

Engineer or Architect: A Crisis of Identity

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Is this person an architect or an engineer? For Leonardo Da Vinci such distinctions would have been meaningless; these professions simply did not exist. Today, all professions, not only architecture and engineering, are steadily hyper-specializing. Now one might ask: what type of architect or what stripe of structural engineer is this person? Specialization in the technical sense can be beneficial. By increasing efficiency for a very specific purpose, we realize some economic or productive advantage. While excellent for a technician hyper-specialization creates barriers against this same technician's potential move into a position of leadership.¹ Perhaps as one response to the continual branching and stratification happening in so many fields, some individuals follow a multi-disciplinary trajectory.

There is a mixed group of individuals who pursue both architecture and engineering. Some are academics others are consummate professionals; all have interesting things to say about the relationship between the fields and how they perceive future trends. This paper is the beginning of a work in progress that seeks to quantify this group of architect-engineers and to understand their viewpoint and how they perceive their identity. As products of, and in many cases participants in, architectural education this group is a potentially valuable resource.

The first part of this paper describes preliminary methods used to try to determine the number of dual professionals currently in practice, with California as its initial basis. The second portion reports on a series of ongoing interviews with both academic and professional colleagues having a dual background. The interviews investigate each

subject's decisions, motivations, and perceptions as architect-engineers. The paper concludes with speculation about potential future trends regarding education and the profession.

QUANTIFICATION

To begin to quantify how many individuals have so far pursued both architecture and engineering the author first looked to his state licensing bodies. In California architectural and professional engineering licenses are regulated by the Department of Consumer Affairs (DCA). The DCA oversees the California Architects Board, and the Board for Professional Engineers, Land Surveyors and Geologists. Each Board's website contains information regarding registered professionals, and on both sites there is a license lookup function that allows members of the public to verify both the existence and status of a particular person's license. The database itself takes the form of a gigantic master file updated weekly by DCA, and all of the various licensed profession's websites in California utilize data from this file.

As of July 2011, the DCA database listed Registered Architect's license numbers as a range starting at 512 and ending with 33214.² For Civil Engineers and Structural Engineers the numbers were 5511 to 78855, and 486 to 5621, respectively.³ In all three categories some licenses were listed as cancelled or inactive, and others were indicated as deceased. The earliest license numbers starting at number one were not included in the electronic database, because they were no longer active when the data was converted to its current electronic format.

Facing a mountain of data, the author wrote several computer programs using the Python⁴ programming language to try to generate a correlated list containing architect-engineers using the DCA online license lookup.

The first program worked well, but it processed data far too slowly. It attempted to go through each license number sequentially and look for a match. Since each license lookup involved: accessing the online website, generating html-text for a web page, and stripping away extraneous text, it would have taken the better part of a year to perform approximately 2.37 billion iterations.⁵ (32,500 architects X 73,000 engineers)

The second program was more successful, it was able to access the DCA database and generate html pages containing up to 10,000 license entries per page. The drawback was that it had to go through all of the professional engineer licenses in California, not just the civil engineers. This is a list that includes more than 163,000 engineering licenses.

The program broke down the data and generated a list for each group of licenses based on last name and address. A file was then created for all engineers for each letter of the alphabet. Similar files were created for architects for letters a through z. The program saved these files to a local hard disk. The next portion of program then ran a comparison between the saved files outputting the matches. It was a much faster process, because the computer was now simply comparing locally available data. Billions of comparisons now took just a few moments.

After all the files were compared a list of 364 names was generated. While a great deal of data crunching was done to get to this point, this resulting list brought its own set of challenges. Several licensed architect-engineers known to the author did not appear on the list. This turned out to be because their names were entered differently into the two license records by the respective licensing Boards. After spot checking some of the names, it became clear that a significant number of entries were potentially father-son pairs or simply occurrences of identical names. For example, an identical name would show an older cancelled license and a more recent active license with different addresses listed.

