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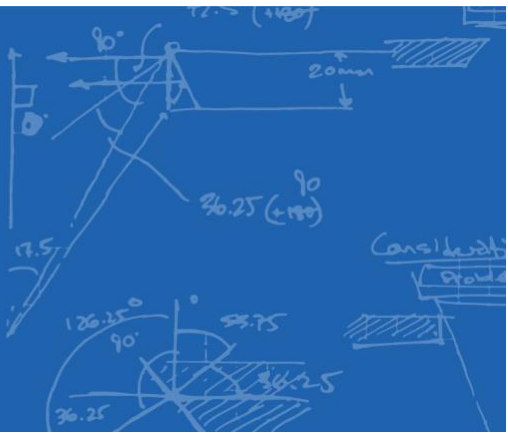
A Comparative Evaluation of 4 Integrated Engineering Service Models



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INTRODUCTION

In today's fast-paced, ever-evolving product development landscape, established brands as well as early-stage start-ups often turn to outside engineering service providers to help complete engineering activities needed to get their product to market. Integrating outside engineering offers a viable way to leverage additional or specialized engineering muscle to get products to fulfill development needs. What integrated engineering looks like and how it gets implemented can vary greatly depending on short-term and long-term engineering needs and resource availability.

If you have determined that integrated engineering is the right product design and engineering solution for your needs, it's important to consider different working models for the relationship with the engineering provider. There are several models to choose from when integrating outside engineering services. In this paper, we will explore four of them, along with the advantages and disadvantages of each.

Models:

1. Directly managed staffing
2. Augmenting an existing engineering team
3. A fully integrated outside engineering team
4. Turn-key design services

1. DIRECTLY MANAGED STAFFING

Managed internally, in this model an engineer hired either through a staffing group or design engineering firm works directly for, and is managed by, the client. People working in this model are sometimes referred to as "engineering contractors".

Pros

This model works well when a fast ramp is required. Contracted talent can typically be brought on board quickly, comparable with a full-time hire. If projected workflow or labor needs are likely to fluctuate and staff is only needed for a temporary surge, using directly managed contractors can provide flexibility. Should resourcing strategies shift or change, being able to "turn off" a contractor quickly without the internal team morale impacts of firing a full-time employee can be beneficial.

Cons

One consideration is the sunk cost of training a temporary outside resource on processes and integrating them with the team. Another risk is that contractors are typically supported by staffing groups that often do not have direct experience with the resources that they are staffing. As such, those groups are essentially responsible for vetting the candidate from a resume point-of-view but may not have direct knowledge of a candidate's strengths and weaknesses.

This working arrangement typically requires extensive oversight. Staffed resources require tasks to be managed with detail to ensure optimal output, which can add strain and workload on internal team

members. Typically, this model works best when the need is for completion of well-defined engineering tasks. If the project includes complicated, cross discipline problem solving, employing a team model may be more practical. Lastly, the client typically needs to plan to provide all required equipment (computer, software, engineering tools and equipment). This needs to be included in the overall cost calculation for the contractor hire.

2. AUGMENTING AN EXISTING ENGINEERING TEAM

This model is typically used in one of two cases:

- When an internal team lacks a technical skill set required to complete the project. A very common occurrence is when a team that has traditionally designed products that are the output of a single engineering discipline, i.e., fully mechanical products or analog electrical products. When a company with this type of team looks to expand product capabilities by adding in electronics, complex mechanics, or firmware, it often makes sense to bring in a full team from an engineering design firm.
- When the internal team lacks the bandwidth to perform the detailed design of a product, but can provide technical guidance, and the technical interface to the business team. In this case a full team of mechanical, electrical and firmware engineers may be brought in to support and implement the technical vision of the chief engineer or systems engineering lead.

Pros

Like the previous model, there is inherent flexibility in this model to manage fluctuating engineering needs. Added advantages to this model include access to a broader talent pool available from firms with technical specialties. Also, if you are working with a design engineering firm vs. a staffing agency, the engineering resources provided have broader access to the "brain trust" that exists within the design engineering firm for brainstorming, design reviews and other ad hoc needs.

Cons

One disadvantage of this model over directly managed staffing is that scheduling remote resources for in-person meetings takes more advanced planning and collaboration on hardware and prototype development takes additional coordination. Also, since the individual engineers are not directly managed by the client, accountability can be a concern with this model. These concerns can be managed easily enough by selecting a design engineering firm to partner with that provides suitable accountability for their staff.

3. A FULLY INTEGRATED OUTSIDE ENGINEERING TEAM

In this scenario the client does not have internal product development engineering capabilities but does have a business team that is actively involved in defining and managing the overall program, making decisions along the way. The client communicates the product requirements, and the design engineering firm carries the technical development burden almost entirely with accountability and checkpoints back to the client's business team.

