Managing Interdisciplinarity in Urban Planning Research

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Abstract

In contemporary research, interdisciplinarity is a common condition. This is especially true for urban planning where the need to leverage fast-evolving technology, emerging trends in social habits and globalization are challenging planners.

Interdisciplinarity is often stated, and almost always expected. But only seldom is clear what it is really expected from it. Even if the term has a common meaning easy to be understood by all people, as happens with quality, it is often hard to define it in terms of normative expectations. Another aspect of interdisciplinarity is that, following the research phase, a teaching and application phase is frequently present. And is in this phase that issues arise. These issues should be reconducted to the original research but, being it interdisciplinary, there is a probability that the right knowledge domain is missed: a problem arising from technology maybe should be analysed also in urban design to be really solved.

Is then important to create positive, effective, feedback to return these issues to the right research domain from the field and from the classroom. In addition, a trending approach is growing to move from interdisciplinarity to trans-disciplinarity, working with the stakeholders.

In this paper, the most common and recent best practices are explored and formal definitions and constraints are provided to clarify both the interdisciplinary and trans-disciplinary approaches with a special focus on urban planning.

Introduction

The concept of interdisciplinarity is, today, ubiquitous in any research and academic context. It depends on both the strong impact that technologies have on modern research in many fields, technical and humanistic too, and the pervasive progression of many soft sciences like sociology or anthropology in many other fields of knowledge. But interdisciplinarity, even if it is often claimed or required, is sometimes missing and often undefined. When "interdisciplinarity" is used, a formal definition of its meaning and its relevance is almost missing. In a few words, it is not clear if the term, in a given context, must be considered a sort of generic expectation or a formal rule to be mandatorily applied. To solve this first issue, we have to define the role and the sense of the word in the given research context. Being "interdisciplinary" in research should be considered from three different points of view: the need for interdisciplinarity to consider the research successful, its importance to provide useful research results and the distinction from the implementation phase.

The disruptive impact of digital technologies on any knowledge context has further extended the need for interdisciplinarity, even widening the concept that must not be confused with trans-disciplinarity and multi-disciplinarity (Hunt et al., 2014), (Gitta et al., 2014). Digital technologies and, in general, Information and Communication Technologies (ICT) have introduced new languages into research. But language, which has always been considered a tool of interpersonal communication control, is the real vector used to transfer knowledge. And the ability to apply language also involves a strong cultural knowledge in the domain of its application, to make the language a control tool (Zhang, 2022). Consequently, the ICT invasion has introduced two kinds of languages: programming languages and knowledge representation, transfer, and control languages.

Programming languages will not be considered in this paper, even if they are a sort of multidisciplinarity that is needed to automate some tasks and compute results in a reasonable time and with the required accuracy. From this point of view, programming languages are like tools and training on their usage is also related to a very small subset of the original ICT domain because, in their application to various disciplines, programming languages are mediated by visual tools or by very specialised software libraries that reduce the programming effort to very basic and simple instructions or graphical element compositions. Today, in many fields of knowledge, is practically impossible to avoid digital technologies. In Architecture, the discipline has become, especially during the last decades, an interdisciplinary mediation between multiple political, economic, social, technological, and cultural factors (Lukasz et al., 2007).

Methodology

The methodological approach used in this paper starts from a literature review of the main concepts of disciplinarity, interdisciplinarity and trans-disciplinarity, with application to the specific context of Urban Planning research. Then the possible applications and usages of the research results have been explored to evidence if the same concepts are yet essential or can be ignored. Final results are then provided as a summary schema.
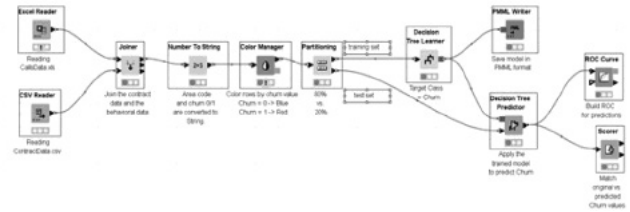

Figure 1 - Example of visual programming language (KNIME, image of the Author)

Disciplinarity, interdisciplinarity and transdisciplinarity in architecture and urban planning

Starting from the 1950s, Architecture moved from mere functionalist theories towards a more general and multifactors point of view (Lukasz et al., 2007). Planning ceased to be considered a sole "aesthetic" or "artistic", mostly based on a single individual's efforts, and become a combination of research, best practices and policies coming from different domains like sociology, economics, politics, ecology and, last but not least, aesthetics. This perspective introduced interdisciplinarity in urban planning but this could be done with two different strategies.

