



Outsourcing Engineering Work

An Online Continuing Education Course for Engineers

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George Petrescu, P.E., Ph.D.

Preliminary Considerations

The cost pressures faced by many Companies in the modern economy are pushing them to run as lean as possible by reducing the organizational, procedural and technical inefficiencies and by increasing the focus on their core expertise. Those types of restrictions are affecting every function in the Company, from Accounting and Marketing to Manufacturing and Engineering. Conversely, an increasing number of small and medium sized Companies, as well as individual entrepreneurs, are shaping their business models to be ready to accommodate the needs of the Companies which are looking to lean their operations and to capture the resulting business opportunities.

Companies that create technical products or deliver technical services recognize the unique role that Engineering plays in their spectrum of activities. Just like everyone else, they are not insulated from the market forces that are pushing them to run leaner and as such are often looking to outsource at least parts of their efforts. Several studies estimate that ~30% of the international companies are already outsourcing some of their new product development (read: “Engineering functions”), with this number expected to increase by the end of the decadeⁱ at a rate of 4-5% per yearⁱⁱ. Moreover, it is often recognized that offshore outsourced Engineering services is one of the fastest-growing outsourcing marketsⁱⁱⁱ.

Just like other outsourced functions, when executed with proper attention, both parties to an Engineering outsourcing relationship benefit from the collaboration. It has been recently noted that once an Engineering outsourcing project has successfully concluded, there is a significant chance that the already established relationship will continue, as the benefits of their relationship materialize and both partners have increased levels of mutual confidence^{iv}. The Contracting Company enjoys more freedom due to fewer concerns related to managing an Engineering project (including the benefits of lower overall costs), while the Contractor Company gains agility that allows it to compete in more than one market, or to offer related services to more organizations.

Just like any business relationship, it is recognized that all the mutual advantages that result from outsourcing do not come unrestricted and the relationship between the outsourcing partners needs to be managed carefully to prevent the benefits being overtaken by the downsides^v. Care needs to be exercised for establishing and managing an appropriate work relationship. Several best practices can be followed to ensure that both parties have a mutually beneficial and productive work relationship. The guidelines and roadmaps provided in the material below will

help both parties develop a better relationship, with less unwanted surprises and more chances of success.

The following material is written from the Contracting Company’s perspective and is presented in a pragmatic, readily applicable way. Moreover, it is also useful to Contractor Companies and Engineering Contractors/Freelancers, as they will learn the typical needs, capacities and processes employed by their potential customers.

Terminology

The “Contracting Company” is the business entity that owns the Engineering function via the Engineering Department. In this context the Contracting Company is the party that is looking whether or not to outsource the engineering work, and is the recipient of the outsourced work.

The “Contractor Company” is the business entity that is the potential recipient of the outsourced Engineering work, and that delivers that work.

The “Engineering Manager” is the person in charge of the Engineering Department of the Contracting Company. He/she is the one that usually recognizes the potential need of outsourcing engineering work (alone or in collaboration with other departments’ representatives and/or project managers) and drives the preparation of the outsourcing process. The Engineering Manager may drive the actual project management activities of the outsource work, or may delegate it to one of its representatives.

The “Project Manager” is the person assigned by the Engineering Manager to be responsible for the project relationship with the Contractor Company. In smaller Engineering Departments, the Engineering Manager can execute the Project Manager’s duties as well.

What is Outsourcing?

In a general, outsourcing can be defined as “the act of one Company contracting with another Company to provide services that might otherwise be performed by in-house employees”^{vi}. This definition emphasizes that the Company potentially has the capacity to execute the work in question, but for various reasons decides not to do so. In more particular economic terms, outsourcing can be defined as “the contracting or subcontracting of noncore activities to free up cash, personnel, time, and facilities for activities in which a company holds competitive advantage.” This definition encompasses all the activities performed by a company, like data processing, legal, manufacturing, marketing, payroll, accounting, etc. It can be noted that the purpose of outsourcing is reducing the average “per unit” cost and can be an integral part of strategies for increasing the Company’s productivity via downsizing or reorganization.^{vii} It follows that engineering activities are often a potential candidate for outsourcing.

The following material will introduce a hands-on approach to the process of outsourcing Engineering work. The outsourcing process as a whole and its components will be presented not thru the prism of abstract theories, but by means of practical and readily applicable concepts. For reader interested in further reading on the subject, a few underlying theories will be outlined at the end of the course.

