Sumerianz Journal of Education, Linguistics and Literature, 2021, Vol. 4, No. 3, pp. 73-83
ISSN(e): 2617-1201, ISSN(p): 2617-1732
Website: https://www.sumerianz.com
DOI: https://doi.org/10.47752/sjell.43.73.83

Original Article Open Access

Analytical Study in Algeria: The Question of the Division of Labor between Architects and Engineers Based On the Concept of the Oath and Complementarity

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Article History
Received: June 9, 2021
Revised: August 13, 2021
Accepted: August 17, 2021
Published: August 19, 2021

Abstract

Nowadays, in Algeria, the institutional and practical context differs between the profession of architects and engineers. The latter are devoid of the concept of an oath. This concept can be the catalyst and generator of responsibility, equality, and merit between these two professions. To achieve complementarity between these two professions, an approach based on a questionnaire and interview on this situation is carried out at architectural design offices and minimal technical design offices in Algeria in order to bridge the gap created by the division of labor. Nationally, the work situation is sequential and linear. I.e. the engineer works under the responsibility of the architect. At the international level, the process is organized between architectural design offices and technical design offices, an iterative process. How to achieve this culture of complementarity of international practices. To validate this oath-based complementarity, this article reports on the results obtained and the prospects envisaged following this study.
Keywords: Architect, Engineer, Division of labor, Complementarity, oath.

1. Introduction

The interest aroused by the absence of analytical studies in Algeria on the question of the division of labor between these protagonists, in particular their degree of interaction, in relation to international practices using the concept of the oath. Oaths were ubiquitous rituals in ancient Athenian legal, commercial, civic and international spheres (Judith, 2015). Nowadays, Engineers undertake to respect the solemn duties described by architects who work in direct contact with the Client. These Algerian architects are sworn in under their tutelage, the National Council of Architects. While the supervision of engineers only came into being in 2003 after the great disaster in the city of Boumerdès in Algéria.

According to Judith (2015), an oath is a framework for committing oneself to actions based on competence and skill. It is *"a formal promise, made within the framework of your peers, to respect the moral values and behaviors of your discipline ... a commitment made by an individual, who is then guided by his conscience to achieve it."* an architect and engineer can build public confidence in the profession. The oath is the pillar of the interactional relationship between the two designer actors in a situation of complementarity.

The present research attempts to bridge this gap by providing quantitative and qualitative analyzes and an interpretation of the said situation and contributing to existing scientific knowledge. It can be a platform for scientific research in this field. The dialogue is impossible between two people who have different languages. The result of the struggle is always the same : "*science prevails and the final design has generally lost the eventual charmed and fitness of detail dreamed by the architect* " (Faber, 1963).

To bring this institutionalized approach to light, a body of law can serve as a common thread for the practice. Law no.85-704 of July 12, 1985 relating to public project management and its relationship with private project management, known as the MOP law, is a French law, which is put in place for public contracts, the organization of the relationship between project management and project management. Repealed by Ordinance No. 2018-1074 of November 26, 2018 - art. 18 (V). The article of Decree n ° 93-1268 of November 29, 1993 relating to project management missions entrusted by public contractors to service providers.

In Algeria, we can underline that, *"with regard to civil engineers, law n ° 01-05 of August 14, 2004, amending and supplementing law n ° 90-29 of December 1, 1990 relating to planning, has introduces an extremely important provision in its article 5, which stipulates that the construction projects submitted for building permit must be jointly developed by an architect and a certified engineer, within the framework of a project management contract "* Posted in (Bendaoud, 2010).

"The regulations are clear, the building project management must concern groups of architects and engineers in civil engineering, and both approved and bound by a project management contract". Posted in (El Watan, 2010).

On the national scene, the body of engineers of [structure, fluids, acoustics,] performs tasks under the responsibility of the architect in the project management according to the MOP law. This situation favors the linear design process. *''The body of Algerian engineers does not have a National Council of Engineers, CNIA''* (El Watan, 2010).

The French National Council of Engineers, CNIF, was created in 1957. This legitimacy of the two bodies, the international, has given rise to a model of, BEA and BET. Complementary work becomes an iterative process. It is institutionalized collective work.

The hypothesis is that as it stands, this division of labor involves a sequential and linear process between architects and engineers avoiding recourse to complementarity; this to remedy the problems of loss of time, economy, feasibility and the quality of execution of the project. Complementarity is a collective activity which can be a situation full of interactions between the two functions. The regulatory adaptation of the ethics and professional conduct charter based on the "oath concept" with a view to remedying this situation of division of labor between architects and engineers.

The uniqueness of this research lies in the exploration of the work situation of Algerian architects and engineers of different statuses by revealing the importance of the charter of ethics and professional conduct. The research results allow decision-makers and designers to recognize influence, review the granting of approvals to the two professions, and explore other forms that can promote the work situation of Algerian BEA and BET to international standards.

The initial training of architects and engineers predisposes them to acquisitions endowing them with an architectural and engineering culture. The way of thinking, of specific representation of the ergonomic and structural space, based on the imaginary, allows them to master the project from the project management phase until its maintenance.