Along with duplicate names, the data includes individuals that are no longer practicing, so instead

of providing a precise snapshot of how many architect-engineers are currently registered and working in California, it indicates a potential range.

Out of the 364 names listed only thirteen were women. While some women have been left out because of a name discrepancy, this finding is noteworthy. If we assume that roughly 30% of entries are bona fide architect-engineers, then we're looking at a male to female ratio of roughly 10% - 15%. This is a sharp contrast to current percentages of women studying architecture and even quite low for those studying structural engineering.

In California the overall percentage of dual licensed professionals as compared to licensed architects is somewhere near two percent. This estimate does not include the fraction of people who have actually studied both architecture and engineering. Ultimately, many do not pursue both professional licenses.

Out of 123 US institutions offering various accredited architectural degrees,⁶ the percentage of dual licensed professionals involved in teaching is much higher than California's estimated two percent of licensed architects. The author knows quite a few educators with dual background teaching throughout the country. Some are licensed, and others are not. Exploring the number of academics and following up on those who have not pursued professional licensing will provide additional angles as this investigation continues. Looking at university graduation rates and data for additional states could be informative and potentially helpful for institutions that have joint degree programs or seek to increase their diverse offerings.

QUALIFICATION

How this group of architect-engineers identifies itself poses some interesting questions. Do they feel more like engineers or architects? Why did they end up following both paths? What strengths and weaknesses do they perceive based upon their background? To get at these questions, the author is interviewing colleagues. Some of them are double licensed, but they have all, as a minimum, studied both.

Fifteen questions form the basis of each interview, and the author calls or meets with willing colleagues one at a time. The author asks each question and takes notes as the interviewee speaks freely and shares their stories, experiences, and views. The

author participates somewhat in the ensuing discussion. The interview format is chosen over that of an email survey or poll, because many responses are personal, and the participants' feelings and perceptions surrounding the topic are of interest. The interview questions and summaries of the resulting discussions follow:⁷

Why did you decide to pursue both architecture and structural engineering?

Reasons given for following both paths have been quite wide ranging. One interviewee studied solely architecture and became a structural engineer after years of learning on the job, by apprenticing with various architects and structural engineers. Several interviewees noted that they came from families where their parents or relatives were architects or engineers—it is interesting because these same familial relationships were clearly an issue in trying to quantify the numbers of dual licensees in the first part of this investigation. While they both studied engineering first, later they described a “pull” back towards architecture. John W. said that he started his education in electrical engineering because it was more of a challenge, and in his head he saw that the age of the great civil engineers was past, but that the future appeared bright for electrical engineering and computers. He came back to civil engineering and eventually architecture, because he felt that he needed to return to his heart. All interviewees' perception of the professions while they were students and young graduates was extremely formative. Hana B. was turned off by her experience and impression of engineering offices, instead architecture offices had a much bigger draw for her. Not surprisingly, the question of why people pursued both fields often turned into a story of how certain events transpired and under what circumstances.

Which did you study first? (do you have any feelings about that order?)

So far, interviewees have indicated that the order in which they approached their studies was appropriate. Engineering-first respondents noted a solid “fashion-free” formative base upon which to build. Architecture-first respondents embraced architecture's multi-disciplinary nature, and saw engineering as adding a sort of concentration to their background.

Did you pursue other studies besides architecture & engineering?

When asked if they had pursued other studies, interviewees mentioned subjects ranging from: working on satellites, to studying music, to Italian and even German literature. The presence of additional fields could be because the appeal of multiple disciplines is common amongst those with generalist tendencies.

Do you consider yourself: more architect, more engineer, equal, neither, something else?

Outwardly respondents defined themselves roughly according to their main professional activity. Some of the academics classified themselves as neither one nor the other but something else. Inwardly, many of the respondents classified themselves based upon how they perceived their own thought process and approach to problem solving. This often correlated with their first academic concentration. The response to this question showed for some there was a degree of ambiguity, but not necessarily a full-blown crisis of identity.

