3 FORMALIZATION OF THE ORDERING PROCESS

3.1 Introduction

In the previous chapter we modeled the ordering process in order to define the domain of this study. The modeling of the ordering process is the first step in developing a conceptual model to study formalization of the ordering process. The aim of this chapter is to conceptualize formalization of the ordering process in order to operationalize formalization per dimension. The operationalization of formalization is necessary to describe and analyze in practice the degree of formalization of the ordering process and is considered as the second step in developing a conceptual model to study formalization of the ordering process.

Section 3.2 starts with a discussion of the concept of formalization and as a result from this discussion we define formalization. On the basis of this definition of formalization and the three dimensions we elaborate on formalization of the three dimensions of the ordering process. Section 3.3 focuses on operationalizing the formalization of the logistical decision-making dimension by discussing the ways of formalizing operational logistical decisions to be made in the ordering process. Section 3.4 discusses the formalization of the information-processing dimension by operationalizing the ways of formalizing the workflow and the information requirements. Section 3.5 elaborates on the formalization of the organizational setting by operationalizing the ways of formalizing the hierarchical structure, tasks and responsibilities and the lateral consultative structure.

After discussing the ways of formalizing of the three dimensions of the ordering process, Section 3.6 addresses the theoretical considerations that underlie the degree of formalization of the ordering process and the advantages and disadvantages of formalization of the ordering process. This chapter ends with a summary (Section 3.7).

3.2 Defining formalization

Formalization is defined in many different ways. These definitions differ, for instance, on the level of aggregation, the related aspects or dimensions and the function of formalization. This section addresses the various elements of the concept formalization in order to define formalization of the ordering process.

Many studies have addressed and clarified the concept of formalization (see for instance Bodewes 2000; Walsh and Dewar 1987). From these studies it is clear that, one way or
another, formalization always relates to ‘rules’ and almost always to procedures. There are different interpretations about the way rules and procedures are made explicit in an organization. Some authors explicitly focus on the fact that these rules and procedures should be written down and filed (Pugh et al. 1963). Other authors mention only that the rules and procedures should be specified to make them explicit (Ford and Slocum Jr 1977). Walsh and Dewar (1987) introduce in this respect the concept of reification of the desired behavioral standards of one actor (or set of actors) for the other(s). “Reification means that the expectation is either written or repeated verbally a sufficient number of times so that it is remembered and understood over time by a relatively large number of people” (p.219). In the line of this definition they then conclude that little-used or long-forgotten written rules can hardly be considered ‘formal rules’, because probably only few actors know that these rules exist or remember them. For rules and procedures to work effectively they should be made explicit and in making the rules explicit it is often necessary to write them down one way or the other. But, as Walsh and Dewar noted, rules can also be made explicit by verbally repeating them. For instance, the rule that managers have to wear a tie during the working hours. This rule is not written down, but only repeated verbally and can be considered as a form of formalization of behavior. So, formalization at least concerns rules and procedures that must be made explicit. The difference between formalization and standardization lies in this same aspect. There is only a very thin line between these two concepts. Standardization is the extent to which the behavior of employees or parts of the organization is programmed in advance. When these standardized rules or procedures are formally laid down, made explicit, then we can refer to it as formalization. In this respect Mintzberg (Mintzberg 1979) states that formalization is a design parameter to standardize the work processes of an organization.

The actual use of formal rules and procedures is another element of defining formalization. Bodewes (2000) proposes a definition of formalization in which the concept not only refers to the documentation of standards for behavior and outputs (job codification), but also to the actual use of these standards (rule observation). He suggests that these two dimensions should not be studied as additive indicators, but as interacting indicators. According to Bodewes, it is interesting to know if formal rules and procedures are actually used in an organization. This is in fact often discussed in introducing a quality system in organizations. Implementing quality systems often goes hand in hand with quality manuals, in which many procedures are laid down. Implementing these procedures top-down does not guarantee that the procedures are also used because they are sometimes not sufficiently known by the organizational members or the organizational members are not committed to the procedures and are not willing to follow them. If rules and procedures are formally made explicit but are not used or followed up then these rules and procedures will not have the effect meant.
The concept of formalization may relate to various aspects or dimensions. For our definition of formalization we distinguish three dimensions, namely decisions, activities and working relationships. The first dimension that formalization refers to is the formalization of decisions, including the operation of procedures that deal with decision seeking and conveying of decisions (Daugherty, Stank, and Rogers 1992; Pugh et al. 1963). The second dimension, activities, refers to formalizing the workflow (Mintzberg 1979) and concerns the actual work instructions and conveying of information (Pugh et al. 1963). The third dimension, working relationships, refers mainly to formalization of tasks and responsibilities (Daugherty, Stank, and Rogers 1992). These three dimensions are closely related to the dimensions of the ordering process as we distinguished and conceptualized in Chapter 2. Formalization of decisions is linked to the logistical decision-making; formalization of activities or workflow is related to the information processing within the ordering process and formalization of working relationships is primarily concerned with the organizational setting.