The first one, with Italian Tendenza and Colin Rowe and his students as main examples, tried to preserve the core of the discipline (the form and the typology) leaving it as the essence of the discourse and disconnected from the social forces that have driven its evolution. In the second one, all disciplines are considered peers and it is claimed that each interdisciplinary approach is based on means of understanding different, interdependent domains, ruled by laws that are in continuous transformation. In both strategies, a role to interdisciplinarity is evidenced, in opposition with the modernist approach that proposed architectural space as a unifying process of architecture's multiplicities, called "interpretations", that were related, among others, to "politics, philosophy, religion, science, economy, society, technology, physiology, psychology and aesthetics" (Zevi, 1957). Scolari, Rossi and other scholars further developed these interdisciplinary discourses but their reasoning evolved overlapping two rails that were the vision of Architecture as a singularity, i.e. a single discipline (disciplinary perspective) as a unique container, question and answer to its implications and the vision of Architecture as an interdisciplinary discipline that realizes itself through the management of the contexts where it is involved. These two-dimensions definitions can be called, to distinguish from the single rails, trans-disciplinarity. What these scholars tried to do was synthesise two different aspects of Architecture, singularity and multiplicity, in a single concept, and the use of trans-disciplinarity is the right tool to accomplish the task (Tine & Hansen, 2023). The same process can be repeated for urban planning that evolved with the same issue. Formal and clear definitions of the terms disciplinarity, multi-disciplinarity,

interdisciplinarity and trans-disciplinarity can be found in (Klein, 2006), (Rosenfield, 1992) and (Nicolescu, 1999). These definitions can be summarized in the following table:

Disciplinarity	That refers to a single knowledge domain and is sufficient to develop a complete discourse on something
Multidisciplinarity	Involving many disciplines, either in a sequential or overlapped way, to fill a complete discourse on something. No integration between these disciplines is needed, now new knowledge is created.
Interdisciplinarity	Many disciplines are involved but they are interfaced and integrated to create a harmonious knowledge, smoothly moving from one domain to another. No new knowledge is created.
Transdisciplinarity	It completes the previous definitions, being open-minded, combining new vision and lived experience, generating new knowledge, and going beyond disciplinary research. It relies on three pillars that are: multiple levels of reality, included-middle logic and complexity

Table 1 - X-disciplinarity definitions

While multidisciplinarity and interdisciplinarity remain in the disciplinary bed, transdisciplinarity exits from it, combining complexity, different level of perception and syntheses. Multidisciplinarity generates new forms of knowledge but t is challenging: mixing different elements, often opposing each other, is a delicate task that needs to be governed, to avoid confusion, misunderstanding or lack of objectivity.

Language as a control tool for Culture
Given what was exposed in previous sections, it should be now evident that all the "*x-disciplinarity*", (i.e. multidisciplinarity, interdisciplinarity ad transdisciplinarity) are forms that require control and Language is the main tool for managing them. So, to implement x-disciplinarity, Language is the key and, at the same time, the critical point of failure. Transferring knowledge, and transferring culture, requires the use of a language that, at the disciplinary level, is the typical jargon of the domain. But what happens when researchers want to implement this control in a multidisciplinary context? The first issue is that they have many different jargon (or domain language) that are used to provide knowledge and culture but that can have ambiguities, false friends and misalignments. Fortunately, in the case of multidisciplinarity, the problem is delimited to overlapping and interfacing elements, because single disciplines remain separated and preserve their integrity: they are only applied together or as a sequence, without mixing. But, even in this case, an issue can arise if there is a need for traceability, as further explained in the section Steps after research: application. When dealing with interdisciplinarity, the challenge begins to be evident: having to integrate and harmonise the disciplines will require the definition of rules of integration and the sharing of syntax and semantics of various kinds of jargon of the involved disciplines. Having multidisciplinarity is the highest demanding task because, often, existing languages are not sufficient and new ones must be created to represent novel knowledge. In all x-disciplinarity cases, the need for traceability requires a strong dominion over the used languages and can even lead to the definition of new rules to ensure the capability to trace the discourse from one domain to another, often used not only for knowledge and culture transmission but also for impact analysis and change management in case of change of something in the discourse path.

