# Defining Specifications for Custom Designed Products

An Online Continuing Education Course for Engineers

**Course Number: P-2011**

**Credit: 2 Hours / 2 PDH / 2 CPD**

# Defining Specifications for Custom Designed Products

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# 1 Preliminary Considerations

The Engineering Departments are typically involved in two types of activities: Sustaining Engineering and Research & Development (R&D). Sustaining Engineering can be defined as "continuing engineering and technical support that follows release of requirements, specifications, and drawings for fabrication, assembly, testing, and delivery of an end-product"[1]. R&D activities are defined as "systematic activity combining both basic and applied research, and aimed at discovering solutions to problems or creating new goods and knowledge"[2]. Furthermore, the R&D activities can be divided into:

- Research - it takes place when basic research is employed to solve engineering problems or develop new processes, products, or technologies
- Development – it takes existing engineering knowledge – processes, technologies, techniques, etc. - and applies it to develop new, but technically similar, products

Many of the Engineering Departments developing new products are doing Development, sometimes with some amount of research. Those departments are creating novel products, products that have not existed before and that are fulfilling some clients' needs. In order to adequately answer the client's needs, the Engineering Department needs to have a good set of specifications for the product. But what does "good" mean in this instance? What is good for some people may not be sufficient for others… A reasonable answer to this question can be along the lines:

*"A good set of product specifications generates a product*
*that fully satisfies the client's needs."*

For this to happen, the set of specifications has to have the following characteristics:

- needs to be clear, un- ambiguous and not allow for interpretations
- needs to be complete – to fully and uniquely define the product
- needs to be technologically achievable – so the product can actually be developed with the available resources and within the expected timeline

- needs to generate a cost effective product – to strike the proper balance between the desired features and the product's cost, such that a client is willing to pay to have those features

In many cases, the desired product belongs to a family of products with which the client or the Engineering Department already has experience with. In this case the client knows exactly what is needed and can define the product's specs alone, without involving others, before organizing the bid meeting.

However, in many other instances the features desired in a product are pushing the known technical boundaries. This is the case when there are questions about the technical feasibility of the desired features or when the features may possibly be prohibitively expensive. In this case the client needs to involve more experts in the field to clarify what is possible and what is not possible, and what is reasonable and what is not reasonable, etc. – to help with the definition of the product specifications. Here, the client only has a general idea of what is needed and is not clear about the feasibility of the required product characteristics. In this case the client typically contacts some of the Engineering Departments of the well-known companies in the field as the experts in developing the product and/or other experts in the field (third parties). While the third party experts may be very knowledgeable about the feasibility of the *functions* in discussion, the Engineering Departments understand very well what it takes to *develop* the products, both in terms of time and resources.

The "Definition of the Product Specification" phase of the project is critical. This phase establishes the project's life trajectory and wrong directions can result in very expensive project re-alignments, insufficient, inadequate or futile product features, and consequently in client disappointments. The earlier the potential obstacles are identified, the easier it is to address them, and the stage of definition of the specifications is the best place to do this.

## 2 Definitions

The term "Project Manager" refers to the person in charge of the engineering project. The Engineering Manager is the most likely candidate for this position when the ambiguities involved require that the Project Manager has the right tools and abilities to

resolve them. In other cases, the Engineering Manager can delegate a senior team member to take on this role, one that has the proper authority to resolve the uncertainties typical for a novel project.

The “Expert” refers to a person that has thorough knowledge in the field of interest to the engineering project. This person has a recognized authority in the field and knows all there is to know about it. He/she can be part of the Engineering Department, the Engineering Company, the Client’s company or can be a third party outside consultant.

The term “Process” refers to the activity that the desired product is intended to perform. This term does not refer to the product itself. Most likely the client will have a good idea of what that process needs to be and sometimes even knows how to achieve that process.

The “Client” is the beneficiary of the product in question. It can be an outside entity (a Company) or an inside department (like the Operations Department, or the Sales Department).

