifying their immediate environment. Visitors also witness disciplined and committed teamwork shown in a video of a children's orchestra. Afterwards, they experience working together through the interaction with a video game trying to imitate the children's orchestra performance. This game requires working as a team to achieve a number of points. Different quotes and graphics are placed at the room to remind visitors that education is the key component for social mobility. Final pieces at the exhibition leave visitors a positive feeling and wish for a better future.

As one can see, the two levels described before mingle together in four spaces, that make visitors go sequentially from immersion in the country's reality –and possibly their own situation– to their close environment, to intimacy and the importance of others. Visitors also engage in understanding information, identifying in the situations depicted, and sharing their own ideas and projects with others.

### 4.3 What Were Visitors Responses to the Exhibition?

In four months time, the exhibition has been hosted by two different venues<sup>9</sup> in Puebla, Mexico, and has already received 6,300 visitors from different areas and back-

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<sup>8</sup> Simon [16] says that the best participatory experiences are in small groups. They should support people to feel comfortable engaging in the activity. 'It requires a careful balancing act between structure and flexibility'.

<sup>9</sup> The first institution that hosted the exhibition was Universidad Iberoamericana Puebla (UIAP); it is a private university whose doors are not opened to everyone. People have to show an identification card to enter at the university. The second venue is a public university, Benemérita Universidad Autónoma de Puebla (BUAP) and the exhibition could be accessed through a direct door to the streets of the city centre. This venue received many more groups coming from public high schools and people walking on the street.

grounds. Knowing people's reactions to the exhibition was indispensable to find out whether the objectives were fulfilled.

Two types of testing were designed for this purpose: a quantitative test of 4,089 visitors and applied by an external consultant, and a qualitative test of 10 visitors performed by the author.

1. Quantitative test. Visitors answered either in printed or electronic media a questionnaire regarding taste, definition of social mobility, main obstacles for moving, main opportunities identified for success, a one-word definition of the exhibition, and additional comments. The results show that the exhibition's message is very clear and conclusive. Education and will are the major incentives; oneself and apathy are the main slow downs to education. However there are situational aspects or group dynamics that influence these last results [17].

However there are some differences in the results depending of which of the two venues visitors attended to.

**Table 1.** Quantitative results: opportunities and obstacles

Visitors answers	First venue (UIA-P)	Second venue (BUAP)
Visitors mentioned that they have opportunities such as study and learning	39.7%	32.8%
Visitors mentioned that they have opportunities related to attitudes, self-effort and will	19.3%	27.8%
Visitors mentioned having obstacles such as: oneself, will, conformism, fear	24.4%	38%
Visitors mentioned obstacles such as: laziness, apathy and comfort	16%	7.7%

**Table 2.** Quantitative results: One-word description of the exhibition

Description of the exhibition	First venue	Second venue
Excellent, extraordinary, awesome	26.7%	20.2%
Educational, informative	21.1%	10.9%
Good, intelligent	14.9%	21.6%
Thoughtful, conscientious, provoking	10.1%	8.7%
Stimulating, inspiring	9.2%	14.2%
Dynamic, creative, interactive	4.8%	3.6%
Fun, entertaining	3.2%	4.5%
Innovative, creative	2.7%	8.7%
Negative comments	0.8%	0.8%

2. Qualitative test. Visitors were asked to select the three pieces per room that were more meaningful to them, in terms of the information presented, of their emotional responses and their credibility to the pieces presented. In other words, the three



rhetorical ways of convincing established by Aristotle were questioned. Visitors explained their reasons for each piece selected.

Visitors' selection was varied; they chose almost every exhibition panel. However, there were pieces that were frequently selected. Here is the distribution of their choices by room.

Visitors also answered how they would describe and recommend the exhibition to other people.

Some significant phrases they mentioned were:

'We were confronted with reality. It is true'

'It made us think, question and share'

The interactive table was also mentioned several times. Visitors mentioned that they were given the opportunity to think about their future and share their feelings. They seemed not having these kind of questioning.

Some visitors appreciated the opportunity they had to think freely and to imagine how they would like to be in the future, share their views and discuss them with the group. They suggested visiting the exhibition without parents or grandparents because they felt controlled.

Some visitors asked the organizers if the exhibition could travel to their hometown because they wanted their own people to see it and experience it.

As one can see from both, quantitative and qualitative tests, the exhibition had a strong impression on visitors.



**Fig. 1.** The first graph shows the differences of goods and services of two parents and children. The pictures show the comparison between Mexico and Sweden households lowest socioeconomic levels. The text says: “if you were in the lowest socioeconomic level, this would be your house”.

**Table 3.** Answers to qualitative questions

Exhibition rooms	Pieces frequently selected	Visitors' comments
Room 1. This is Mexico	Comparison between Mexico and Sweden	'If Sweden could achieve a higher level, why Mexico cannot?' 'Sweden is clean, ordered.'
Room 2. Social mobility and education	Graphs on education and income	'If we had more opportunities we would have a better national level.'
	Intergenerational mobility	'I only studied highschool. Here, I commit to study a Bachelor's.'
Room 3: Imagine your future	Interactive table	'It gave us the opportunity to think about our lives, question it and share it with others.'
	Testimonies	'One can confirm ideas. These examples show you that it is not too late to study, because some voices are not that young.'
Room 4: social mobility and the community	Children's orchestra	'Inspiring' 'These children learn to value.'
logical appeal (logos)	Graph on goods and services	'It provokes a private commitment with oneself.'
Emotional appeal (pathos)	Video on poverty [18]	'Indifference to poverty. We do not see it anymore.'
Ethical appeal (ethos)	Various answers, but inequality was the most repeated	

## 5 Conclusions

The information design system proved to be very effective. Quantitative tests results show that a large percentage of visitors left the exhibition with understanding social mobility concepts and clear ideas on the importance of education to achieve a higher

socioeconomic level. Qualitative tests results show that the exhibition was meaningful to most visitors. Young people realised that they have not had the chance to think about their future, question it and plan their future.

It was relevant to test from an external consultancy because they could give objective data on the impact of the exhibition, which was later confirmed by the ‘in-house’ qualitative test, which shed additional and detailed information.

Interdisciplinary teamwork was crucial in the concept development, graphic and information design, industrial design, interactive design, film, and the general organization of the exhibition. Information design considered the whole range of issues, contents, language use, adequacy of images, narrative, organization of the venues, development of manuals, engagement of institutions that support education, testing, legal permissions, etc.

This project showed that it is possible for information designers to intervene in social issues of this importance.

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