

Interdisciplinary Project Approach at the Analysis of Urban Happiness

Developing, managing and displaying interdisciplinary content with the outlook on designing smart cities from a humanistic approach

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Abstract. The following paper illuminates the process of interdisciplinary teamwork alongside a real project at the University of Monterrey. Connecting the faculties of architecture and medicine as well as integrating participants of the University of Applied Sciences in Karlsruhe, Germany, the project is aiming to get a new view on the connection of urban happiness, architecture and corresponding systems and processes in the human body. It combines philosophical research to define the term urban happiness as well as practical analysis of the city of Monterrey resulting in different problem cases for citizens nowadays. These problems were then used to draw a line to similar systems and cases which can be found in the human body and to see, how the human bodies way of solving problems can help architecture and especially the development of smart cities in the future – because keeping a focus on the human side will be an important part of realizing smarter cities. The paper is also focusing on the process of teamwork itself. It shows the necessary steps from initiating the project to organizing teams and communication up to the process of communicating and displaying the acquired knowledge.

1 Interdisciplinary projects

Working in teams can have a great benefit on the outcome of a project as well as playing a huge role in the personal development of each team member. Another possibility reveals itself by working in interdisciplinary teams.

The following chapter will give an introduction into the term of interdisciplinary work, the project work at the University of Monterrey, showing why it was initiated as well as its goals and the methods used. This lays the foundation for the subsequent chapters who will dive deeper into the actual process of the interdisciplinary teamwork at UDEM.

1.1 Definition of interdisciplinary work

The term interdisciplinary can be described by “involving two or more academic, scientific, or artistic disciplines” [1] and shows the potential that can unfold when people with a different background knowledge work together on solving specific issues. Repko and Szostak define interdisciplinary work as a “process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline, and draws on the disciplines with the goal of integrating their insights to construct a more comprehensive understanding.” [2]

These definitions also underline the fact that interdisciplinary projects require a lot of planning communication throughout the process to be a success.

1.2 Introduction into the project

Project work has always been a big part of every field of study at the UDEM, even though the project mentioned in this paper has been one of the first to be developed in this manner.

The project was initiated in early 2019 and set for the fall semester of 2019. The goal was to connect the architectural approach on human life in cities and the quality of life in cities with the human life itself and to give solutions for future developments.

It was set to find parallels in each structure and to show how the city can benefit from the way the human body solves problems within those structures, further explanations are in chapter 1.2. The approach on the project was changed and modified according to research results throughout the process, which will be explained in chapter 2.3.

Apart from the main goal, the project had the aim to dive deeper into the possibility of having different faculties as well as students and professors to work together on one topic. It was also hoped that the project could only be the first step in a series of related projects, more on that will be evaluated in chapter 2.4.

Next to students and professors from the faculties of architecture and human sciences it was also the first project to offer a space for a student from the Karlsruhe University of Applied Sciences to be involved in a research stay and contribute to the project as well as further developing its topics in upcoming projects.

Therefore, it was also a multilingual project with meetings and documentation to be held either in Spanish or English.

1.3 Overview on objectives and schedules

The projects main objective was defined as the following:

“Interdisciplinary approach of conceptual and practical type to establish parallelisms between aspects of health sciences, especially medicine, and aspects of architecture, especially urbanism within the framework of the 50th anniversary UDEM.” [3]

To narrow down the main objective further objectives were defined as well, initially consisting of the following:

“Present common concepts, apparently independent, that apply in both disciplines or scientific areas.

ii. Find similarities between urban grouping patterns and cell grouping patterns, according to functions and environment.

iii. Find elements of design and aesthetics in the previous groupings.

iv. Find common patterns in proper functioning and dysfunction as well as when such patterns are broken in both sciences.

v. Organize, classify and process the information in a layout that allows the visualization of the project from a digital platform” [3]

At first, the title was set as *bioarchitecture* but then later changed into *La fenomenología de la felicidad urbana: proyecto transdisciplinario* [4] to better incorporate the aspect of urban happiness and also to better separate the project from the original meaning of the term “bioarchitecture” which is rather “a blending of art/architecture and biomimetics/bioinspiration, and [...] bioinspired design” [5] rather than the approach of urban happiness and its human correlation that the project was aiming at.