Steps after research: education
There is a general agreement that education is moving from a traditional approach to a new one based on x-disciplinarity, especially the transdisciplinary one. For example, in the design field, many scholars have evidenced this phenomenon (Gibbons, 1994; Etzkowitz, 2003). The Etzkowitz spiral "*government-industry-university*" is an example of the multimodal research first hypothesized by Lauer (1984).

And all these modes of research have an impact on education. In Urban Planning, the migration towards x-disciplinarity is not only tangible for the already depicted reasons (ICT invasion and singularity-multiplicity perspective) but also because the need to teach these subjects to new generations of university and PhD students requires a cultural opening to let them able to use this knowledge in their future work and research, that can be dramatically different from what expected today. Disciplines are evolving at light speed and are often changing in an unpredictable way so, to produce an effective new generation of researchers it is important to feed minds with x-disciplinarity, giving raw concepts of languages needed for this purpose. Belongs to one or more specific disciplines, often from both human and technical sciences, but they have been put together to provide research and innovation in disparate fields. Another element that pushes for x-disciplinarity in Urban Planning research is the need to apply this research to the real world. In this application, many elements of the implementation phase are coming from technologies or require support from human sciences.

Any kind of Urban Planning or Design, when put into practice, will require specific construction and digital technologies. And this requires x-disciplinarity. But this is not the only reason. Often (not to say always) the need to involve stakeholders immediately takes the discourse into a transdisciplinary perspective. Participation and commitment of stakeholders to Urban Planning is today an essential element of any Urban Planning and Design development and realization and involves many different types of stakeholders. Each one of them carries its language (its jargon) and its culture. And planners must interact with them, understanding the values they would like to gather from the planning, evidencing limits and risks, and translate everything that matters into The Plan. But for doing this, the planners must be able to understand the jargon spoken by stakeholders, and put questions in their language. But the language is only the control tool, as already said, and it is required, by planners, also to correctly understand the intimate meaning of what language vehiculates. And all of these tasks require x-disciplinarity.

Case studies: Christopher Alexander
To describe the evolution of x-disciplinarity we will consider the path starting from Christopher Alexander's "*A Pattern Language*" (Alexander, 1977). In his legendary book, Alexander defined a set of design patterns that formed a language to describe the city, formed by 253 recurrent schemes he called "*patterns*". In this book and his other related operas (e.g.

"*The Timeless Way of Building*"), he proposes an extremely innovative view that can be considered disciplinary. But his ideas have spread outside the Architecture environment entering into Computer Science where his "Pattern Language" became the spark that ignited the Design Pattern Movement (Kilov, 2004) providing the homonymous software design approach that has been used in software development since 1994 when the legendary "*Design Patterns: Elements of Reusable Object-Oriented Software*" (Gamma et al., 1994) was first published. In this case, Alexander caused researchers to move out from Architecture and apply, through a multidisciplinary approach, some concepts ("*patterns*") to a different context, in a sequential process. Alexander was also the inspirator for Wiki technology (C2 Wiki), a splendid example of Web 2.0, which was an interdisciplinary approach to design, where the product was done (designed) directly by its users. In this case, the original concept of design has been translated from Architecture into Computer Science to provide a new form of design. In this case, the approach was interdisciplinary.

A last merit attributed to Alexander is having inspired the Agile Manifesto (i.e. "*Manifesto for Agile Software Development*"). In this case, we can call it a trans-disciplinary approach because the design theories from Alexander were transposed onto the software development process, which is a wide topic that belongs to software engineering, ranging from software design, software validation, project management, team building, stakeholders involvement and commitment. Each element belongs to one or more specific disciplines, often from both human and technical sciences, but they have been put together to provide research and innovation in disparate fields.

Conclusions

The use of x-disciplinarity in Urban Planning research is today pressed by the introduction of digital technologies but also by the overlapping and interaction with other disciplines like sociology, anthropology and so on.

What is important to underline is that the kind of x-disciplinarity needed must be explicitly defined depending on research objectives. For research purposes, the Interdisciplinarity and Transdisciplinarity types are those that have the highest probability to provide important results

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