"It is about intelligence quotient, diploma and technical expertise" (Daniel, 1998). Both professions provide a reflection on the organization of space and its structure from a technical and economic point of view. Prouvé (1990) emphasizes the device that the two disciplines Architecture and structure are inseparable and must exist together *"For me there is no architecture without structure, architecture is an object built in the space, it must be structured''.*

2. Theoretical Framework

The Algerian professional reality, the pension between the architect and the civil with the client, made the civil engineer work under the cover of the latter, and that the responsibility in the quality of work rests with the architect, and congratulations are due to the latter. It is noted that the presence of the civil engineer next to the architect is necessary and certain. Which is stated as an establishing and intelligible way of working between the two professions in time and in space. *"Without Engineer, nothing stand up. Without architect we would want it to" ...etc.*

It is observed that the quality of Algerian buildings has not reached the level of the achievements of international academic offices. It can be summed up in the failure to take the oath to the civil engineer and hold him responsible for the project with his colleague the architect. Herein lies the concept of integration, which can harm the perfect coexistence between the architect and the engineer. And from it floats the behavior of competition, valuing the creative idea, and making the civil engineer face the customer.

The research interest of this work is to understand the relationship between architects and engineers in a process from the division of labor to complementarity in Algeria. This section present a brief theoretical, sociological, and empirical overview of the relationship between the two professions. Presentation of an analysis of professional situation modalities will serve as a platform for bringing these two professions together. This research studies the concept of oath and complementarity which serve as a platform to elucidate the process of the division of labor between Algerian architects and engineers.

2.1. The Project as a Space for Professional Interactions

A project, designed and carried out by the architect and engineer, has the advantages of better professional and interdisciplinary interaction for the prevention against the risk of earthquakes or collapse of its structures. The division into specialized skills has caused negative effects; the volume of knowledge has become too large for the brain. But, interdisciplinarity only works to the extent that a discipline is immediately accompanied by the germ of knowledge and values specific to other disciplines. Michael (2000) emphasizes this professional situation *"the architect and the engineer proceed from two completely different visions of the world (Project of life) : the architect appropriates the world with all these stimuli, his product comes from human for humans, the world of the engineer is perceived through mechanics and its product is derived, and responds to the natural sciences "*. In agreement with Michael Carley, during the professional interaction complementarity is necessary to better manage the project.

The architect Felix Candela emphasizes the situation of conflict which tends towards the division of labor much more between the two professions. *"The second design phase…. consisted of a tremendous battle between the structural engineer and the Architect- the former willing to introduce modification which, although, sometimes necessary, many other times should be unnecessary- on the other hand, the architect wants to maintain his preconceived idea, but has no weapons to fight against the scientific arguments of the technician. The dialogue is impossible between two people who people different languages. The result of the struggle is always the same:*

science prevails and the final design has generally lost the eventual charmed and fitness of detail dreamed by the architect " (Faber, 1963).

2.2. Technical Growth

In the 19th century, the Industrial Revolution shook the more or less stable hierarchy that had been established between the three specializations, the artist, the craftsman and the scientist. The man of the tool will have to retrain and become the man of the machine. This transformation is supported by the creation of new schools which will constitute the framework of the new economic and social situation, the engineers. The School of Roads and Bridges is the first engineering school in the world. It was founded in 1747, with those of Mines and Polytechnique. During this time, engineering conquered other areas of building construction, including infrastructure and their structures. On the other hand, the architects ensure the aesthetic sublime.

The 19th century therefore marks the beginning of the latent antagonism that still exists today between architects and engineers, some retaining most of their prerogatives in the construction sector, others claiming the monopoly of art. , entering this semantic sphere which makes men of them. Art, professionals able to link abstract design and concrete realization in the building. This quality, whether they are protagonists, insists on the use of sublimity in their buildings.

2.3. Separation and Rapprochement Between the Two Disciplines

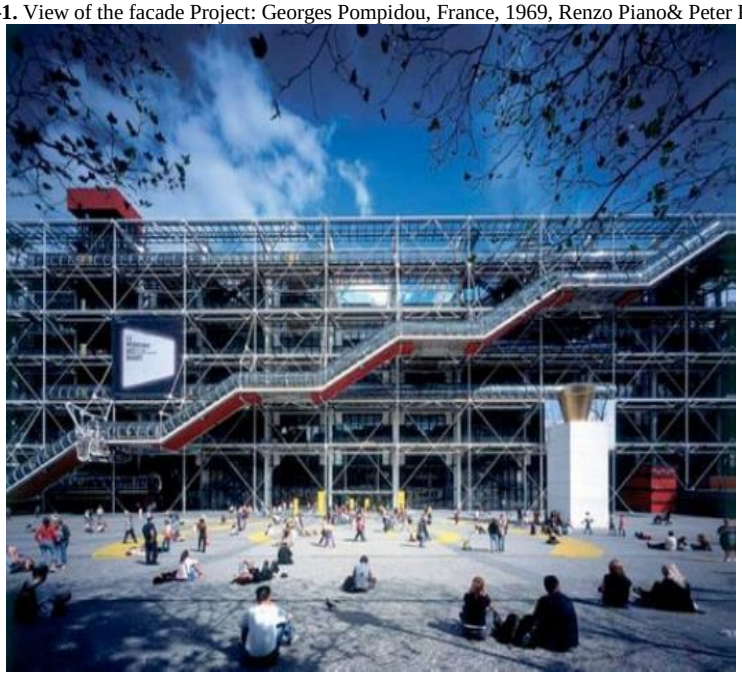
Bringing together architecture and engineering as constructive practices is of paramount importance. According to Jean (1981), this notion of unity between architecture and construction is akin to architecture and [...] engineering, separate fields only come into contact by chance, the day of the appointment to the construction site [...] What need does this […] meet?

In general, engineering includes topics such as fluids, heat, etc., which, while less recognized, no less affect the design phase, especially with regard to specialized buildings requiring the use of a particular technique, as underlined by Ferrier (1999). It is necessary to heat, light or cool, to take care of the distribution of flows, under penalty of seeing the architect's proposal remain only a pleasant drawing (Ferrier, 1999). The cohabitation of the two disciplines leads to rediscover the sublime of the buildings built by these two professions.