The three main goals in the project for the semester of 2019 turned out to be the following:

- The publication of the important extracts of the research findings in an exhibition in the Museo de Arte Contemporáneo in Monterrey.
- The creation of a book with ISBN containing the entire and its results, to be published in 2020.
- The creation of a book as intellectual property containing a manual to recreate the process of the project.

The official kick-off was scheduled for mid-August 2019 so that all the participants had started the new semester and were able to participate. The rest of the timeframe was adjusted accordingly and modified if necessary. The following graphic shows the main milestones of the project.

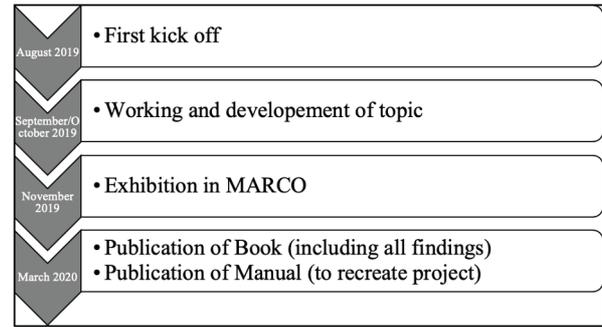


Fig. 1. Broad time frame of the project

1.4 Defining and creating urban happiness

There is no single source of truth when it comes to the term urban happiness. Different approaches see different key factors in what is being needed to make the residents of a city satisfied with their life.

Montgomery states that the initial creation of urban happiness “has nothing to do with buildings or roads or trees or bicycles. The first step is to agree on what matters for wellbeing.” [6]. His model on creating urban happiness encompasses subjective wellbeing, psychological wellbeing and the healthy live years spent in a city [6]. He also admits, that “various elements of wellbeing contribute to this ideal condition” [6].

Each person has their own view on what is needed to make the life in a city worth living. The projects interdisciplinary approach provided views from multiple fields of study and nations of this world. It aimed to show how all of these views could be merged into one definition and how this definition could be the base of further research and the solution to future problems.

The elements that form urban happiness as approached in the project will be evaluated in chapter 3.1, more input on how the project’s research and definition of urban happiness can be used in the actual development of (smart) cities is given in chapter 3.3.

1.5 Methodology of the project

The research throughout the process was mainly based on qualitative factors, taking a phenomenological approach into account. Since the goal was to develop a qualitative analysis, quantitative methods were not as useful and therefore not in focus.

The project could mainly be divided into three parts:

- Philosophical Approach
- Practical Approach
- Human Science Approach

The existing knowledge was analysed and worked through in a content analysis, for example getting familiar with the theories of E. Dussel and C. Alexander and developing the wheel of happiness out of those theories.

The observation of the city and the connection to the human side through the medical approach was a thematic analysis, working bottom-up to develop problem cases, more explanation on that in chapter 3.1,

and later on working top-down to derive solutions and directions for the cities in the future.

Figure 2 shows the main three approaches in the project and the necessary steps that were taken in them. It visualizes how the different views blend together and how the process forms a full circle, meaning that the entire project can be redone using the information that was gathered in the previous rounds.

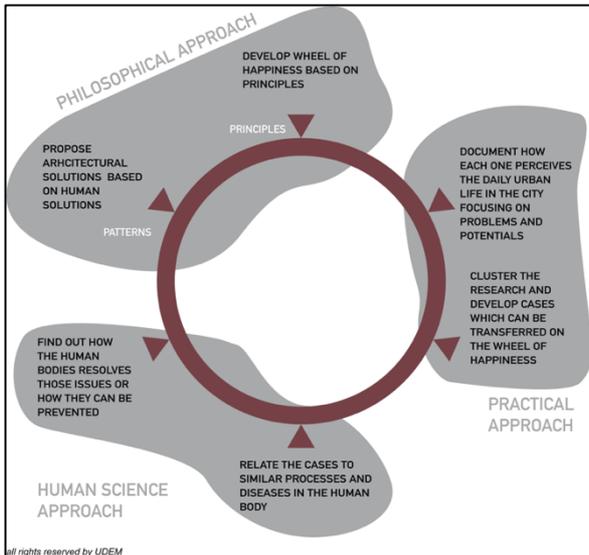


Fig. 2. The blending of different approaches

2 Structuring the work of interdisciplinary teams

To ensure that the project would actually be able to fulfil its goals and objectives and that everyone was able to give his best input possible, it was necessary to continuously monitor the current process, react to problems and to propose new solutions.

