

2.9 Product Delivery

The product delivery model is a specification of the project-customer relationship on technical aspects of the need for and acceptance of a product. This includes elements that address:

- How the product is perceived from a customer perspective in terms of capabilities it needs to provide, how it is to be used in operation of their enterprise, and minimal criteria for its acceptance
- How the product is documented in forms sufficient to instruct and guide users in proper operational use;
- How the product is configured, packaged, and deployed to a customer;
- How customer product acceptance efforts, including validation and certification, are supported;
- How users are assisted for effective and efficient use of the product; how flaws and potential future needs are specified to inform the project in planning for product improvements.

Customer Needs

The customer needs element specifies a customer-oriented portrayal of how the customer enterprise operates and how the product fits within that operation, including the capabilities the product will support and changes that use of the product may prompt. This specification constitutes minimal essential criteria for a product that customers will perceive as beneficial to their operations and is the validation criteria on which product acceptance is based. An adjunct to the customer needs element is a customer responsibilities specification.

This is the voice of the customer to the project, what customers think a product can do for them. This is a complementary means to ensure what customers expect is consistent

with the project's ability to build a product in response and, if needed, to engage with customer representatives to close any gap.

The customer responsibilities specification identifies and tracks actions required of the customer in support of the development project, such as providing representatives to collaborate on developing and refining the customer needs specification and corresponding product documentation, revising enterprise processes and practices to accommodate use of the product and arrangements for associated logistics, and preparing users for involvement in product acceptance and deployment, training, and operational use.

(diagram relationship to product requirements and product environment models)

From a developer perspective, this specification represents an "under-constrained" specification of required product capabilities and behavior, identifying only those aspects of a product that if not properly supported would cause the customer to reject the product. Many different products could be built to satisfy a customer needs specification, leaving flexibility for engineering tradeoffs and decisions required to building the actual to-be-delivered product. This contrasts with the product requirements model, which must be consistent with this specification but is an "over-constrained", built-to/as-built specification of the product's expected observable behavior.

This specification, and any changes, must be consistent with commitments made through the customer relationship specification of the project management model. It may begin as either a marketing- or a customer-provided description of needed capabilities. This description may be conveyed in any of various customer-familiar forms such as orally, free form text, diagrams, tables, scenarios, or model-based descriptions. The goal of such a description is to expose developers to the customer's perspective, not only by defining the problem that a product is expected to solve, but also by describing current operations, quality priorities, and any constraints that are imposed by operational context, conventions, or other considerations. This description is presumed initially to be incomplete, due to uncertainties and inadvertent omissions, and inaccurate, either in misrepresenting actual needs or in poorly communicating

about those needs. A specification of these needs is then derived, iteratively refined, reviewed, and revised based on developer knowledge and past experience with similar products and in collaboration with customer or marketing representatives, and continues to be revised as understanding of needs or circumstances change.

The essential goal here is to understand the customer's actual needs and describe capabilities of a product that will meet those needs. Actual needs become better understood but also tend to change over time, both as a product is being built and after it has been put into use. Characterizing potential future changes will provide the basis for building a product that is less difficult and costly to modify as changes occur.

Practical issues of technical feasibility, availability of resources, cost, and delay can induce a customer to accept a product that does not fully conform to previously envisioned needs. Furthermore, once a product is deployed into use, the customer's perception of their needs often change further due to a better sense of how the product can enable changes in enterprise practices to better achieve its objectives, and in turn these changes can lead to changes in the customer's perception of the capabilities they need the product to provide.

Flaws in expressions of needs are most serious when they do not accurately represent actual needs, in some or all areas of the customer enterprise that a product will affect. These can take the form of prematurely resolving uncertainties, that reflect inadequate information or well-informed but conflicting opinions, due to pressure to be "finished".¹ Similar flaws are a reliance on unstated or unsubstantiated assumptions (e.g., about how the product will be built) and omission of supporting information that explain needed capabilities. Finally, a flaw that can increase the long-term cost of a product is failing to highlight poorly understood needs or likely future changes in needs that may require later changes to the product.

Another category of potential flaws in an expression of needs is less serious to the integrity of the product but can lead to confusion that increases the effort required to

¹ G.H.Campbell, "An Illusion of Certainty", ?

build it. These include poorly defined or inconsistently used terminology; poor organization that separates or duplicates related information; vague, ambiguous, or contradictory information; verbosity due to unneeded or overly complex content; ill-considered constraints on a solution based on current circumstances; and overly strict or unverifiable criteria for acceptability of a solution.