Do you reconcile these two fields in your work, If yes how so? If not, why not? What are some of the difficulties?

Reconciling the two fields was a common theme for the participants. Each had a different way of describing this process. One respondent reconciled the two by simply bypassing the distinction. She noted that this caused her to expect more from her students, because she presented the material without many of the standard distinctions. Another respondent noted that he reconciled the two in his work, by taking on the scope of both the architect and engineer on projects. Another respondent stated that he reconciles the two by being picky about which projects he, “gives his heart to.” He feels compelled to be more creative as an engineer when he is working with talented designers and designs that have potential for excellence. He gets the idea, and he feels compelled to collaborate to make it even better.

Which of the following do you feel describes you: Interdisciplinary, Multidisciplinary, Crossdisciplinary, Transdisciplinary? (any feelings about these terms?)

Most respondents considered themselves multidisciplinary, and they were somewhat puzzled by the question. There were a few strong feelings against the terminology. Some felt like the terms were themselves forcing distinctions.

What strengths do you feel your plural background provides you?

What weaknesses do you carry due to your dual background?

Strengths and weaknesses were varied. Many of the strengths boiled down to having a wider perspective on design and building. All respondents agreed that being able to negotiate both fields was a strength. Weaknesses mentioned included: concerns that being a generalist in some circumstances would be viewed as a detriment, architectural design could feel too constrained without sufficient exercise to “loosen up” to get back into an architect’s mindset. A counter argument painted the constraints of deep structural knowledge as a fundamental strength towards designing ever more inspiring architecture.

Who is your favorite architect-engineer?

Some favorite architect-engineers mentioned included, Will Bruder, Eero Saarinen, Robert Maillart, Leonardo Da Vinci, Pier Luigi Nervi, Antoni Gaudi, and Renzo Piano. One respondent argued that Piano considers himself a builder and is therefore an eligible candidate. This list will no doubt grow as interviews continue.

What do you think of your educational experience?

What do you think of your professional work experience?

All respondents spoke very favorably about both their educational and work experience. The fact is that to become an architect or an engineer there are minimum requirements for education as well as work experience. These two components together comprise a practitioner’s formation. Respondent’s descriptions of their work experience resembled that of their formal education—the learning continues, and overall they are thankful and pleased with their experiences thus far.

Do you see or sense a trend of more and more people studying/pursuing both?

Respondents were not convinced that more and more people are actually studying both. One interviewee stated that quite a few architecture students consider engineering as an option. She stated that part of this is due to difficulty many are facing of finding work. She said that while a significant number of students seem to be considering engineering as an option, many of these students are not actually suited to following through with engineering studies. Another respondent paints a much more bleak picture. He sits on an advisory committee for Cal Poly San Luis Obispo, and he says his sense is that overall civil engineering enrollment is stagnant or potentially decreasing. He predicts a potential coming shortage of civil and structural engineers. Another respondent, whose firm has hired quite a few recently graduated dual background employees over the past fifteen years sees the numbers as staying relatively the same. For example, at UC Berkeley on average every year there is a handful of students pursuing the joint degree program in architecture and structural engineering. The author’s initial assumption that there is a trend of increasing dual professionals is not supported by the responses so far.

Do you sense a trend of increasing specialization across all fields/professions?

A strong trend of increasing specialization across all fields was noted by multiple participants. Medicine and the building trades were singled out as examples. Two respondents were more skeptical in regard to this commonly assumed trend. They cited many examples of large companies swallowing smaller more specialized ones, thus burnishing an overall organization’s credentials and capabilities.

What do you see as potential outcomes from the above two trend questions?

