Excellence Criteria of Science in Architecture

Tadeja Zupancic Strojan
University of Ljubljana, Faculty of Architecture, Slovenia
(http:/www.arh.uni-lj.si)

Abstract. *The relation of the architectural community to the generally established scientific rules always seems to be problematic. The same refers to the general trend of increasing quantity by neglecting quality at the same time. Nevertheless, the present situation of the rising quantification in comparison to the wider context calls for special attention. The extent of socio-spatial consequences requires the identification of the wider system references, useful to introduce the lacking cultural criteria into the general evaluation system. Combined with the identification of the 'scientific' level in architecture, this could change the perception that architectural design lacks its scientific tradition. Both may stimulate architects to take their own scientific traditions more seriously, enhancing the tradition itself. The paper contributes to the discussion about the excellence criteria of science in architecture with the explanation of the 'formal' proofs of relevance and vitality of architectural research to replace the favoritised 'impact factor' differentiation, where it is still (or even more intensively) taken as the key criterion of research excellence.*

Keywords. *Database Systems, Communication, Collaborative Design, Prediction and Evaluation.*

Increase of research discrimination in Slovenia

There is no doubt that the favouritised quantitative criteria in comparison to the qualitative ones are always problematic. What makes the local and regional conditions special from this point of view is the extent to which this focus reaches in the regional context when compared with the trans-regional one, especially in the public funding schemes.

The conditions mentioned above can be identified in Slovenia as one of the new EU countries (Silvertsen, 1997) in spite of the declarative and formal agreements about socio-spatial justice and long-term balance. These conditions can be illustrated by the comparison of the Slovene research evaluation ordinances from 2002 and 2005. (www.arrs.si: May 2005). The categorization of the previous version defines the articles from the ISI citation databases as more important than those indexed in other, specialized databases. It can be argued that the ISI databases are specialized as well, and that the SCI, SSCI and A@HCI are defined according to the contents related to natural, social sciences and arts/humanities…. The importance of the publications within the ISI category was differentiated by IF within the same database. Books were

Field		Citations	Papers	Impact
1	Clinical Medicine	4420055,00	891334,00	4,96
2	Literature	2365,00	19501,00	0,12
3	History	5681,00	15791,00	0,36
4	Philosophy	507,00	10968,00	0,46
5	General	2003,00	918,00	0,22
6	Language & Linguistics	2897,00	7285,00	0,40
7	Religion & Theology	205,00	7076,00	0,29
8	Performing Arts	1643,00	5858,00	0,28
9	Art & Architecture	480,00	5088,00	0,09
10	Archaeology	4251,00	3897,00	1,09
11	Classical Studies	467,00	2098,00	0,22

Table 1. Most versus less productive sciences within the Web of Science database.

Field	% Cited
Art & Architecture	6,78
Computer Science	38,75
Engineering	37,95
Environment/Ecology	49,35
Multidisciplinary	40,57
Social Sciences, general	36,62

Table 2. Design science in architecture: space, culture, technology, computer science – (cited) publications of Web of Science.

not considered as possibly excellent, except in humanities. The changed ordinance takes books more seriously, but adds some discriminatory details to the idea of the IF differentiation: ● 100 points are devoted to a book, published by one of the selected international publishers; ● 80 points refer to an article, published in the magazine from the SCI Expanded: IF in the first quartile in the field; ● 60 points: an article from the SCI Expanded magazine: IF in the first quartile in the field; ● 50 points: book, published by one of the selected national publishers; ● 40 points: article from SCI Expanded: IF in the third quartile in the field; article form SSCI expanded: IF above the median in the field; ● 30 points: book published by other publishers; ● 20 points: article from SSCI: IF under the median in the field; A@HCI: regardless to the IF; ● 10 points: article published in a magazine indexed in a specialized database (such as ICONDA, Avery Index to Architectural Periodicals…); ● 5 points: other selected refereed national magazines (in humanities only).

The comparison with the EU research evaluation system (www. cordis.lu...: May 2005) shows that the last offers a less rigid research environment. It can be argued that an evaluation system where the researchers are not treated as being able to achieve the maximal level of 'scientific excellence' regardless to their thematic focus, as in the presented case, can be treated as discriminatory. It is necessary to define the fields where such a system is perhaps even applicable (and their representatives are trying to force their criteria as 'general') and replace the IF criterion for those where it is less relevant or not relevant at all. New challenges of open publishing are still more than needed (http://www.scix.net/). The lessons from the indicators of productivity suggest some reference points offered by in the same information database.