To Outsource or Not to Outsource?

As mentioned before, there are advantages and disadvantages to outsourcing engineering activities. Companies typically weigh the pros and cons on a case by case basis, before the decision to outsource or not is made. Several factors are considered, that are not only related to the work or the project itself, but also to the structure of the Engineering Department, the work relationships within it and with its business partners and to the Company's future vision.

Oftentimes "make or buy?" questions are posed during the development phase of a project. While this question has obvious answers on various project components (for instance few Companies will design their own electrical terminal blocks or common fasteners), there are instances when a more thorough analysis is required before a valid answer is provided. Several instances are presented below.

From the organizational perspective, it can be said that ideally the Engineering Department is already structured such that a core expertise can easily be complemented by additional know-how obtained from outside the Company, as needed. If this is not the case, a temporary structure can be deployed to allow for this to happen.

At the same time, the Company's future vision needs to be considered, as developing the business relationships with Engineering Contractors can represent the prelude for further collaboration. On the contrary, there can be instances when such collaboration can represent an obstacle in the development of the Company's future due to legal entanglements that the Company is already bound to.

When to Outsource Engineering Work?

Engineering Departments often outsource engineering work when they are in one or more of the following situations:

- The Engineering Department needs to gain access to complimentary competencies. In this case the Engineering Department does not have the skills required to perform some very specific, one-time engineering activities.

For example, an Engineering Department, whose core competency is mechanical and electrical engineering, needs to outsource the optical design or the heat transfer design of a product. Another examples would be outsourcing esthetical analysis or

specialized Finite Element work (FEA, CFD), as well as subcontracting specialized testing services.

- The Engineering Department does not have enough resources to complete some projects on time and hiring additional resources is not an option for various reasons.

This is the situation when all the available expertise is already tied up, while the Company already committed to developing an additional project without having adequate resources. It is typical that hiring and training efforts take longer than the time available to deliver the project, and that a 3rd party is available to deliver the project on time.

- Some designs were performed already by an outside company, and it is cheaper to have those Companies modify them than to have the Engineering Department re-cover the whole development process of learning, gaining a complete understanding and then executing the desired modifications.

In this case a particular product expertise already exists outside the Company and it is not economical to “re-develop” it; at the same time, care needs to be exercised so this expertise does not affect the Company’s intellectual property strategy.

- There is potential for lower development costs and/or achieving higher product quality.

This is the case of make-or-buy decisions, when it is decided that having a specialized Company develop a particular component of a project (or a particular product) is cheaper than developing it in house. Here the Contracting Company recognizes its technological limitations and decides to increase its focus on its core competency.

This is also the case for outsourcing in markets with lower development costs, domestic or international.

- The Contracting Company realizes that focusing all of the available energies on its core competencies will solidify its market niche; it is a strategic decision to concentrate on its most important products.

In this case the Company will outsource ancillary and routine designs and will keep in house its core expertise. It will allow less consequential functions be developed by others, while it will focus on expanding its core expertise.

When Not to Outsource Engineering Work?

When weighing whether or not to engage outside engineering services, it is helpful for the Engineering Manager and other decision makers in the Company to take a look at the other side of the coin and ask the question: “why would we *not* want to outsource this work?” A number of factors can be used by the Company to decide against hiring outside engineering help:

- Intellectual Property and critical engineering expertise

The Company decides that the Intellectual Property currently owned or that has the potential to emerge during the project considered is critical to its strategic goals. This not only refers to the potential development of unique products (often materialized in patents and trademarks), but also to exclusive, non-patentable expertise, that needs to stay in-house. The Company's core strengths need to be preserved.

Here, the knowledge with a certain product, process or of a particular method that is critical to the development of the project is limited and needs to only be available in house. Projects that involve strategic technical knowledge (such as defense industry) also fall into this category.

- Integration with other processes

The Company may not want to outsource ancillary technical activities that are closely related and critical to activities that make its core competency. This can be the case when a Company may not want to outsource certain drafting services, when their on-time delivery and accurate performance is critical to the R&D activities. This is in spite of the fact that drafting in itself is not usually considered as a "core competency". However, it recognized that any disruption to engineering-drafting relationship may negatively affect the rest of the product development process (by increasing the delivery time, reducing the drafting quality, leaking of intellectual property, etc.). This is also the case of various projects in the civil engineering that need to perform in tight integration.