Pros
In this model, the client likely has a strong business case for the engineering needs but requires help with technical aspects of the development. This model can offer a wide degree of flexibility to the client for products that are not fully defined, which is exceptionally challenging when creating something truly new. This model is most successful when both the client and the design engineering firm are highly collaborative.

Cons
In this model the client does not have an internal technical lead. That usually means the product requirements are left at the business needs level and need a strong technical lead to define the technical requirements, define the product architecture, and develop the specifications so that the architecture will deliver on the requirements. This requires a very experienced and capable technical lead, something that some engineering design firms may lack. This also places a high communications load on both the client and design firm technical lead. To mitigate the risks in this model, the client should check the qualifications of the engineering design firm's proposed technical lead.

4. TURNKEY DESIGN

In this scenario, the client provides a detailed product specification to a design engineering firm. From there the design group executes all design activities, and potentially manufacturing activities, providing a final design, or finished product to the client.

Pros
This model offers the lowest level of interaction and management load for the client to generate a product. Once the design specification is handed over, the client typically receives periodic status updates, but there is little, or no interaction required for design decisions. The design engineering firm manages the full project with budget, schedule, and deliverables. For products that fall into common categories like manufacturing equipment, there are companies that specialize in turnkey outsourcing. These companies have typically spent lots of time and energy developing efficient and effective tools for developing products in their niche. Their team is trained and experienced using the company's processes and tools and the client benefits from a team that has already learned from past mistakes.

It's worth considering that design engineering firms that offer turn-key product development have invested in creating a team that works together well and can draw on one another's experience and expertise, bringing efficiencies to this model.

Design engineering firms typically provide all required equipment (computer, software, engineering tools and equipment), saving time and additional client investment.

Cons
Generating a product specification that is detailed enough to define all aspects of a product is a large investment. Creating such a document requires a significant amount of technical expertise. A turnkey design model is the least flexible of the models, there is little collaboration or ability for the client to make design changes during development. The client should be prepared for all change requests to be met

with change orders detailing out schedule and cost impacts. Finally, with everything outsourced, the client is not building a team with engineering expertise in-house. If there will be follow-on products, this may represent a significant missed opportunity.

DEVELOPMENT MODEL TRADEOFF

As described above, each engagement model for outsourced design engineering has a set of pros and cons. The majority of these pros and cons can be grouped into the following categories.

- Product Specification Capability & Effort – How much effort is the client willing, or able, to exert to develop a product specification to provide the design engineering firm? How much is really known about the product at the start of the development effort? Is the business team really capable of fully and realistically defining the needs up front? Truly groundbreaking products are an exploratory effort, with the product team (business and engineering) exploring and learning about the market, the requirements, the technologies, and the design as the product design evolves.
- Internal Technical Expertise Required – How much internal technical expertise does the client firm have available to lead the technical development of the product? It is critical to have a technical lead that can communicate with the business and technical teams effectively. If this skill set is not available internally, that will impact which engagement models are viable.
- Management & Communications Load – How much bandwidth does the business team have available to discuss and make tradeoffs in product features, project and device cost, and program schedule? Product business requirements typically represent a wish list. When the reality of what is truly achievable is discovered in the design process, there are always tradeoff decisions to be made. The availability and bandwidth required of the client's management team varies across the models.
- Product Design Flexibility – As described above, the product development process for an innovative product is an exploratory process. As more and more is learned about the product, decisions will need to be made that affect the final outcome. Each model allows a different level of flexibility to the client to steer the development efforts to yield the most optimal final product for their business.

CONCLUSION

We hope this review of integrated engineering models helps inform the best path forward for your future development efforts. While there is considerable flexibility in ways one can engage outside integrated engineering services, it's critical to evaluate several factors before moving ahead.

- What confidence is there in internal abilities to create a fully developed engineering specification set?
- What are the downsides if that outside expertise isn't leveraged?
- Which model provides the best leverage of your current staffing expertise as well as your long-term or ongoing technical needs?
- Which model helps you maximize development efficiency and optimize design quality?

Every company's needs, budgets, and internal resources will help dictate uniquely how to best proceed. Making optimal use of outside resources is pivotal to product development success.

It's critical to build the right kind of working relationship with a design engineering firm. The best design engineering firms are flexible enough to always keep the client's best interests central to project execution. Ideally, the outsourced design engineering firm selected will have the depth and breadth of personnel to enable flexibility in how they engage with and/or augment available internal teams to optimize design quality outcomes -- all, while aligning with available budgets, product timelines and internal staff proficiencies.

ABOUT THE AUTHOR

Doug Harriman is the Vice President of Engineering of Simplexity Product Development. Simplexity is the market leader in mechatronics and detailed engineering design services and a design engineering firm as defined by the models in this paper. Doug has over 25 years' experience in the development of mechatronic systems and feedback controls for products ranging from low-volume wind turbines to high-volume consumer 2D and 3D printers.

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