Lessons from the indicators of productivity

It can be noted that superficial observations of the Web of Science, directly transformed into excellence criteria, lack the potential hidden in the same reference system.

The tables present the set of the analysis within the Science Indicators database (2000-2004; http://home.izum.si/izumft_baze/wos.htm).

The inquiry on the most productive field that is clinical medicine and the series of the arts and humanities is represented first. The numbers of papers, citations and the impact of the fields are simply not comparable: the impact factor is completely irrelevant for the last. The atmosphere of competing with non-comparable fields may lead to neglecting the scientific tradition of a 'less productive' discipline within a (from the most productive researchers' selected) database.

The second table compares the productivity of 'art and architecture' and its linked fields. It shows that the fields focused on the basis of architectural self-definition (such as architectural theory and other art/culture related issues) cannot compete

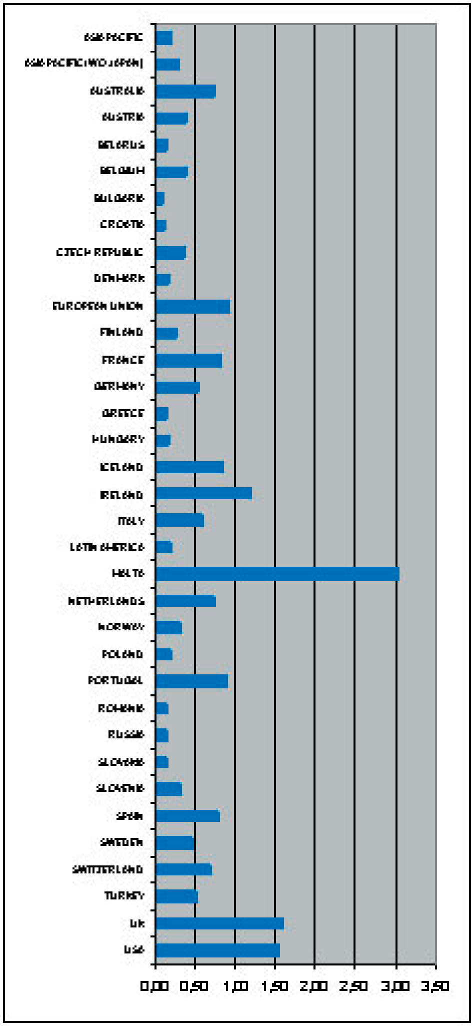

Figure 1. Field weighting: art & architecture in Europe (individual countries, EU context) and other contexts within the Web of Science database.

with any of the other aspects of architectural endeavours.

Instead of the number of publications or citations alone (or their differences), productivity could be explained by the use of the indicator called 'relative field weighting'. The criterion offers one of the potentials for the relativisation of the production numbers, taking the 'cultural dimension' into account – at least in the quantitative sense. The productivity of the field is related with its interrelation to the whole productivity within the country or other chosen cultural context level. The analysis performed within the Science Indicators database is based on the choice of the European countries and the major geopolitical regions. The results show the (expected) similarities of UK and USA, but also the comparable levels of relative architectural productivity in Austria, Belgium, Czech Republic, Finland, Norway and Slovenia. The results can be understood as consequences of both specific architectural and general publication policy differences. Any correlation with the architectural quality of the same context seems speculative.

What is the role of the criteria of productivity and relevance outside the ISI limitations? The lessons of the field- or problem- oriented but general criteria examples introduce the specific discussion on architecture.

General criteria of research excellence

The criteria of the research excellence, relevant for all variety of the disciplines, are: quality, productivity, relevance, vitality and feasibility (http://www.knaw.nl/...: May 2005).

Quality is assessed within the field. The peer-review systems are relevant for the academic publications, while other forms require further examination. It represents the key criterion of research excellence: it is focused to the innovative aspects, goal-achieving, argumentation logic, methodological issues… of the research.

Productivity includes bibliometric and sociometric components. When the bibliometrics are taken without the sociometric point of view, the results seem questionable. The same comment refers to the productivity priorities, selected from the 'most productive' disciplines. Research practice shows that there is a certain production level required to achieve the quality wished – exaggerations may cause the opposite effect. The balance depends on both research field and individual or group potential.

Relevance represents the meaning of the research within its contextual framework. It can be said that one of the quantitative methods, taking the impact factor of the ISI database, indicates the quantity of the influence in the contextual frame, relevant for that database only. Other possible quantitative methods include calculating the numbers of citations in other publications, reviews published, etc. Quality of the influence needs other forms of evaluation.