The following chapter will deal with the way the project work was structured and the research findings were documented and shared. It also shows how this knowledge can be preserved and shared with future students to expand the project and be the base for future and ideas and further developments.

2.1 Structure, research and communication

After a first kick off was set it was important, especially in the first weeks, to keep a tight connection between the team members to ensure that they would all have a common understanding of the roadmap.

At first, all the schedules of the team members were collected, and weekly meeting times were set so that every team member had the possibility to plan ahead and be present in the meeting. The first meetings were the base to build clusters (research areas and goals) in the project and set the team structures so that everyone knew in which cluster he was responsible and to whom he had to report to.

It was important that from every faculty there was a team leader to keep track of the process as well as people being sorted into the clusters where their knowledge would benefit the progress the most.

To share any kind of information and to document the knowledge that was developed throughout the project a Google Drive folder was set up and all the relevant participants were invited to share.

It also contained protocols (and sometimes audio recordings if important participants were missing and needed the possibility to listen to the meeting) of each meeting so that the outcomes were documented to prevent further discrepancies.

Throughout the project, different roadmaps were set up to document the necessary To-Dos and steps in each phase of the project. The initial roadmap started out on a weekly base but was later on enriched by a daily layout so that meetings and tasks for each individual person could be documented.

		September / Septiembre						
		Calendar Week 39						
		23.09	24.09	25.09	26.09	27.09	28.09	29.09
Research	Weekly Goals	- Define clear research goals and individual steps for everyone to do - Define timeframe when these steps need to be done						
	Meetings	General Group Meeting		Weekly Meeting				
	Content							
	Topic							
Book	Weekly Goals	- finish rough table of content - modify layout according to table of content - decide on colors, fonts, etc.						
	Meetings	General Group Meeting	Meeting Fernanda/ Alessa on Layout	Weekly Meeting				
	InDesign		Set up color scheme and font scheme Alessa	Set up final InDesign Document (1.0 Version) Alessa				
	Design							

Fig. 2. Part of the September roadmap

Keeping track of all the tasks through roadmaps was especially important since all of the team members were also part of other projects and had their daily job routine, more on that will be evaluated in chapter 2.3.

2.2 Documentation and presentation of content

Throughout the project, a lot of content was created and documented which needed to be taken care of. The most important fact to keep in mind with the interdisciplinary work was that with the book and the exhibition it had a very broad target audience with different levels of background knowledge and understanding. Therefore, the content needed to be presented in a way that every viewer would understand the facts, the facts were correct in each way of depth of the content and that no viewer would be bored because the level of depth was not aligned with his level of background knowledge.

It was also important to keep in mind that a lot of different content from different approaches needed to be present in a uniform way to underline the fact that the project was an interdisciplinary work but still had one fixed goal that everyone was working towards to.

Since the main place for all information was Google Drive most of the documentation in the first phase was done in either Google Sheets or Google Docs. These documents allowed all the participants to view the produced content, add comments and to make changes in one place. It also brought the possibility to create folders to especially include external feedback from participants that weren't supposed to view the rest of the content.

As the goal of the project was defined in showing the results in an exhibition as well as a book it was clear that next to textual content there was also a lot of graphical content to be produced. Since this is especially time-consuming, all of the graphics started out as hand-made sketches that were evaluated in meetings with all group members and then created with the help of software from the Adobe Suite (Illustrator, InDesign, Photoshop).

The following graphic shows such a process during the development of the wheel of happiness, going from first sketches to the final approved version a couple of weeks later.



Fig. 2. First sketch and final version of a graphic

Another reason to put a special focus on the graphics was the fact that they allowed to explain the complex structures and processes of the project in a much faster way. If presented in a correct manner, humans can perceive information in a graphical form much faster than in textual form [7] which was especially important for the parts that were to be presented in the exhibition.

