

Guide to production control —

Part 6: Computer aided production control

Committees responsible for this British Standard

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- British Computer Society
- British Production and Inventory Control Society
- Chartered Institute of Management Accountants
- EEA (The Association of Electronics, Telecommunications and Business Equipment Industries)
- Institute of Logistics and Distribution Management
- Ministry of Defence
- Nottingham University
- PERA International (Production Engineering Research Association)
- University of Bradford
- University of Manchester Institute of Science and Technology

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Foreword

This Part of BS 5192 has been prepared under the direction of the Quality, Management and Statistics Standards Policy Committee.

The prime objective of production control is to help a company become more competitive and profitable. An effective production control function endeavours to fulfil this objective by keeping a balance between satisfying sales demand, achieving high plant utilization and maintaining low investment in stocks and work-in-progress. An optimum balance between these often conflicting objectives will only be achieved by a production control system designed to meet the specific needs of the company and run by well trained and dedicated staff.

BS 5192 is published in six Parts and gives comprehensive guidance in those areas that are considered essential for effective production control. The Parts are as follows:

— *Part 1: Introduction;*

Scope of the guide, purpose of production control, relationship to other functions, technological changes, choosing the system to fit the business.

— *Part 2: Production programming;*

Relationship to corporate and business programmes, planning techniques, master production scheduling, capacity planning.

— *Part 3: Ordering methods;*

The various types of ordering and stock control systems, comparing the advantages of each for particular applications.

— *Part 4: Dispatching (shop-floor control);*

The methods of shop-floor production control and documentation involved and the increasing influence of computers.

— *Part 5: The relationship between production control and other management functions;*

The production control information flows in the organization, their generation, presentation, use and maintenance.

— *Part 6: Computer aided production control;*

The application of computer software to the production control function.

Throughout this standard the use of the pronouns he, him and his is intended to be non-gender-specific.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

The planning and information flows in the various stages of a production control system (see Figure 1) can be facilitated by the use of computers. This Part of BS 5192 describes the benefits of the use of computers in the production control process. The capabilities of computers to store, maintain, manipulate and share large volumes of data and communicate information very quickly is ideally suited to the present day needs of production control. Today's manufacturer can be faced with international competition, quickly changing markets, the customer's expectation of significant reductions in design-to-delivery lead times and severe profit margin erosion. Much of this pressure is brought about by the intelligent use of computers by the competition especially in the field of production control. The effective management of this area of the business is vital and can lead to significant cost reductions in the areas of work in progress and component stores; it can also lead to an overall reduction in delivery lead time.

To remain viable and to meet and beat the competition, manufacturers should seriously evaluate the use of computer aids in production control. This evaluation has to be professional in terms of the objectives and the likely costs and benefits. The effort required is large and cannot be taken lightly, but the rewards in terms of improvements in performance and management control can be enormous.

NOTE The development of the use of computers in production control is described in Annex A.

1 Scope

This Part of BS 5192 gives guidance on the use of computers in production control. It does not describe the use of computers in other areas of the business such as computer aided design, engineering management, finance, purchasing, payroll, maintenance and sales order processing. However, the techniques and requirements identified and recommended in this Part of BS 5192 for the establishment of a formal specification of requirement, selection and justification of a computerized production control system (either bespoke or a commercial package), installation and implementation of the system, together with the guidance on ongoing operational requirements and future trends, may be applicable not only to production control systems but equally to the professional evaluation, selection, implementation and operation of any business system in the manufacturing company.

2 References

2.1 Normative references

This Part of BS 5192 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 5192 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 5192 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 5192, the definitions given in BS 3138:1992, BS 5191:1975 and BS 5192-1:1993 apply.