Vitality and feasibility refer to the personal (group) abilities to develop their research endeavours. The working conditions, management, strategies… cannot be evaluated through the productivity changes only. The criterion reflects the idea of sustainable development in research. The cultural dimensions of criteria may be found in the quality of the contribution to the socio-cultural context and its sustainability, the diversity of the levels of relevance, the interrelation of diverse modes of productivity within different cultural contexts…

The five point scale from the Netherlands represents one of the generalised evaluation systems, taking the autonomy of the research fields and the contemporary problem approach into account. All academic publications are recognized as relevant (articles published in refereed and other journals, book chapters), monographs, PhD. theses, professional publications. The assessment of quality-level is enabled and enhanced by the choice of the leading presentations. The key provisions of 'the scale' are:

-'excellent: work that is at the forefront internationally, and which most likely will have an important and substantial impact in the field /…/

-very good: work that is internationally competitive and is expected to make a significant contribution; nationally speaking at the forefront in the field /.../

-good: work that is competitive at the national level and will probably make a valuable contribution in the international field /.../

-satisfactory: work that is solid but not exciting, will add to our understanding /…/

-unsatisfactory: work that is neither solid nor exciting flawed in the scientific and or technical approach, repetitions of other work' /…/'.

The approach to the research excellence described above is focused to the quality instead of quantity as seen from diverse indicators of productivity.

The reasons of the 'low' productivity or architecture in the ISI magazines, misleading to the notion of a generally 'less productive' or even 'less scientific', can be traced in the nature of architectural research and its own scientific tradition.

Notions of architecture and science – scientific nature of architecture

The diversity of the ways people understand science and the interrelation of architecture and science varies from the notion that science refers to the (natural) sciences only, to the conceptualisation of the whole body of knowledge. It is often related to the top knowledge level, which seeks further for the criteria of excellence. It is also argued that architecture is science, even in the case of the focus to the (natural) sciences (Picon and Ponte, 2003) like in the case of the 'Artful Science' (Stattford, 1994). This includes topological tendencies (Cristina, 2001), organic approaches, optical themes; leading to perception, eco-logic, which finally looks beyond 'the sciences', to the fields of social and other sciences. In short: from a narrow focus to a holistic notion. However, architecture has always taken the current knowledge of its own and other fields into account, regardless to the definition of science. It can be argued that contemporary design science is not an application of scientific results only but applies its principles. That means it can be understood as science itself.

What are the principles of science then?

There is also the question of what is the meaning of the research appearing in this context. The possible misunderstandings derive from the fact that research may refer to what seems innovative to an individual or what represents the top, socio-culturally defined level of achievements. The notion of science in the sense of the whole body of knowledge and skills seems close to the general notion of research, leading to this general knowledge field. It is obvious that the possible misunderstandings mentioned above reflect in architecture as well: Architectural design is research, generally; research in the scientific sense refers to the culturally agreed level. It is obvious that the criteria of excellence are culturally rooted and depend on the people, evaluation period and purpose. Nevertheless, a cultural agreement reduces the arbitrariness in evaluation.

The discourse presented takes the holistic notion of science and the narrow focus of research into account – both most relevant for the definition of the criteria of excellence in (scientific) research in architecture.

The definition of 'scientific' (level) in architecture derives from the definition of the diverse nature of architecture from the aspects of the philosophical starting point, aim, approach/method, representation and applicability of results.

'This is not architecture…', it is argued while dealing with architectural representations. Nevertheless they are dealt with as if they were physical 'architecture' (Rattenbury, 2002). A similar attribute is attached to science in architecture as a field: 'artists' would claim it is useless, possible source of argumentations perhaps. Others would take science as its theoretical and methodological basis, the essential component (or level) of professional endeavours, which is potentially upgraded into what is culturally identified as 'art'. Architectural wholeness can be then understood as the integration of its artistic and scientific nature.

Science is aimed primarily towards the knowledge-base development, while art is usually understood as focused to the issues of aesthetics. Sometimes art gets a meaning similar to the widest notion of science. Thus it can be added that it is questionable to take the polar concept literary. Also art may become a scientific topic (as in the case of art history) and science may become an artistic topic (paintings interpreting scientific discoveries). The same scientific achievement can be applied in an art object, as sculpture or a painting, for instance, of can lead to further scientific investigation. As a parallel, an object in the chosen cultural context evaluated as an artistic achievement, can be researched in a scientific manner, with a scientific aim; or/and stimulating further artistic play. Nevertheless it can be said that the aims of scientific and artistic endeavours in architecture are not identical, regardless to the possible uniqueness of the concrete topic, problem and goals of the project. A holistic approach requires a balance of both 'dimensions'. Both may lead to the discoveries – though of different nature. It can also be noted that the knowledge base consists from both explicit and tacit knowledge (Polanyi, 1966) and the scientific research refers to the first more than to the second one; sometimes it is difficult to distinguish the role of each within the field, especially in those where the tacit knowledge plays an important role.