- Legal, Governmental and Trade Restrictions

This is often the case of industries that are considered of national importance, such as defense, aerospace, etc. In this case the amount and type of work that can be outsourced is most likely regulated such that the likelihood of critical knowledge drain to unwanted parties is minimized and hopefully removed.

- A corporate vision of organic growth

One of the downsides of outsourcing is that it reduces the Engineering Department's ability to organically develop its technical expertise. In such situations the new engineers are not offered the opportunity to be exposed to a learning process that is progressing from easy tasks to difficult projects, and as a result they do not develop a complete overall view of the strategic products. The Company may want to avoid this scenario to reap future rewards.

- Licensure

Those are the cases when projects require a stamp and signature by a Professional Engineer licensed in the geographic area where the project/product will function. This is often the case of projects that directly affect the public at large or the environment.

- Quality of work, insurance coverage needs

Many projects require coverage by professional insurance. The insurance underwriter may feel that the quality of the project/product can be negatively affected by outsourcing. If this is the case, it will either request that the outsourcing is not executed, or may raise premiums to cover for the perceived increased levels of risk.

What Engineering Activities Are Often Outsourced?

The vast majority of the Engineering activities are candidates for outsourcing, although subject to the factors mentioned in the previous Chapter. Outsourcing happens via discrete projects, where the Outsourcing Company will need to define the specifications, design inputs and design outputs. It is obvious that it is highly advisable that this activity is not outsourced, as the Outsourcing Company needs to have complete control over establishing and formalizing its needs. It can be noted, though, that the Outsourcing Company can involve other specialists (hiring included) in developing the specifications, but it cannot go as far as completely delegating this need to an outside workforce.

The following is a list of typical engineering activities that are commonly outsourced, along with some explanatory details.

- Design

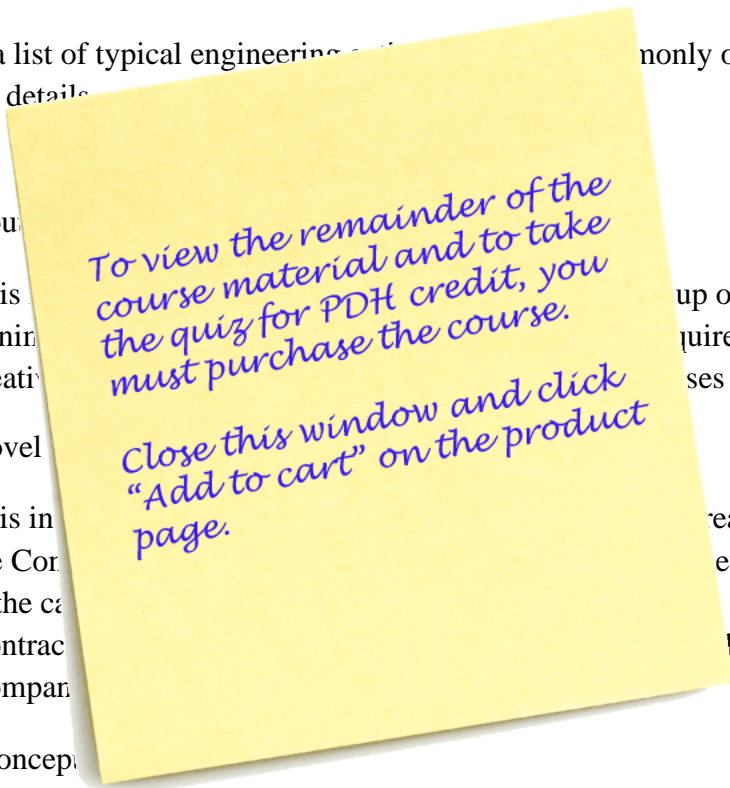
- Routine

This is a type of design that is often outsourced. It involves minor modifications to existing designs, requiring a lower level of creativity and expertise.

- Novel

This is a type of design that is often outsourced. It involves the creation of new designs from scratch, requiring a high level of creativity and expertise. This is the case for Contracting and Comparison.

- Proof of concept



up or sizing down, require a lower level of expertise and procedures.

areas currently outside of the level of creativity. This is the case for Contracting and Comparison.