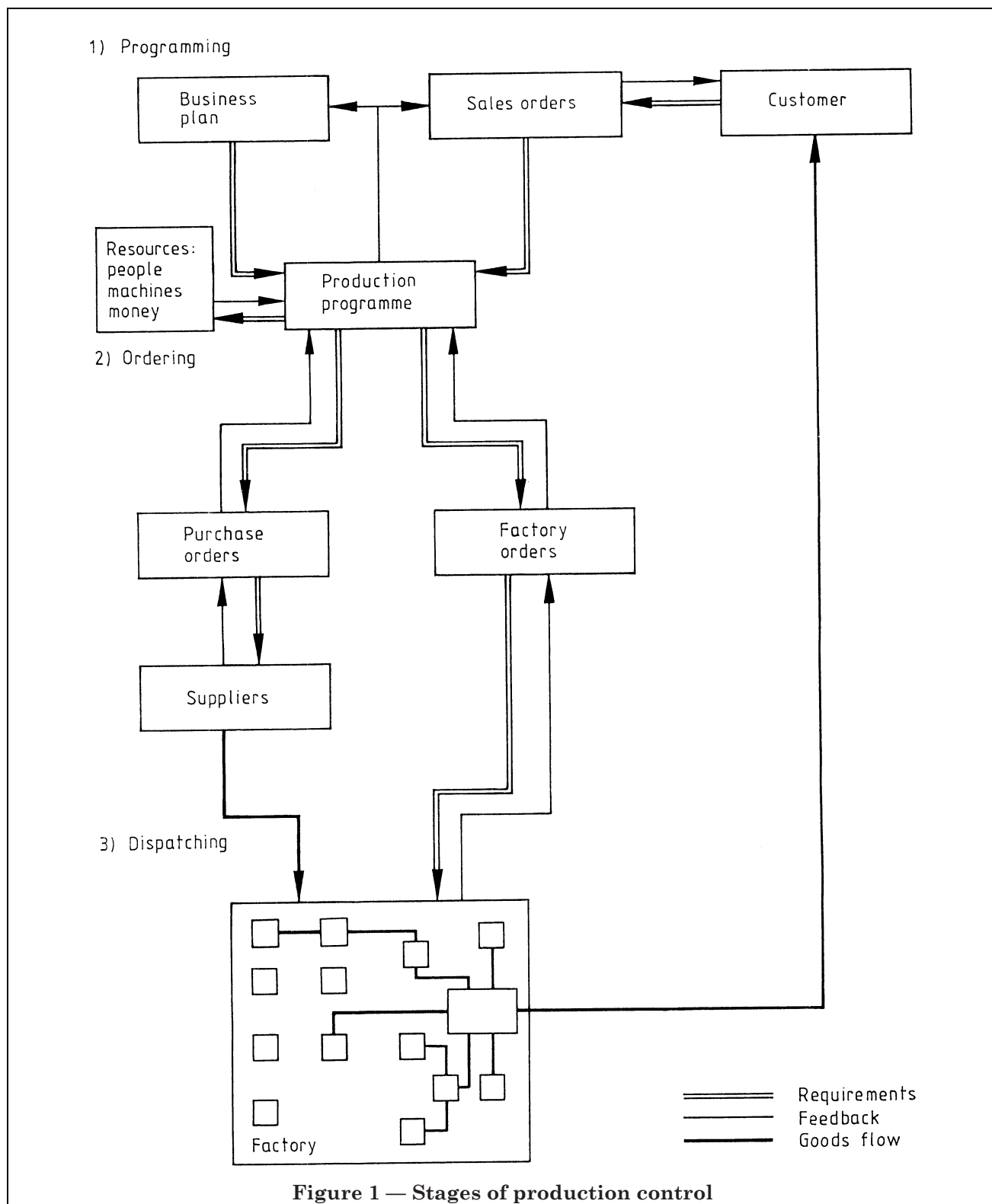
4 Specification of requirements

4.1 Business requirements

In today's business environment of international competition, world class quality for products and drastically reducing manufacturing lead times, the need for good production control systems has to be clearly understood in terms of the business requirements. These should be defined clearly in three strategy statements.

- a) *Marketing strategy of the company*: it should be stated what segments of the market the company is in, what segments it is not in and where the company plans to be in 5 to 10 years.
- b) *Business strategy*: the business and financial targets that the company has set for itself over the next 5 years should be stated. Examples are return on investment targets, inventory turns, production lead times, quality targets, cost reduction targets, profitability targets, training targets, market share by country.
- c) *Information technology strategy*: the types of systems that will be required to meet the demands of the business and marketing strategies in the face of competition should be identified.