The excellence of the results might be found either in the confirmation and essential upgrade of the leading paradigm or the destruction of the leading and the establishment of the new paradigm. The last are usually not recognised by the leading group but within the rising new social context, as described in the Thomas Kuhn's theory of scientific development (Kuhn, 1962). The trouble with architectural scientific research is that it represents a paradigm far from both the leading practice and the leading scientific group of the most productive sciences.

Science, art and religion as activities of human mind can be related to the three philosophical

(Okasha, 2003) starting points: idealism, materialism and phenomenology. The philosophically legitimate approaches: subjective, objective, and relativistic (Kosir, 1999) differ in their acceptability for 'scientists' in general. Objectivisation seems the only relevant option, at least for the positivists (materialists), sometimes without the critical awareness of its limitations. For them, relativisation seems to be acceptable conditionally (according to the problem focus). It can be argued that scientific methods differ from artistic by the level of objectivisation.

Architecture (as a profession) is sometimes differentiated also to the levels of 'professional' (concrete, specific) and scientific (abstract, general) approach to the architectural problem (Kalisnik et.al, 2003). The level of abstractness is, from this point of view, one of the key characteristics of 'science' in architecture. Science acquires general principles from specific problems and solutions. What is special in architecture is that what seems general in a chosen scale represents perhaps 'specific' in another. In spite of that, the process of generalization and formulation of the principles remains. This is directly linked with the applicability of the results. 'Pure' science, applied and development research in architecture are all development oriented, and intertwined necessarily.

There are three generally acceptable scientific research methods: historical, descriptive and experimental (Kalisnik et. al., 2003). The first usually tends towards objectivisation but cannot achieve the level of the experimental one; the descriptive allows the highest level of relativisation and even subjectivity (the tolerance within the field, and especially the confrontation of other fields limits the level of subjectivisation). Is it more appropriate to treat architectural design, for instance, as the development simulation, laboratory based experimental work, both, or something else?

General scientific achievements are integrated within the architectural design endeavours into a concrete, unique artistic solution. Its realisation leads back to the 'scientific evaluation'. Thus some aspects of architecture touch humanities, other are closer to social sciences, technology etc.

The scientific representations differ from the artistic as well. A text on a statistical survey result about the quality of life in the chosen spatial circumstances is probably not acceptable for the majority of architects, not to mention other fields. Architectural representation is linked with architectural theory. The theory may be treated as the scientific research level of architectural self-understanding: the first level includes the descriptive: 'establishing the paradigms of high-code architecture and affects how architects see the world and which things get described as architecture'. The second level "establishes a canon of famous architecture" by using photographs, journalism, exhibitions, and books. The top level is represented by critical theory, with specialized values (Rattenbury, 2002). This leads from description towards explanation and evaluation. The third belongs to the scientific world, the second conditionally: when it explains the third, it seems more acceptable than in the case of referring to the first (at least from a more or less positivistic point of view).

The localists and globalists fight in the definition of the target audience of the representations. The responsibility of scientists in the fields dealing with cultural contexts is to develop both their native language and inform and address the international audience; the target audience depends on the relevance and applicability of the results. Applicability of the results relates to the contents as well as to its presentation. Global applicability cannot be taken as the generally most important. The presentation of the results and the process leading to the presentation enables the research evaluation. The presentation form is not necessary balanced with the presented contents. The problem of the evaluation system appears if it is focused on the formal attributes of the research representations, intended for the scientific/academic audience only. It neglects the communicative potential and need of the fields focused to the local, regional, trans-regional, and not only the (more or less) global context.

The lack of thinking about direct or indirect applicability of the results of scientific research in usual architectural endeavours (exceptions can be found in the field of the so-called and already mentioned ‘development research’) is combined by lacking promotion of architecture (either idea/representation or its materialisation) as an artistic creation and scientific research application. The last problem requires an inquiry into the possibility to express the specific aspects of architectural research in diverse manners, including the positivistic one.

Special criteria for research in architecture

It can be noted that the endeavours of conference organisers and publication boards recently tend to the enhancement of the quality level in the specific sub-field in architecture.