2.4. Visions of the Technical World

Engineering is the open domain of creativity. The respective work of George-Pompidou in France, of Piano-Rice, is so closely interwoven that it is very difficult to say who is responsible for what. The sublime is taken to its highest level by these protagonists. This building is the "high-tech" which is a reference of the dimension of the sublime. According to Oxford English Dictionary (1988) "high-tech" is understood to mean a style of architecture (and interior design) that mimics the functionalism of technology. Here is an example in Fig.1.

Fig-1. View of the facade Project: Georges Pompidou, France, 1969, Renzo Piano& Peter Rice



Source: Author Screenshot

The right solutions appear if the two professions know their jobs, share the same objectives and respect each other. More importantly, if the engagement of the engineer begins early in the programming and design phases of the architect. This will not obtain good results by asking an engineer for a structure under conditions already fixed and limited. According to Schlaich (2010), the architect must be open to the contribution of the engineer, who want to contribute by proposing alternative structural solutions. Everyone should want to understand each other's ideas and give enough explanation about their work to allow this understanding.

3. Reflectivity as a Support Generating the Smooth Running of the Two Disciplines

Reflexivity is the product of the action between architects and engineers. It allows designers, architects and engineers to complement each other. For us, reflexivity allows us to see the project in its entirety, it is not more partial. Thus, the emergence of the sublime of the two disciplines is perceived and experienced through its multiple dimensions, aesthetic, technical and functional. The effect of the action between these two protagonists leads to reflexivity. When the architect puts his knowledge and know-how to work, he pushes the engineer to deploy his skills and vice versa. The interactions between architects and engineers constitute a set of experiences which reveal the unsaid of the two professions in their relative autonomy. And beyond that, the sublime emerges in the realization of the project by the protagonists of both disciplines.

The sublime expressed in dimensions of promotion, prestige and size, may be the result of the revelation of the symbolic dimension of architectural design by the architect to the engineer, who does the opposite through his skills in construction. The two disciplines go together for the objectification of these concepts found in different masterpieces. The sublime thing about architecture and engineering is to properly help users with their projects so that they feel involved. The end result lives up to their expectations in the materialization of sublime concepts.

The user is able to understand that his project is to make more informed choices about the sublime materialized by the two protagonists. They strive to keep their satisfaction rate in perpetual growth. Along with reflexivity, someone could say that the creativity and innovation of both are at the heart of the approach to the sublime, architecture and engineering. The masterpieces that pass through the hands of architects and engineers are designed in a constructive logic in order to facilitate the task of the stakeholders and to optimize the aesthetic and technical dimension of the building designed and constructed for the good of human being.

In their design and production work, the protagonists explore how the dimension of the sublime nourishes and shapes the spatiality of individuals and their decision-making processes. This influences other dimensions (ethical, technical, functional) of the workspace. Space, as a fundamental element of architecture, takes its source and its birth in the organization of the different components of the architectural elements which delimit this space and give it the notion of promotion, prestige and grandeur. For us, it is important to stress that aesthetic properties are neither properties of the environment per se, nor simply properties of individuals reacting to that environment. Rather, they are properties that emerge from the interaction between the protagonists.

Aesthetic issues are therefore systemic issues and should be treated as such a space. The aesthetic dimension directly appeals to the imaginative consciousness, which in turn activates the space that exists only in power. Aesthetic space is a product of the imaginative consciousness which makes the architectural world and the technical world coexist. The mechanisms that govern the production of the sublime of the two disciplines are the interaction and reflexivity between architects and engineers in the manufacture of masterpiece in its environment for users.

The users and the environment that receive the work are part of a world ruled by monotheism. This brings us to refer to the organic architecture of architect Frank Lloyd Wright, which is based on the concept "The part belongs to everything and everything belongs to the part". It's like in society, "the element serves the group and the group serves the element"

4. The Evolution of the Relationship between Architect and Engineer

To understand the relationship between architect and engineer, it is important to go back to the origins of builders. At the time, a single professional was responsible for the entire project. The evolution of practices towards more complex projects has brought about a transformation of roles and responsibilities. A movement towards specialization began at the beginning of the 15th century, when the professions of architect and engineer began to be defined separately. The art of building has become very complex and has resulted in a fragmentation of art and science.

History shows that the evolution of the relationship between architects and engineers is influenced by time periods and ways of thinking. In this sense, the new challenges of sustainable development, climate change and all the needs for regeneration of ecosystems are transforming the same practices for the reorganization of work and changes in paradigms between the architect and the engineer. Thus, for the past ten years, professionals have been much more present at the start of the project in order to optimize the initial concept. The engineer is no longer at the service of the architect, but works with him for a common goal of optimizing the project. This makes it possible to create added value to the latter with a view to complementarity.

The complementarity of well-established roles and responsibilities through a synergy of disciplines avoids the confusion of practices and generates optimal results. The mutual involvement of the architecture and the engineer is therefore beneficial to the project. To this end, the importance of complementarity does not lie only in the architect and engineer relationship, but in the existence of a dialogue. Dialogue, communication, pushes the two actors to go as far as possible from their art and allows the synthesis of different thoughts to lead to a common creative and innovative project.

5. The Training of the Two Professions in Algeria

The two professions appeared in Algeria, between 1830-1962, as the result of an internal dynamic of modernization of Algerian society by the colonizing country which accompanied the economic development and technical advances of Europe, France. *"During the year 1949-1950, among the 1973 registered students, there were 271 Algerians"* (Khelfaoui, 2000). The reasons that would have prevented the access of the natives to technical

training is political. *"The technical functions are the functions of professional and therefore social supervision ... Colonialism wanted at all costs to avoid having to ensure the supervision of the natives by the natives"* (Khelfaoui, 2000). This training of the two professions saw the light of day in three periods.