After the business, marketing and information technology strategy statements are known and agreed within a company, the informational subset that is now required to support the production control part of the business can be defined.



4.2 Problem definition

Once the business, market, and information technology objectives have been established, the problem for production control is to define how to achieve them. It is necessary to identify the main problems that have to be overcome in the production control function to support these strategies and at the same time fit into the overall framework of present and future system communication requirements implied by the strategies. The problem definition phase should describe the production problems in terms of the following requirements:

- a) batch sizes;
- b) routing options;
- c) contract control;
- d) traceability;
- e) frequency of change over;
- f) work-in-progress value;
- g) engineering change control;
- h) bottlenecks;
- i) overall manufacturing lead time objectives;
- j) quality/rework objectives;
- k) volume;
- l) warranty control;
- m) key equipment maintenance;
- n) multi-site manufacturing;
- o) centralized or decentralized purchasing;
- p) centralized or decentralized production planning and control;
- q) cost of space;
- r) cost of people skills;
- s) space constraints.

The objective here is to define the production control problems that are specific to this business and then prioritize their importance.

4.3 Functional requirements specification (FRS)

After the objectives have been established and the specific problems defined, a functional requirements specification (FRS) should be drawn up. This step is absolutely crucial and cannot be ignored. It establishes the basis for the system design and provides the reference point for comparing all proposed solutions (whether in-house or third party).

Without this vital reference point the evaluation of all possible solutions is haphazard and unprofessional. Without it there is a risk of comparing one solution against another rather than always comparing a proposed solution against an agreed standard (the FRS). In the case of purchasing computer software, shopping around for a solution is useless without the agreed specification against which to compare it. The FRS has to be agreed formally by the major business divisions within the company such as finance, manufacturing, sales/marketing, engineering and data processing. Otherwise the resulting solution will not be used seriously by the end users.

The FRS should describe in detail the flow of information required, the volumes anticipated and the business issues to be serviced. For example the following sizing requirements may be specified:

- a) number of parts;
- b) number of product structures;
- c) number of operations;
- d) the need for alternative structures and routings;
- e) contract control requirements;
- f) traceability requirements;
- g) batch sizes;
- h) quality control targets;
- i) shop-floor data collection requirements;
- j) finite scheduling requirements;
- k) capacity modelling;
- l) master scheduling modelling;
- m) re-order levels;
- n) material requirements planning (MRP) capabilities;
- o) links to cell controllers;
- p) links to other business systems such as
 - accounting/finance/ledgers
 - purchasing
 - finished goods
 - receiving
 - engineering/design
 - sales orders
 - sales forecasts.

The objective of the functional requirements specification is to think through and address in detail the type and flow of information required to support the business objectives and to solve the business problems. The actual systems required to implement the specification range from face to face verbal communication in a small partnership to large scale integration in very large companies. However, without the agreed specification a detailed computer software solution (if required) cannot be designed.

4.4 Feasibility study

Once an agreed functional requirements specification has been obtained, the feasibility of the alternative solutions should be examined so that a recommendation can be made. At this stage the feasibility of manual systems, bespoke software, commercial software, or the combined use of two or all three of these is evaluated.

Manual systems are most effective when volumes are low and the timeliness of data is not critical. However, manual systems still require documented procedures and controls.

If part of the solution deemed appropriate to address the functional requirements definition of production control is computer based, there are two options: develop a bespoke production control system in-house or using a third party; or find a commercially available product that has a reasonable fit to the requirements. The best fit will always be from a system specifically designed and programmed for the defined requirements. However, this is a costly and time consuming task even with the use of the most modern development tools. The costs are in two areas:

- development of a system requirement specification that is a detailed computer specific specification;
- development of a system design specification that is a detailed code level specification.

There is an associated cost and talent requirement for each of these plus the ongoing maintenance and error correction support costs of the finished product.

Bespoke systems provide the best fit but they are usually not undertaken because of the huge overhead costs in developing and maintaining a one-off system. The usual compromise is to find a commercial product which is a close fit (80 % is satisfactory) and either to modify the last 20 % in agreement with the vendor or to modify the company procedures to fit the standard. The benefits of commercially available systems are:

- ongoing maintenance and development;
- error correction support;

- consultancy and training availability.