Increasing specialization in all fields was viewed both positively and negatively. The value of being a generalist was championed by all respondents. Positive comments suggested that increasing specialization could be used to try to solve some of the major problems that society faces. Energy, environmental, political, and economic challenges are becoming steadily more difficult, and the potential for specialists to actually get to the point where

they can solve some of these problems holds great promise. All of these issues are present in architecture and building, this could bring great benefits. Negative views of specialization were made up of examples where systems could potentially grind to a halt because the various components cannot communicate or adequately function with one another to keep the system working. Dick D. described the example of the project attorney, the project publicist, the project consultants for x, for y, and for z. This group creates a burden of unneeded consultants and potentially pushes the architect further into the role of political and technical coordinator possibly reducing the architect's creativity. He noted that increasing specialization leads to greater and greater complication and makes accomplishing tasks increasingly tedious.

If you could go back to school, knowing what you know now, what would you study? (something different? or another pathway back to arch./eng.?)

Most respondents were satisfied with their decisions, and would have followed a similar path given the same circumstances.

CONCLUSIONS

Quantifying the number of people who have background in both engineering and architecture poses some interesting challenges. The procedure could grow to include additional states and those individuals who have pursued multiple degrees. The author thinks that further investigation could be meaningful, especially from the point of view of academic institutions.

Qualifying these architect-engineers and their views is turning out to be very interesting, at least for the author. This aspect could potentially evolve into a more formalized and data intensive type of electronic survey, if the investigation expands significantly.

The crisis of identity for architect-engineers exists in each person's ability to navigate the ambiguity between how they perceive themselves externally vs. internally. The two professions still maintain strong caricatures of one another. As far back as 1959 Mario Salvadori pleaded:

Collaboration should be the basis of work between the architect and the engineer. Early in the evolution of a design there should be grouped around the

conference table the architect, a structural engineer, a mechanical engineer (the mechanical part of the building is sometimes forty percent of its cost), and a contractor. The contractor is necessary, because even though the engineer has a very bright idea about how to build a structure, if the contractor doesn't know how to do it, it's going to be a complete mess. If you confer in this way, I think you will find the job much easier. The engineer will be elated to be at long last a collaborator, instead of the mere serf of the architect, and you will find him much more agreeable than if you presented him with a ready-made solution.⁸

Individuals with background in both architecture and engineering go a long way towards Salvadori's plea for collaboration, and most of them don't consider engineers serfs. Positive collaboration can lead to outstanding architecture, but it is in many ways just as difficult to achieve now as it was in 1959.

Ever greater specialization in all fields demands generalists to take up the leadership roles. The positions of communication and dissemination can and should be leveraged by both architectural education and practice to cultivate future generalist leaders. Architect-engineers and their formation provide a potential model.

ENDNOTES

1 Regina, March 7, 2006 (09:22 AM) comment on Francois, "hyper-specialization is not always the right thing to do," *Emergence Marketing Blog*, March 7, 2006, http://www.emergencemarketing.com/archives/2006/03/hyperspecialization_is_no.php

2 State of California Department of Consumer Affairs, California Board for Professional Engineers and Land Surveyors and Geologists <http://www.pels.ca.gov>

3 State of California Department of Consumer Affairs, California Architects Board <http://www.cab.ca.gov>

4 This is a particularly inefficient method. It would make sense to remove matches as they occur to reduce overall search effort. Since, 364 matches were eventually made, this would have eliminated more than 26 million iterations ... about a 2.5% improvement. Thankfully, much more efficient methods exist for data searching.

5 Python is a popular open-source object oriented programming language. Its use of mostly standard english words for commands and strict graphic syntax using tab delineation makes it particularly accessible for non computer scientists. The author wishes to thank Prof. Ulf Wostner of City College, San Francisco for his class CS131 Python Programming, Spring 2011.

6 National Architecture Accrediting Board (July 2011) http://www.naab.org/architecture_programs/

7 Individually conducted interviews with colleagues having background in both architecture and civil/structural engineering: Hana B., John W., Dick D., Jon B., Kate S.

8 Mario G. Salvadori, "The Engineer and the Artist," *Perspecta*, Vol. 5 (1959): 17