5.1. The Colonial Era

The engineering profession appeared as early as the Ottoman Empire almost at the same time in Europe, since a first school had been created in 1909. The great engineering school was set up to train civil engineers responsible for road works (Perassimos, 1990). In 1894, a ministry for the colonies was created and the French society of colonial engineers, created in 1895, brought together the engineers acquired in the "expansion work", with the mission of exploiting the conquered territories (Vacher, 2004) In 1958, this institution took the name of the National School of Engineers of Algeria. It then formed four areas: public works and construction, electronics, electrical engineering and mechanics (Ben, 2001).

5.2. The Post-Independence Era

For independent Algeria, National School of Engineers of Algeria was reopened in 1963 under the name *"National Polytechnic School of Algiers". A massive departure of technical executives:"92.8% ٪of senior executives, 82.4% ٪of technicians and supervisors"* (Augeron, 1999). The priority displayed then, by the Algerian political leaders, was to replace these technical frameworks and, secondly, to proceed with the implementation of the development project envisaged by the country. In this process, engineers were given the role of "Builder" (Longuenesse, 1990). The state will then engage them in its administrations and in the public sector companies that it has created, by importing "advanced technologies" (Charte, 1976).

5.3. Period of Economic Crisis

This historic phase produced a change in the management of the project. A recourse deemed excessive to "foreign technical assistance" by the "foreign consultancy firms" is then incriminated. National companies are giving way to large SMEs deemed to be easier to control and manage. The project sponsor rarely calls on civil engineering consultancies, generally preferring "architectural consultancies" which are not their trade.

6. The Division of Labor between Algerian Architects and Engineers

This division of labor has meant that an exclusion often appears in competitions or calls for tenders relating to project management, where "offices specializing in civil engineering" are systematically excluded, always in favor of "design offices of architecture". The latter use civil engineers for subcontracting for "undervalued amounts". When presenting a work or a public infrastructure project, it is often the name of the architect (or architectural design office) that is cited or highlighted. On the other hand, the name of the engineer, bearer of technical knowledge and who participated in the existence of the project is not mentioned on the project as the architect. This is the result of the division of labor. The architect thinks of himself as the conductor. Certainly, but things have changed. The project is complex. He needs other design sciences.

The art of building requires multiple skills and calls on many stakeholders in the design, construction and quality control of buildings and infrastructures. In Algeria, project management is often entrusted out of ignorance and perhaps the non-existence of the status of the engineer exclusively to architectural design offices. In a country like Algeria, ranked among the most exposed to seismic risks and natural disasters, the absence of the intervention of the civil engineer as the main actor during the design and construction process was noticed. This absence is confirmed by the disasters of El Asnam in 1978 and that of Boumerdes in 2003.

7. Relevance and Research Question

The scientific interest in presenting this research is rooted in the curiosity to understand the situation of Algerian architects and engineers from the divisions of labor to complementarity. The exploration of statistics and of the code of ethics and professional conduct using an adequate analysis with the oath to achieve complementarity.

8. Methodology

The problem lies in exploring the process of division of labor into complementarity under the various aspects of the concept of oath applied to the profession of the architect rather than the civil engineer. He has been working under the responsability of the architect. This led to the failure of the buildings to be completed according to international standards. In order to ensure the effectiveness of the oath, its importance, its concept in theory and its application in the field to the architect and civil engineer on a global basis, a statistical approach was implemented for the two professions for both temporal and spatial, based on an analysis model for a sample of five to ten years. The goal is to evaluate this process from division of labor to complementarity with the oath as the primary focus of the assessment. This analytical approach relies on a combination of two methods, namely reading statistics and conducting interviews. It is noted that the interviewing process was fruitful due to the mentoring method. Architects and Engineers Statistics Tables were developed using Excel as a representation tool with accuracy in tracking the data collected.

8.1. Interviewed Population, Data Collected and Interviews

The work is based on interviews conducted in research offices located in Algeria. The interview touched on the size and functioning of the BEA and the BET, highlighting the process of interaction between architects and engineers from the division of labor to complementarity. The majority of private design offices are made up of 01architect [agency manager], 02 trainee architects. No in-situ engineer, he is at a distance, in another corner.For state design offices, the engineer existence of in-situ is remarquable on site. The exchange relationship between architect and engineer is characterized by a linear progression process either with the engineer-in-situ or the remote engineer in both types of design offices. The majority of the interviews collected are similar in content. This clearly explains the division of labor between the two professions.

9. Results

9.1. The Oath as an Ethical and Deontological Dimension to Manage the Profession: Architect and Engineer

Ethics and deontology are based on the principle of the oath which is the fundamental element of all professional practice, even the Archimedean oath.

The oath ensures equality of responsibility and merit between these two professions. With the practice of the oath in the two professions, the exchange relationship is strengthened in the sense of filling the gaps in the process from the division of labor to complementarity.

