

Product Design Specification

The PDS is a comprehensive definition of design intent. It defines the parameters within which design development activity can be undertaken, and sets the criteria that can be used to evaluate the results of this activity.

Dynamic rather than static – the PDS is an evolutionary and comprehensive document. In some cases the PDS may be used as a contractual document. The absence of a PDS will invariably result in the product's failure in the market. A poor PDS leads to a poor design solution, a good PDS leads to a 'better' design solution.

Guidelines for PDS preparation:

- It is a control document – representing specifications for intended achievement, not the achievement itself.
- It is a user document; therefore it must be clear and succinct.
- Use short, sharp, definitive statements under the headings outlined below. Allow space for amendments and additions – it is an evolutionary, user-friendly document.
- Quantify parameters in each area.
- The starting point for the document will vary as each PDS is unique to each new design situation – choose one relevant to the particular project, avoiding standard approaches. The list below is in no fixed order!
- Date the document (issue numbers)
- Clearly document and date amendments.

Partial PDS:

Within the total system outlined by the PDS, products may be broken down into *sub-system* and *component* levels. SSDS = Sub-System Design Specification. CDS = Component Design Specification.

The same rules of systematic approach apply to the Partial PDS. Elements of the total PDS will be applicable, some more than others depending on the nature of the sub-system or component.

The constituent elements of the PDS outlined below are applicable to some degree in all products. However, within an educational environment it may only be practical to produce a partial PDS due to restrictions on access to information and resources.

Contents of the PDS:

▪ Performance:

The performance demanded or likely to be demanded should be fully specified - ensure the objective can be obtained economically, avoid over specification at the expense of other PDS elements.

- **Environment:**

Consideration is required of temperature range, pressure range, humidity, shock loading, dirt/dust levels, corrosion, noise levels, insects, vibration, safety, hazards etc...

Within the following contexts: - manufacture, storage, assembly, packaging, transportation, warehousing, point-of-sale and use. These environmental subsets must all be considered or essential performance may be missed as a result.

- **Ecology:**

There are guidelines and measures embedded within local and global environmental policies that must be adhered to by manufacturers and distributors.

- **Disposal:**

Strategies for the disposal of the product and its constituent components must be defined – design for disassembly, reclamation, safe disposal. This will have a direct impact on materials and process selection, design, maintenance policy etc.

- **User/Ergonomics:**

Man-Machine interface during manufacture, use and maintenance. It is necessary to clarify the nature of the interaction between the product and subject within these contexts - consultation with users is a prerequisite. Careful analysis should be made of user abilities (physiological & cognitive) and anthropometric data, as this will define the products interface. This must be considered in relation to the previous category, for example: high noise levels may make visual or tactile feedback more essential.

- **Consumer:**

Although intertwined with the previous category this refers more to the type, social position, likes, dislikes, preferences and prejudices than the physical nature of the user. This is useful in the definition of the market and should take into account issues such as disposable income, gender roles etc...

- **Life in service (performance):**

Short or Long? In relation to which element of the PDS?

- **Maintenance:**

What is the current maintenance and spares philosophy of the company and market?

- **Target Production Cost:**

Should be established from the outset and checked against existing or similar products (competition), available manufacturing facility and/or sub-contracting.

- **Competition:**

A thorough analysis is necessary for a comparative viewpoint - identifying elements such as their market share, design strategies, product features and retail costs.

- **Transportation:**

Identification of final destination and transportation methods, types of packaging, overseas shipping requirements, custom and excise.

- **Packaging:**

This will add to product cost and volume. It should be considered in relation to transportation, storage, point-of-sale, post-purchase ('high-street to home').

- **Market Constraints:**

Full and detailed knowledge of market conditions, whether local or overseas, is required. What is acceptable, can it sustain additional competition for market share etc? Quantity? Size of the production run will directly effect the design of the product and manufacturing strategy - manufacturing process, material selection, tooling, assembly, investment in new or re-furbishment of plant, sub-contraction etc.