It is the function of the feasibility study to evaluate these options and to choose the most cost effective direction.

4.5 Market appraisal

If the recommendation of the feasibility study is to utilize a commercial software product, a market appraisal may be necessary to find the best solution. This is where the FRS is particularly valuable and forms the basis for the capability evaluation. This view, balanced with system costs, return on investment views, software availability, adherence to system standards, financial health of the vendor and total system cost of ownership including hardware and supporting system software, will enable the company to make a product/vendor selection.

4.6 Computer software definition

An important aspect of the computer based solution is its ability to coexist with and link into other existing and proposed systems. Therefore, the standards which the company wishes to utilize in support of their objectives should be defined first. Areas to be considered are as follows:

- a) communication standards;
- b) the database structure to be used;
- c) the programming language to be used;
- d) the operating system standard;
- e) security and access control.

4.7 Computer hardware definition

A further definition of the system standards the company requires may be appropriate for the hardware.

Considerations are:

- a) the need for colour graphics;
- b) remote communication;
- c) speed of transaction response;
- d) maintenance and training costs;
- e) use of standard packages on the hardware;
- f) programming language availability;
- g) vendor's financial health.

5 Option selection of standard packages

5.1 General

For each new system introduction it is essential to study the specification of requirements outlined in clause 4. After the functional requirements specification (see 4.3) has been completed a key decision should be made: whether the functionality defined can be obtained by using a standard package or whether it will be necessary to develop a bespoke system.

The development of a bespoke system or indeed a major tailoring of a standard system is a costly and time consuming route. It is therefore recommended that companies should re-examine the requirement for the functions not provided by a standard package and check whether there is an alternative standard function that would fulfil the same need. They should also question whether that function is essential or just attractive and whether the extra cost and time of implementing it would be justified.

A distinction should be drawn between the incorporation of a new function and changes to the input and output screens and forms. The latter case, in general, will be relatively easy to amend to meet users' preferences.

In 5.2 to 5.4 some of the main categories of application package which might be considered for use within a manufacturing company are outlined. For each category there is a brief description of:

- a) the major functions that would be expected in a standard package;
- b) the areas and industries where the category of package is generally applied;
- c) possible problems and an indication of how an improved solution can be achieved.

An application package will usually consist of a number of modules. Annex B lists the major package modules and the functions typically found in them. Additional modules are also available to handle specific manufacturing requirements and those of other parts of the company. To be effective all these should be integrated, so that users have the minimum of inconvenience in switching between modules and duplicated data entry is avoided.

5.2 Stock control application packages

5.2.1 General

Applications for stock control are usually one of the following two types:

- those that are made up of modules (e.g. part data, purchasing, inventory control) that interlink and to which further modules can be added as required (e.g. financial, planning);
- those that are not modular but carry out similar functions; such applications often have more sophisticated statistical control and reporting features.

5.2.2 Major functions

Stock control application packages enable users to control the stocking and replenishment of materials. Users maintain a database of stock item information and the quantity of stock on-hand. The usage of stock is recorded and forecasting techniques may be used to predict future usage and hence when or how much to re-order to prevent stockout. The re-order decision may be based on the following:

- a) fixed order quantity (see 6.3 of BS 5192-3:1993);
- b) fixed interval re-order (see 6.4 of BS 5192-3:1993).

Re-order recommendations may be handled by a purchase order module.

5.2.3 Application areas

This type of package may be suitable for companies or departments that buy and resell goods, or use material with no or minimal processing. Examples might be those engaged in maintenance, spares or retail activities.

5.2.4 Possible problems

The following aspects of stock control application packages may cause problems.

- a) *Production control.* The basic stock control functions are not supplemented by any planning function. Therefore, any associated manufacturing activity is not planned or controlled. These functions are left to manual procedures or stand-alone systems.
- b) *Priority control.* The due-date of the orders is assigned at the re-order point (ROP) or the review point, but the standard functions do not revise the due-date with changing events. The tendency is therefore to expedite the urgent requirements but not de-expedite the non-urgent. This rapidly destroys any priority for internal or external supply orders.