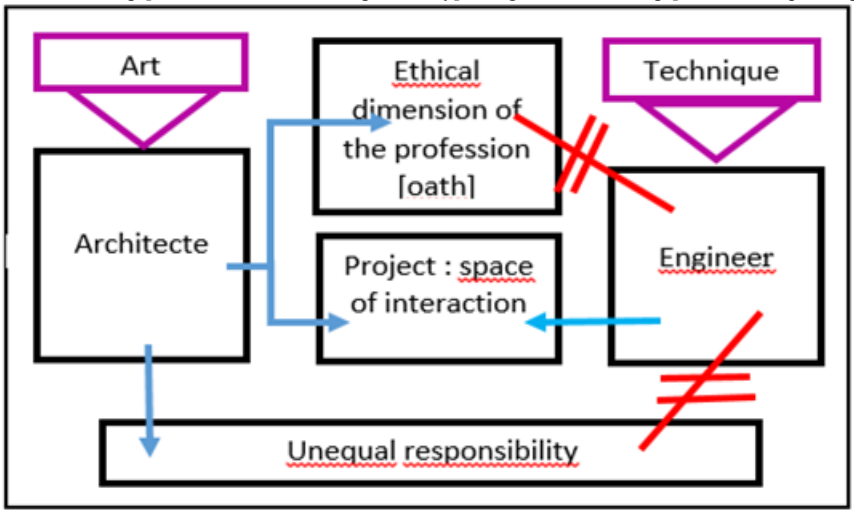
The questions put to architects and engineers in Algeria on the need for the oath and complementarity led to a necessary argument for the establishment of the ethical or deontological dimension.

In these two professions, there are two categories of articulation between architects and engineers:

- **First modality :** Architects take oath and Engineers do not take oath

In this first modality: in practicing the profession, the two protagonists do not share at the same ethical issues : the oath, Unequal responsibility, unequal merit. Here is an example in Fig.2

Fig-2. Positive relationship [existence of oath and responsibility] ≠ Negative relationship [no oath, unequal responsibility]

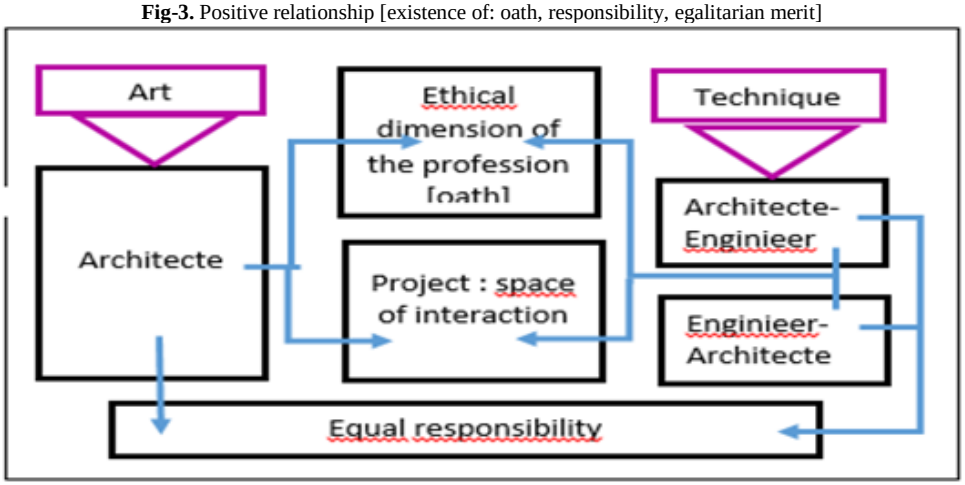


Source: Author

- **Second modality :** Architects take oath, and Architects-Engineers take oath

In this 2nd modality: The two protagonists share the ethical issues : The oath. Both professions assume responsibility for the project. These are witnessing two-headed professionals. Here is an example in Fig.3

Fig-3. Positive relationship [existence of: oath, responsibility, egalitarian merit]



Source: Author

As argued the complementarity is necessary through the application of the oath on which is organized the ethical and deontological charter so that the two professions have the same status through the process of the design and manufacture of the work.

In Algeria, and until 2016, the exchange relationship between architects and engineers in the project development process remains minimal. This relationship shows a lack of ethics or deontology, avoiding recourse to complementarity.

This is elucidated by the absence of the engineer's oath. This situation calls for merit and is the responsibility of both the engineer and the architect in the design and construction of the Building which constitutes a technical being.

The technical knowledge and skills of the architect are still very limited compared to those of the true holder of this knowledge, the engineer at the international practice scale.

Complementarity is a social and technical fact to strengthen the work between the two professions. Recently the Ministry of Housing and equipements has issued approvals to engineers to rule their professional situations with those of architects.

The status of the engineer is summed up in his place and his role in the project management from the point of view of 'equal responsibility and merit on the work like the architect.

9.2. Statistical Data on Architecture Study Office and Technical Study Office Approved in Algeria

The construction of a sample of this reflection is based on the statistics of 2012-2016 for engineers and architects. It can be noted that the State began to approve engineers in 2012. This period (2012-2016) of the sampling constructed shows, well the division between this two-professions.The body of architects, Architecture study office, is the National Council of the Order of Architect. As long as the engineers does not exist. Which are summarized in Table 1.

Table-1. State of architects approved by the State [2012-2016]