- **Manufacturing Facility:**

Is the product's development constrained to in-house expertise and facilities or is 'outsourcing' viable? Sub-contraction = less capital intensive and reduced fixed costs, allowing flexibility in selection of competitively priced manufacturers and suppliers.

- **Size & Weight:**

Effects handling during production, transportation, use etc. Alternative strategies may be appropriate - modular, flat-pack or inflatable.

- **Aesthetics and Appearance:**

Visual performance is vital as an indicator of quality, function, social position and status. Many purchasing decisions are based on style particularly when physical performance and functionality are standardised across market sectors.

- **Materials and Processes:**

These must be identified and relevant specifications and standards should be included. If special processes or finishes are to be used during manufacture they should be defined e.g. plating, anodising, and plastic coating. Costs, availability, processing times, energy use, recyclability etc. should be indicated and considered in relation to other elements of the PDS.

- **Product Lifespan:**

Marketable life / productive life – product lifespans are reducing rapidly in many sectors. Design approach, market and competition, tooling and

manufacturing facility are all factors that influence or are influenced by this component of the PDS.

▪ **Standards and Specifications:**

UK and International where appropriate. (Although useful and essential in many areas they represent current industrial and technological practice and a consensus at a particular point in time = potential restrictions on innovation)

▪ **Quality and Reliability:**

The levels of quality and reliability necessary to ensure success and acceptance in the market place should be quantified. MTBF = mean time before failure, MTTR = mean time to repair. Look to precedents set by competitors as a guide, not a rule. ISO 9000/1/2/3

▪ **Shelf Life:**

Product shelf life and storage during this period must be considered (in relation to the environment) and methods for combating issues like degradation through UV or moisture absorption for example should be identified. Packaging design may be a key issue in this area.

▪ **Time Scales:**

What is the time scale involved for the project as a whole and also it's individual stages? Design development, testing, market research, manufacturing, transportation etc. Lead times for tooling, down times during production, materials procurement etc. should be considered in the project planning. Design development times must be adequate to avoid creating costly mistakes that will add to project timescales at later stages.

▪ **Testing:**

All products require testing – testing is required to verify designs during the development stage and also to gain approval prior to entry to the market place. Tests will be made on rigs, mock-ups, prototypes, production tools, assembly lines etc. and also during production quality tests are undertaken to ensure quality and compliance with the PDS and externally set standards. Initial test specifications should be made indicating test frequencies, methods and criteria.

▪ **Safety:**

Compliance with BS, EC and other legislation. Aspects such as labelling to provide adequate warnings, operating instructions, technical specifications such as power ratings, potential abuse and safeguards need inclusion. Representation of function in the product's aesthetic treatment should be considered.

▪ **Company Constraints:**

Many constraints are imposed on projects by company practice or previous products, manufacturing facility, financial strategies and investment attitudes, in-house facilities for product development, personnel quality etc. These will

have implications to the design development activity, sub-contracting, production etc.

- **Legal:**

EC and US product liability legislation means that liability can fall on the shoulders of individuals not just companies. Litigation is a fact of commercial life!

- **Patents and Protection:**

Patent searches should be undertaken to avoid costly legal battles, also to avoid 're-inventing the wheel'. Your ideas (Intellectual Property) are valuable and should be protected.

- **Installation:**

How will the product interface with other products and systems. Defining system compatibility and capability is essential: power requirements, appropriate connections, volume, fittings and fixtures, access etc.

- **Documentation:**

Product documentation is important in terms of legal requirements and also in terms of instructions for use, guidelines for maintenance, spares and accessories etc. Is this to be digital or printed? How will it relate to other elements of the client's corporate identity?

- **Political and Social Implications:**

Projections of future changes in socio-political structure of the target market should be included using reliable sources. The potential effect of the product within the market place should be considered – consumer movements, market stability, gender roles and stereotypes, religious beliefs... these issues can have fundamental implications to commercial success.

Reference:

PUGH, S. (1991) **Total Design** Addison Wesley Publishers Ltd.