2.3 Prioritizing and changing perspectives

Throughout the project there were certain shifts in the process or the targeted goals which were necessary to keep the project a going and which also brought up possibilities for new, thematically connected projects in the future, building upon the research that was already made.

In the first scope, as already mentioned in chapter 1.3, one of the objectives was the development of a digital platform to share the knowledge and to enable people to share their own experiences.

During the first weeks of the project, it got clear that at this point the development of such a platform was not useful as on one hand there was no capacity and skills available to do so and also that the structure of the content that was supposed to be shared wasn't validated yet as the content wasn't even created in the project itself. In order to not spend too much time on an objective that wasn't going to work out at this point, the objective was moved to the next semester with the possibility to be a future project or thesis that would be connected to the project.

Being flexible throughout the process and adapting to the current situation was very important and helped in putting the focus on things that were going well and therefore being able to reach the objectives

2.4 Dealing with difficulties and deriving learnings for future projects

In working with people from different faculties and even people with different native languages, naturally, some problems appeared that this subchapter is taking into focus.

One of the main problems was the availability of all the participants. Finding dates and time slots, where all the participants were available, was a problem that was present throughout the entire process. It shows the importance of planning with everyone's availability in an early stage, e.g. through collecting all schedules and setting weekly meetings throughout the first weeks. Meetings cannot be as productive as planned, especially when expert knowledge from one side of the interdisciplinary approach is not available. This also shows that it's important to integrate at least two people from each field of study so that the absence of one person can be compensated through another. Setting up a clear list of participants and their responsibilities also helps all of the members of the team to know who to turn to as well as helping the team leaders to plan ahead with the resources.

Another difficulty that needed to be overcome in everyday communication was the language barrier, as most of the meetings were held in Spanish, which led to some misunderstandings when it came to topics that required more background knowledge, especially meetings dealing with medical content.

In this case, it was always helpful to take a short time after the meeting, break down the main points (and document them in the protocol) and making sure that everyone had the same understanding on the outcome.

Generally, one of the first things in the project work should be the decision on one main language which every one of the participants should at least be able to understand up to a certain level so that meetings can be held without having to translate throughout the process. English should also be a requirement for all the participants taking a bigger part in the project, also because next to meetings a lot of documentation online, that was needed for deeper research, is in English.

A single source of truth in documentation can only help the participants if it is continuously updated and managed. At certain points throughout the project, some of the documents were in danger of becoming obsolete because they were not taken care of. In this case, it is the responsibility of the team leader to decide whether this means that they were simply not relevant to the project anymore and could be archived but also to keep reminding the other project members to keep the documentation updated. Creating a WhatsApp group or providing a different way of fast communication was very helpful to send reminders as these messages were read much faster than emails.

2.5 Connection with future projects

As already mentioned, some of the objectives, like the data-sharing platform, were moved from being realized right away to being realized in the future so they could further expand the research on the project.

Some other projects, like the re-creation of the entire process in different cities, were already planned as an extension for the next semesters. The recreation in other cities shows enormous potential and could take place in any other city of the world, benefiting each city on an individual scale but also being able to compare the cities to each other.

Documenting these possibilities for further projects right away and sharing them with other people in advance helps in planning the resources for the next projects and ensures that they will actually be put into action.

One possibility to connect the research with other topics will be explained in the following chapter

3 Impact of Research on the development of smart cities

The following chapter will get a closer focus on the actual content that was created throughout the project and shows how to even expand the idea of interdisciplinary work further in connecting the research with another topics – in this case the topic of smart cities.

3.1 Results of the projects

After a semester of interdisciplinary team work the project had a lot of different results to show off, which can be grouped into three different parts.

The first part covers the philosophical research, working with the theories of E. Dussel [8] and C. Alexander [9] to create twenty principles that build the base for human live and needs in their city – their desires to live and their approach on urban happiness, as it was already introduced in chapter 1.4. Throughout the research, the principles were grouped into similar clusters, thus creating a Wheel of Happiness which can be used to apply the concepts to each own surroundings and to measure the quality of live in the city. The Wheel of Happiness contains the following seven parts:

- Sustainability
- Development
- Mobility
- Interaction
- Identification
- Wellbeing
- Beauty

The second part draws the first connection to the human body and looks into three different systems (circulatory, neurological, immunological) and their connections to cities on a larger scale.