STATE OF ARCHITECTS APPROVED BY THE STATE (2012-2016)							
	WILAYA	YEAR 2012	YEAR 2013	YEAR 2014	YEAR 2015	YEAR 2016	TOTAL
1	ADRAR	39	46	49	58	60	252
2	CHELEF	107	114	114	128	136	599
3	LAGHOUAT	76	76	78	79	81	390
4	O E BOUAGHI	149	151	163	175	186	824
5	BATNA	199	239	246	285	302	1271
6	BEJAIA	150	200	214	238	250	1052
7	BISKRA	131	180	197	213	200	903
8	BECHAR	35	40	59	66	60	260
9	BLIDA	141	150	166	218	211	886
10	BOUIRA	55	60	73	99	110	397
11	TAMANRASSET	10	11	16	17	16	70
12	TEBESSA	110	120	139	145	135	649
13	TLEMCEN	98	102	114	159	151	624
14	TIART	35	40	43	70	85	273
15	TIZI OUZOU	235	245	264	266	280	1290
16	ALGER	520	530	549	633	683	2915
17	DJELFA	98	120	122	147	152	639
18	JIJEL	125	127	132	161	164	709
19	SETIF	399	401	434	450	501	2185
20	SAIDA	22	25	29	35	39	150
21	SKIKDA	191	221	238	267	280	1197
22	SIDI BEL ABBES	52	61	82	86	101	382
23	ANNABA	171	182	196	225	245	1019
24	GUELMA	151	161	172	177	180	841
25	CONSTANTINE	160	170	202	325	345	1202
26	MEDEA	121	133	144	157	169	724
27	MOSTAGHANEM	105	109	117	142	152	625
28	MSILA	72	83	94	104	114	467
29	MASCARA	68	75	78	82	80	383
30	OUARGLA	75	80	87	93	83	418
31	ORAN	235	240	247	299	320	1341
32	EL BAYADH	29	32	34	37	39	171
33	ILLIZI	18	18	21	21	27	105
34	B B A RRERIDJ	124	127	131	140	158	680
35	BOUMERDACE	47	58	63	80	88	336
36	ELTARE	56	57	58	59	60	290
37	TINDOUF	8	8	11	9	10	46
38	TISSEMSILT	16	18	23	28	32	117
39	EL OUED	118	120	125	136	145	644
40	KHENCHELA	48	51	54	61	65	279
41	SOUK AHRAS	65	75	89	100	112	441
42	TIPAZA	58	61	75	85	107	386
43	MILA	150	158	171	197	188	846
44	AIN DEFLA	83	90	110	128	140	551
45	NAAMA	54	63	70	79	90	356
46	AIN TEMOUCHENT	50	50	50	54	60	264

47	GHARDAIA	28	29	33	60	68	218
48	REUZAN	68	68	72	72	75	355
	TOTALE	5155	5575	6030	6924	7335	31022

Source: Ministry of Housing of Algeria

Fig.4- Distribution of architectes approvals between [2012-2016]

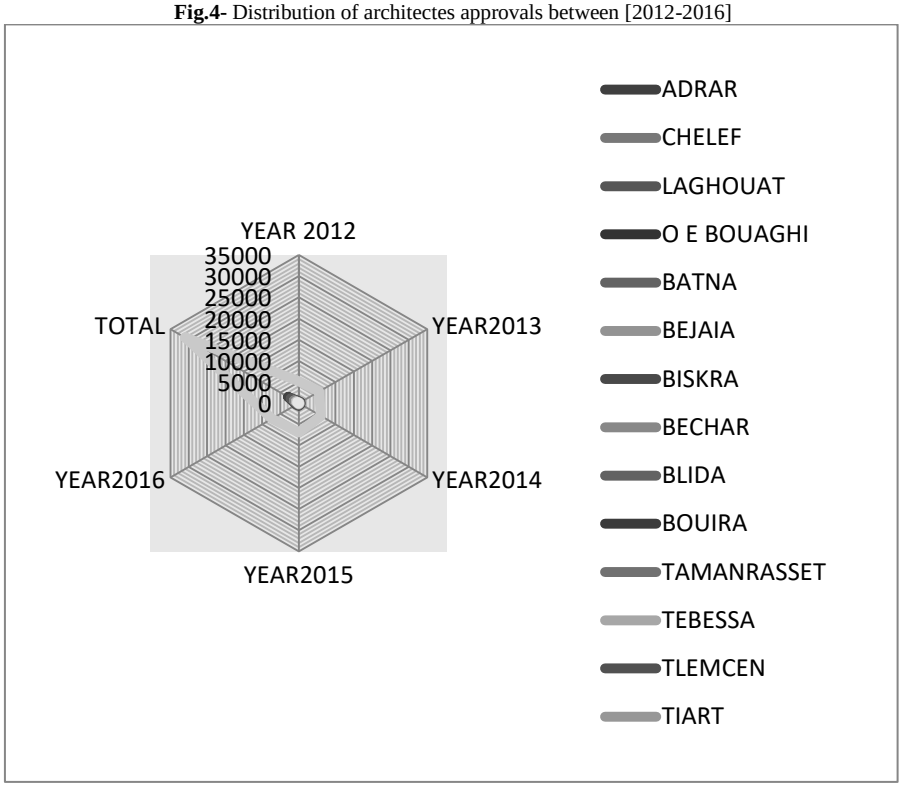


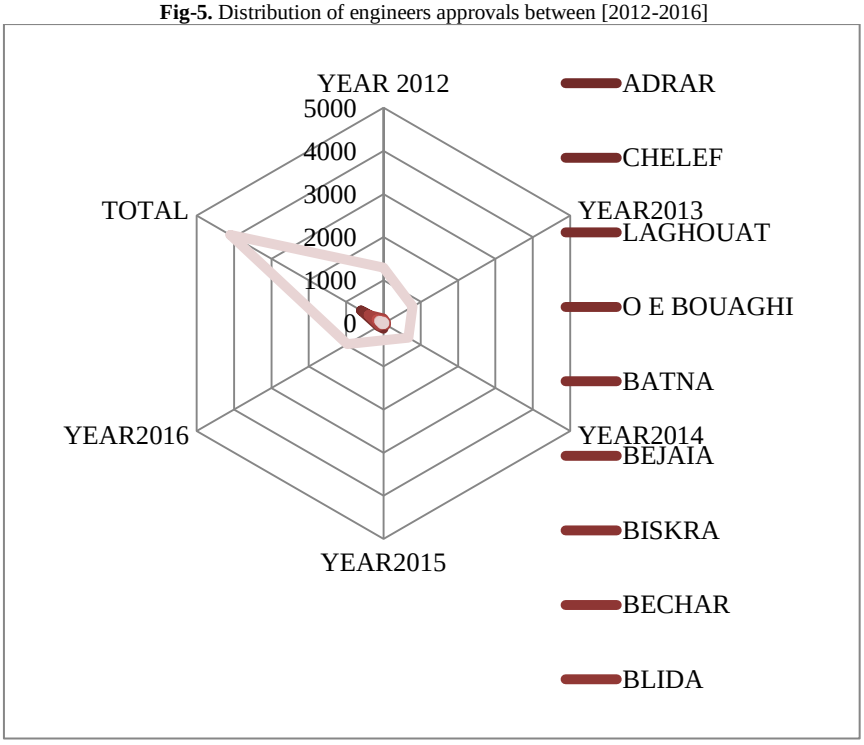
Table-2. State of engineers approved by the State [2012-2016]