What is left for the presented discourse to contribute to the existing endeavours? At least to continue and search possible explanation of the ‘formal’ proofs of relevance and vitality to replace the favouritised ‘impact factor’ differentiation, where it is still (or even more intensively) relied on and taken as the key criterion of research excellence.

What is the range from excellent to satisfactory in architectural research? How is it possible to ‘formalise’ this, in relation to other scientists, at least those relying on the ISI databases? What replaces the ‘impact factor’ in architecture (and possibly other arts and humanities)?

Architecture as focused to cultural environment is able to deal with local, regional, trans-regional or global scale at the same quality level of scientific excellence. Relevance of architectural research results can thus be evaluated from its influence in the target socio-spatial context. Its positive (!) influence can be traced not only from:

- positive scientific citations (identifiable in diverse databases) but also from:
- published reviews written by qualified experts: reviews of research results, reviews of architectural applications as challenged by excellent research results; reviews of socio-spatial changes as development consequences following the research endeavours (in this case after the period needed for critical approach)
- professional public response
- economic response
- general public response.

Obviously the influences mentioned above cannot be identified by taking the IF of the ISI-citation databases into account.

Tradition redefinition and metamorphosis

Architects could improve their short-term research circumstances after the enhancement of their productivity, following the traditions of other fields; on the other hand this could cause non-critical production and redirect the focus from both practical inquiry and theoretical self-reflection. This calls for the redefinition and change our own ‘scientific’ tradition.

The lessons of the chosen indicators of productivity are directed towards bridging the gap between architecture and other sciences, at least those linked with the positivist approach. Identification of the general research excellence criteria in the wider trans-regional context enables linked solutions.

Identification of the relation between architecture and science may contribute to the identification of the scientific level and components of architectural endeavours. Specification of the criteria of scientific excellence in architecture, linked with the criteria of artistic achievements, can become the reference starting point for other sciences as well.

The introduction of the cultural criteria into the general evaluation system enables diversified but balanced horizontal evaluation system of the scientific fields. It redirects the process to the vision of horizontal and vertical scientific research evaluation system coherence and dynamic balance.

The suggestions about the interpretation of the scientific level of architecture are applicable especially in similar contexts of the predominant positivism and extreme globalisation, to redirect the trend towards a more critical approach. Consequently, the improvement of the conditions of architectural research endeavours would stimulate architects towards taking their own scientific roots more seriously.

References

Cristina, G. Di: 2001, Architecture and Science, Wiley, New York.

Guidelines on proposal evaluation and selection procedures [FP6] http://www.cordis.lu/fp6/find-doc-specific.htm#evalguide

ISI Web of Science. 2000 / ISI Science Indicators. 2005. http://home.izum.si/izumft_baze/wos.htm

Kališnik, M., Fister, P., Lah, L., Dekleva Smrekar, D.: 2003, Uvod v znanstvenoraziskovalno metodologijo na podrocju arhitekture in urbanizma, Fakulteta za arhitekturo, Ljubljana.

Kosir, F.: 1999, Post scriptum, in: Debevec, Leon (ed.): Sakralna arhitektura v slovenskem prostoru - danes, Pozoj, Velenje, pp. 7-9.

Kuhn, T. S.: 1962, The Structure of Scientific Revolution, University of Chicago Press, Chicago.

Okasha, S.: 2003, Philosophy of science /…/, Oxford University Press, Oxford, New York.

Picon, A., Ponte, A. (eds.): 2003 Architecture and the Sciences – Exchanging Metaphors, Princeton Architectural Press, New York.

Polanyi, M.: 1966, The Tacit Dimension, Doubleday, New York.

Pravilnik o pogojih in metodologiji izbora /…/. Ur.l. RS, št. 21/2001, 38/2002.

Pravilnik o ocenjevanju in financiranju /…/. Ur. l. RS, št. 12/2005. www.arrs.si

Pravilnik o (so)financiranju temeljnih, aplikativnih /…/. Ur. l RS, št. 12/2005. www.arrs.si

Rattenbury, K. (ed.): 2002, This is not Architecture, media construction, Routledge, London, NY.

Standard Evaluation Protocol 2003-2009 for Public Research Organisations,

VSNU, KNAW, NWO http://www.knaw.nl/cfdata/publications/results_zoeken.cfm

Stattford, B. M.: 1994, Artful Science(/…/, MIT Press, Cambridge, Mass.

Open, self organising repository for scientific information exchange – SciX http://www.scix.net/