The third part applies the Wheel of Happiness to the city of Monterrey itself, analyzing different problem cases that each of the participants encounter in their everyday way to university and also drawing the connection to similar problems in the human body. It derives solutions from the way the human body solves those problems and applies them back to the urban side.

3.2 The term smart cities

To show how the field of Smart Cities can benefit from the research it is important to define the term itself and show its importance for the future development of urban life.

In general, the term Smart City encompasses “the new urban environment, one that’s designed for performance through information and communication technologies (ICTs) and other forms of physical capital.” [10]. Applying smart technologies to all areas of urban life can “have the unprecedented ability to not only describe [...] cities in granular detail but to also discover new, creative ways to design and maintain [...] cities in the most sustainable, innovative, and efficient way possible.” [10]. This shows, that smart cities have the ability to measure and improve their residences lives, an approach also followed in the interdisciplinary project work. Andrews states that smart cities could have a great positive aspect on a lot of areas:

“Public safety: Smart applications could reduce urban fatalities by 8 to 10 percent.

Time and convenience: Cities can use smart technologies to cut commuting times by 15 to 20 percent giving workers back two to four full days every year.

Health: Cities could use smart technologies to reduce their health burden by 8 to 15 percent, and in the developing world could make significant strides through data-driven public health interventions.

Environment: Cities can use a range of smart applications to cut emissions by 10 to 15 percent, save 25 to 80 litres of water per person each day, reduce unrecycled solid waste by 30 to 130 kg per person annually, and reduce the negative health effects from air pollution by 8 to 15 percent.” [11]

At this point the importance and relevance of smart cities has just begun to develop, which makes it even more important to already understand the term and help cities to grow into future smart cities.

3.3 Connecting Smart Cities with the outcomes of the project

In his article “Unleash the (Smart City) Power within” Hwang states that for a smart city to fully develop and increase the quality of live, it is important to “define the result desired and the purpose and need first before there’s a pressing problem to be solved” [12]. This aligns with the development of the Wheel of Happiness defining the needs of all inhabitants of the city, Smart City or not. The Bottom-Up and following Top-Down-approach already mentioned in chapter 1.4 containing the analysis of each on Monterrey’s problems and the connection with the Wheel of Happiness shows exactly what kind of areas of the city need further development and what parts of the clusters (like security or sanity) need improvement before the problems get too overpowering. Connecting these situations with the human body, its diseases and its solutions can help in finding a way to prevent problems from emerging in the future and if they do appear it can show ways on how to handle them.

There is another reason to connect the Smart Cities with the human being itself. Barkho states an important thing to keep in mind when developing Smart Cities: “While historical cities may take years or even decades to develop, their existing populations give them an advantage over glitzier new smart cities, forgoing the need to recruit “residents.” [13]. If the Smart Cities do not focus on the aspect of the human will to live and the human expectations on living in a city, such as the project work does in its philosophical research, humans will not feel the will and urge to live in such a city. In this case keeping the principles and the Wheel of Happiness in mind is a key factor in ensuring a good quality of live and a growing population within the city.

3.4 Future outlook on development

The connections made in the previous chapter show the value that the research can bring for the development of Smart Cities. Especially the possibility of bringing the project into other cities, mentioned in chapter 2.5, could greatly benefit because in this way every other city could also take the research and findings and integrate them into its way of working towards a Smarter City. The importance is also underlined by the fact that the development of sustainable cities and communities was chosen as one of the main objectives for a sustainable future by the United Nations [14].

4 Conclusion

Summing up all the findings it can be said, that interdisciplinary project works can bring a great benefit to every aspect of life. Not only they help in the personal development of each of their team member, they also bring new input to their related universities as well as giving the opportunities to develop many new research projects out of their result. The described project even takes a step further and shows how the correlation of urban happiness and biology can not only help the inhabitants of a city to analyze and define problems and strengths of their own city but also to see how their own body and its complex processes and structures can be used to improve the everyday life of each inhabitant and even play a role in the future development of the Smart Cities in which, next to the technology, the human factor should still play the most prominent role for all actions in development that will be taken.

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