All such flaws can best be resolved through a collaboratively iterative development process that recognizes any initial expression of needs is likely to be imperfect unless it is based on an understanding both how the customer enterprise operates and how a product can be built that will provide needed capabilities. This typically requires a refinement of how needs are understood to result in an effective product. Some imperfections such as uncertainties about needed capabilities are most easily resolved during a development process that elaborates alternative resolutions for empirical comparative evaluations as to which works best for the customer's circumstances.

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Product Documentation

Customer-targeted product documentation, being intended for particular audiences (e.g., different user roles), is audience-appropriate presentations of product capabilities. Examples are an organized presentation of the product's overall capabilities and expected behavior in its operational environment and instructional and training materials that explain how the product is used in performing identified workflows or scenarios. An adjunct to the product documentation element is an operational scenarios specification.

Documentation may be provided in alternative forms of media, accessible using self-documenting capabilities of the product (e.g., as "About" or "Help") the product (using facilities of the product for this purpose) or provided as externally accessible elements of the product (e.g., as hypertext, videos, simulations, printable documents, or slide presentations), each tailored to a specified audience or viewpoint.

The operational scenarios specification provides representative customer views of how the product will be used in providing the capabilities they need. Scenarios serve as a

basis for three purposes: for anecdotal understanding of customer needs, for product testing (i.e., to construct one or more test packages for use in empirical evaluations of the product relative to corresponding customer needs), and for user training (i.e., how to use the product in their roles within the customer enterprise). This specification reflects the nature of work to be performed with the product, including relevant actions that can be initiated and associated initial conditions and resulting effects of those actions. These scenarios should be organized according to the customer's enterprise process and user roles as specified in the product environment model.

Product Configuration and Packaging, and Product Deployment

Product configuration and packaging element specifies the content of a product instance based on the product design model. The realized product contains all prescribed operationally-useful artifacts. These artifacts include executable software object code and documentation in suitable form to provide instruction and guidance to users on the capabilities and usage of the product according to their roles in the enterprise.

Product realization may provide augmented means for safely replicating an operational environment created as specified in the product environment model. Depending on the product's intended use (e.g., for evaluation), it may be configured with instrumentation suitable for monitoring and controlling operation of the product.

The product may also include developmentally-useful elements, including product model specifications and development environment assets, if project management committed to providing these to the customer.

Product deployment specifies the means by which a deliverable product, consisting of hardware and software, is packaged for delivery and installed into an operational environment (i.e., any operational context that conforms to the product environment model). The deployment specification assumes satisfactory completion of customer responsibilities as specified for customer needs. Such environment may be a customer's actual physical environment, a virtual environment, or an instrumented facsimile (simulated or hybrid) environment for product evaluation or training. Installation may include options for customizing the product to fit its intended use or environment. The

installation is confirmed as meeting operational integrity criteria, along with pre-validation fitness tests to ensure the installation has completed correctly and adheres to prescribed customer processes and practices.

Product Acceptance

The product acceptance element specifies how customer validation and certification efforts are supported requisite to acceptance for deployment into operational use. Initial product deployment is tentative, pending customer acceptance of the product as satisfying their then-current expectations. A deployed product will have derived from a consistent product model and verified as satisfying project-specified criteria (possibly including non-critical discrepancies). Product acceptance specifies the criteria and means by which a product is validated as meeting customer expectations and certified as acceptable for deployment and use in the customer's operational environment. The product may be initially deployed into an isolated or facsimile environment until validation criteria, including all critical quality criteria, are known to be satisfied. Product acceptance efforts may build upon and extend means and results specified in the product analytics and product verification models.

User Support and Feedback

The user support and feedback element defines how the provider works with users in the customer enterprise to deliver appropriate guidance, training, and assistance to users, facilitate any associated logistical activities, and provide useful feedback to the project on potential improvements to the product.

User support is a realization of a project's customer relationship, facilitating actual customer use of the product for best effect. This includes understanding of the customer needs specification, documentation of how the product is to be used, and awareness of how the product is likely to change over time.

Feedback to the project is a consequence of providing support to the customer. This includes objective (e.g., analytic data) and subjective (e.g., perceptions) information gained from observations of customer activity as well as specific customer comments

and questions. Feedback identifies perceived defects, imperfections, and inefficiencies, potential improvements in the product for a better fit to customers' current needs, and expectations concerning future changes in the customer's needs or operations.