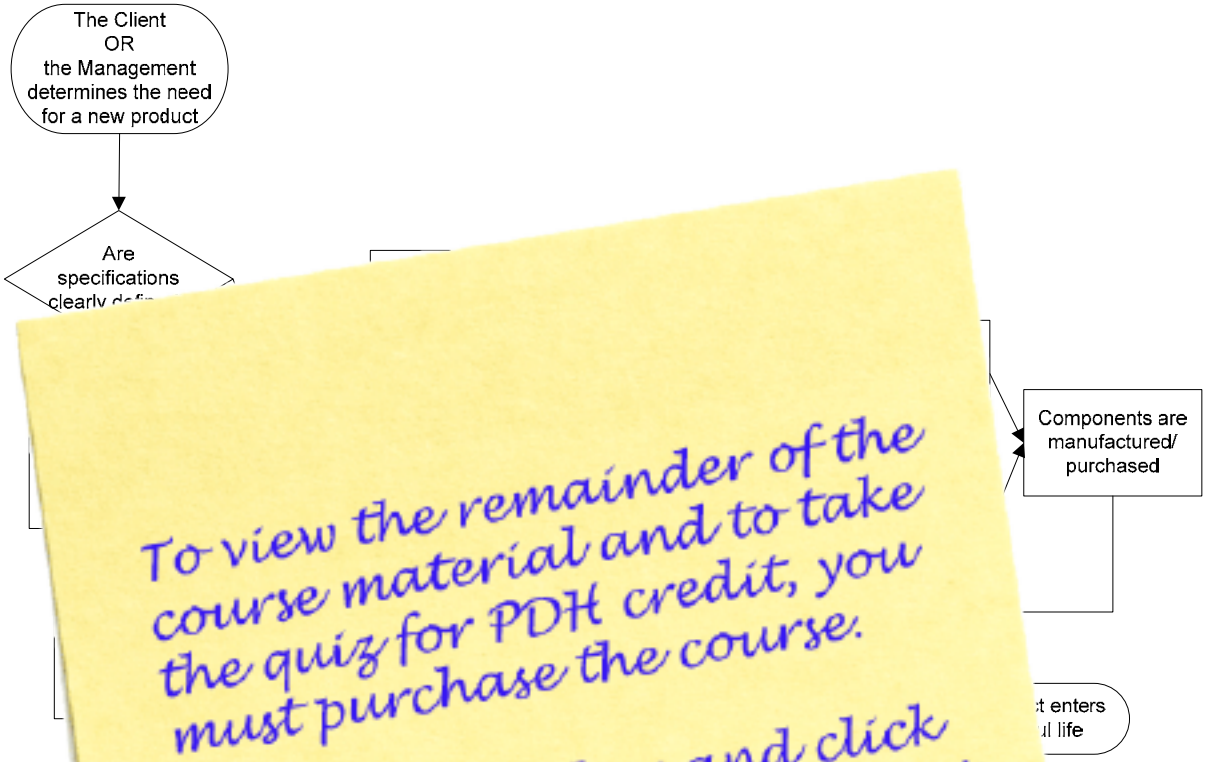
The term “Moderator” refers to the person that enables discussions among the experts engaged. The Moderator can be a person delegated by the Project Manager, or the Project Manager himself/herself.

# 3 The “Definition of Specifications” phase as part of the Product’s Lifecycle

As stated above, when the required product goes beyond the known technical boundaries, the product specifications can only be defined successfully by tapping into the knowledge of the experts in the field.

Figure 1 is describing a typical product lifecycle. In this flow chart, the activity “Definition of the Technical Specifications” sits towards the beginning of the rest of the activities. This is one of the most critical steps in the project, and at the same time the most challenging, due to the vagueness surrounding its deliverables. Being situated at the beginning of the serial work flow, it represents the foundation of the whole project. The outcome of this step will determine how the final product will look like, what

functions it will perform, how much it will cost, and how well it will answer the client's needs. The success of the entire project hinges on the success of this activity.






It volved are pretty m specs are defined, The only obstacles vailability of resou rd party suppliers,

The cations is performe duct (the Client), various experts in t , it is intermediated by the company's salesman. At this stage, the Project Manager's duty is to extract the relevant information from experts (many times geographically spread and technically heterogeneous; many people a very knowledgeable about some parts, few people know everything of all the parts) and place it (integrate it) into the rigorous, organized form of "Product Specifications".