STATE OF ENGINEERS APPROVED BY THE STATE (2012-2016)							
	WILAYA	YEAR 2012	YEAR 2013	YEAR 2014	YEAR 2015	YEAR 2016	TOTAL
1	ADRAR	39	46	49	58	60	252
2	CHELEF	18	12	7	128	136	598
3	LAGHOUAT	20	6	13	3	8	390
4	O E BOUAGHI	30	12	11	3	12	524
5	BATNA	39	26	27	16	37	145
6	BEJAIA	58	37	31	21	38	185
7	BISKRA	56	31	25	10	32	154
8	BECHAR	7	11	4	3	3	28
9	BLIDA	38	15	27	6	24	110
10	BOUIRA	20	14	19	10	12	75
11	TAMANRASSET	4	10	4	2	3	23
12	TEBESSA	31	15	8	4	23	81
13	TLEMCEN	25	16	11	13	18	83
14	TIART	20	10	6	4	5	45
15	TIZI OUZOU	55	46	28	19	64	212
16	ALGER	112	68	70	31	112	393
17	DJELFA	53	33	23	8	27	144
18	JIJEL	37	26	12	8	25	108
19	SETIF	57	39	24	11	39	170
20	SAIDA	9	3	1	1	6	20
21	SKIKDA	45	23	37	10	24	139
22	SIDI BEL ABBES	29	15	17	13	18	92
23	ANNABA	28	18	8	13	27	91
24	GUELMA	12	10	6	4	7	39
25	CONSTANTINE	68	27	27	17	43	179
26	MEDEA	37	12	15	12	23	99
27	MOSTAGHANEM	16	4	12	4	15	51
28	MSILA	26	22	27	13	32	120
29	MASCARA	15	17	6	7	13	58
30	OUARGLA	24	18	7	8	12	69
31	ORAN	28	33	12	19	28	120
32	EL BAYADH	3	9	2	1	6	21
33	ILLIZI	2	2	1	0	2	7
34	B B A RRERIDJ	25	13	13	9	23	83
35	BOUMERDACE	19	9	13	14	27	82
36	ELTARE	3	4	1	2	3	13
37	TINDOUF	0	1	0	1	0	2
38	TISSEMSILT	14	8	8	1	8	39

39	EL OUED	26	15	15	10	42	108
40	KHENCHELA	22	5	10	4	13	54
41	SOUK AHRAS	23	11	5	4	8	51
42	TIPAZA	8	12	3	5	6	34
43	MILA	35	20	12	9	21	97
44	AIN DEFLA	28	9	9	8	7	61
45	NAAMA	3	2	2	3	2	12
46	AIN TEMOUCHENT	4	4	1	1	2	12
47	GHARDAIA	21	19	19	7	27	93
48	REUZAN	13	3	10	9	2	37
	TOTALE	1290	783	669	389	968	4099

Source: Ministry of Housing and Equipement of Algeria

Fig-5. Distribution of engineers approvals between [2012-2016]



In the central region, the BEA approval rate is higher than the BET approval rate.This is explained by the non-existence of the Order of Engineers before 2012. After this date engineers begin to have legal status, BET.

It can be seen that the dimension of complementarity can be reinforced on a large scale between architecture and engineering from the point of view of project management regardless of its size. That is, the existence of competent and expert training.

Long before accreditation, a conflict for recognition arose around the status of the engineer. The architect takes himself as the main actor in the design. The thinking of the architect is generally more holistic than that of the engineer, which is more in the domain of applied science.

10. Discussion

The results indicate that the statute for engineers only came into being after the earthquake disaster which devastated a large part of buildings in Boumerdès. The application for granting approvals to engineers for the opening of Technical study office began in 2012 [source: Ministry of Equipement]. In the international system there is equality of responsibility and merit for the work conceived and carried out. It is the training of two profiles: architect-engineers and engineer-architects, actor-two-headed. The previous results confirm our hypothesis.

Complementarity is a necessary step to conquer the fact of the division of labor and to fill the gap between these training courses. Complementarity, as a collective activity, can be a support to promote a model of BEAT, composed of architect and engineer, based on the quality and size of architectural and engineering studies offices reflecting the qualities of a international model to be able to overcome the challenge of designing and carrying out large-scale projects.

Currently, the process for the composition of these BEA and BET is a minimum size, 1 architect and a secretary. The latter cannot manage the architectural project development process according to these different stages: project management, execution, planning of uses and building maintenance. It is time for the state to consider the review of licensing and align it with the international model.

11. Conclusion

This research identified the concept of the oath as an important element in bridging this gap between the two professions through collective activity, complementarity.

The two professions, architects and engineers, in Algeria, show a lack of eligibility by the absence of a charter of ethics and professional conduct that is the cornerstone of any profession, avoiding the use of the oath of engineers. This charter seeks to resolve the problems of responsibilities of these two professions, see the oath. There are two categories of links between Architects and Engineers:

- **1st category :** architects take an oath and Engineers do not take an oath
- **2nd category :** architects take an oath and architect-engineers take an oath

The charter is a platform to regulate participation in the reflections, constitution and development of training and practices related to the double curriculum "Architect-Engineer, Engineer-Architect" which does not yet exist in Algeria. This calls for a need to revise the training course for the two professions in Algeria. In addition to ensure cohabitation of the two professions from the training.

Factors can be explored and can possibly impact the complementarity in the interaction of the two protagonists, the relational aspect, actional, emotional, interdependence and the degree of the level of training. The results of this research shed light on the protagonists and decision-makers on this unequal situation. Indeed, they offer the possibility of remedying the problems linked to the aspect of the division of labor. For example, the oath eliminates the inequalities of responsibilities and merits between architects and engineers.

11.1. Methods and Ways of the Success of the Two Disciplines Together in Algeria

11.1.1. The composition of the Team-Actors

The project is fully supported by high-level professionals such as architect-engineer, engineer-architect, who respond to the current training course. In addition, the fact of using new technologies makes it possible to maintain a high level of quality and to carry out large-scale projects with a team of actors of the quality "expert skills" in the materialization of these concepts of the sublime of architecture and engineering.

11.1.2. The vision

Creativity and innovation are at the heart of the Sublime Architecture and Engineering approach. The protagonists have a young, refreshing and daring outlook that will delight even the most conservative of customers. The projects that pass through their hands are designed in a constructive logic to facilitate the task of the stakeholders and optimize the construction period.

11.1.3. Commitment

The two protagonists, architects and engineers, commit themselves out of competitiveness, based on their knowledge, to propose sublime concepts of architecture and engineering. Be attentive to the needs of users, devote oneself to the search for original and ingenious solutions to the problems that may arise and work in full agreement with the various stakeholders of the project.

12. Limits and Further Research

Relational action and oath aspects can be explored by the complementarity in the interaction of the two professions with the degree of the level of training. Future research should be extended to explore this complementary relationship with the interaction of the user and the two professions in the design and construction process. Finally, a multidisciplinary, behavioral, sociological approach must be considered for other aspects. It is time for the parent institution of the two professions to review the process of granting approvals and the structuring of the BEA and BET component in the image of international architectural and technical consultancies. So that the latter can manage large-scale projects which are treated, today, by foreign consultancies, even the Algiers mosque taken by a German BEAT and the restoration of the Kasbah of Algiers by the BEAT of Jean Nouvel,… .Etc.

Acknowledgements

I am thankful for Pr. Said MAZOUZ, for his kind suggestions and for exposing me to advanced research methods.

References

Augeron, M. (1999). *L'Afrique, terre de mission au XIXe siècle », dans Mickaël Augeron, Didier Proton, Bertrand Van Ruymbeke dire, Les huguenots et l'Atlantique.* 2 vols.: Fidélités, racines et mémoires: Paris.

Ben, G. (2001). Available: https://www.journals.openedition.org›annéesMaghrebconsulter

Bendaoud, L. (2010). Les ingénieurs en algérie. El Watan, 06.04.2010. Consulted on 20/11/2019.

Charte, N. (1976). Available: https://www.ilo.org/dyn/natlex/natlex4.detail?p_isn=2043&p_lang=fr

Daniel, G. (1998). *L'intelligence émotionnelle.* Editions Robert Laffont, S.A, 1999. 31-35.

El Watan (2010). 06.04. 2010. Consulté le 20/11/2019. *Le Journal*.

Faber, J. H. (1963). *Abstract Coal ASH, Utilisation in Maçonnery construction, Boulder*. University of Colorado: Colorado. 14.

Ferrier, J. (1999). Engineer architect and teacher. *Technique and architecture*, 445(10-11): 84-85.

Jean (1981). *Architecture and rule, architecture research collection.* Mardaga Editions, Lièg. 9.

Judith, F. (2015). *Performing oaths in classical greek drama.* Wilfrid Laurier University: Ontario, Published.

Khelfaoui, H. (2000). *Les ingénieurs dans le système éducatif. L'aventure des instituts technologiques algériens.* Publié à Paris.

Longuenesse (1990). *LONGUENESSE Élisabeth, Bâtisseurs et bureaucrates : ingénieurs et société au Maghreb et au Moyen-Orient; table ronde CNRS (Lyon, 16 au 18 mars 1990).* Maison de l'Orient méditerranéen: Lyon. 127-45.

Michael, C. (2000). Available: https://www.amazon.fr›Michael-Carley/consulterle

Oxford English Dictionary (1988). In the architecture of new engineering. *Casabella,* 542(543): 48.

Perassimos (1990). Available: https://www.academia.edu/11871194/Relatos_de_professores_sobre_manifestações_sexuais_de_alunos_com_deficiência_no_contexto_escolar.Consulter

Prouvé, J. (1990). *Jean Prouvé par lui-même.* Mardaga: Liège.

Schlaich, J. (2010). Engineer. *The Art of the Structural Engineer,* 15(12): 129.

Vacher (2004). Les figures de l'ingénieur colonial à la fin du XIXe siècle. *Le Mouvement social,* 5(10-12): 47-65.

Glossaire

- **CNOA:** National Council of the Order of Architects
- **ENIA:** National School of Engineers of Algeria
- **BEA:** Architecture study office.
- **BET:** Technical study office.
- **BEAT architectural** and technical study office.

Bicephalon: Meeting of two consciousnesses can be the fact of two individuals. According to Stéphane DU CHATEAU, Architect-Engineer-Consulting, Brussels, 20, May 1967