In conceptualizing formalization it is also important to include the function of formalization. In organizational literature formalization is most often referred to as a design parameter (see for instance Mintzberg 1979). Bodewes (2000) mentions that ‘most definitions of formalization seem to assume that this construct can best be conceptualized by its function in organizational coordination and control’ (p.23). According to Jägers and Jansen (1995), formalization is applied to create clarity, certainty and coordination. Volberda (1992) relates the use of formalization to reducing the need for coordination within an organization. We conclude that formalization is a parameter that is primarily used to control and coordinate processes within an organization. Control refers to the process of surveying behavior, comparing it with intended behavior and adjusting (correcting) the behavior if necessary (Bodewes 2000).

A final remark concerning the conceptualization of formalization relates to the fact that formalization is frequently associated with ‘a certain degree’ to indicate the extent to which, for instance, activities may be formalized. That means that decisions, activities or working relationships can be more or less formalized.

As a result of the above discussion we define formalization as the degree to which decisions, activities and working relationships are controlled and coordinated by formal, explicit rules and procedures.

This definition is the basis for discussing formalization of the ordering process. In the following sections the three dimensions of the ordering process, logistical decision-making, information processing and organizational setting are used to further conceptualize and operationalize formalization for the ordering process.
3.3 Formalization of the logistical decision making

In the previous chapter we argued that the ordering process can be considered as a set of interrelated decision functions with the purpose to coordinate demand and production. The coordination of demand and production within the ordering process concerns the operational logistical decisions about order acceptance, allocating materials and capacities, delivery time promising and prioritizing of orders. We argued that the logistical decisions are embedded in the structural coordination within the ordering process. The structural coordination refers to managerial agreements between Sales and Production.

On the basis of these insights and our definition of formalization we argue that studying formalization of the logistical decision-making means that we have to study the degree to which logistical decisions within the ordering process are controlled and coordinated by formal, explicit rules and procedures. In this respect, formal rules and procedures to control and coordinate logistical decisions are related to the managerial agreements between Sales and Production (see Bertrand, Wortmann, and Wijngaard 1990). These agreements may be laid down, for instance, in a sales budget, a production budget or in a logistical concept, defined as a set of planning rules. We argue that the managerial agreements (structural coordination) can be seen as formal rules and may therefore formalize the operational logistical decisions.

In order to conceptualize formalization of the logistical decision-making we take the operational logistical decisions as a starting point and we discuss ways of formalizing these decisions by defining decision rules and agreements between Sales and Production. The operational decisions are: accepting customer orders, delivery time promising, allocating materials, allocating capacities and prioritizing customer orders (see also Chapter 2.5).

Accepting customer orders

The main decision in the ordering process is accepting specifications, price, and timing of the order. The timing of the order is discussed separately by the decision on delivery time promising.

Product specifications can be partly formalized by agreements between Sales and Production on standard products, modules or components. The possibility of standardizing products or components depends, among others, on the degree of customization of the products. In situations with a completely customized product (ETO-situations) the specifications are determined during order acceptance and are actually divided in two decisional stages, the quotation specification and the order specification. The quotation specification aims at giving the potential customer insight in the proposed product or combination of products, the related price and the lead-time (see also Konijnendijk 1992). Quotation decisions concerning the specification of the
product will be difficult to formalize by decision rules because of the uncertainty about customer requirements. On the basis of the quotation specification a customer can decide to place an order for which further specifications are necessary: the order specification phase.

In situations with partly customized products or customer specific variations on standard products (MTO-situations) the company may specify a range of products based on available machine technologies or based on a specific type of raw materials. Customization may involve specific materials, components, size or color. In these situations specification decisions may be formalized by specifying a general product range. In situations with a customer specific assembly of standard modules (ATO-situation) the specification concerns a customer specific combination of standard modules. Decisions on specifications may be formalized by specifying the standard modules and possible assemblies of various modules. The specified modules may be further laid down in a catalogue available for customers. In situations with standard products (MTS-situations) the specifications may be formalized on end item level and will often be laid down in a catalogue for customers.

Another part of the order acceptance decision is the decision on price. Prices of products are mostly calculated based on materials, machine-hours and man-hours required to produce the product plus a sales margin. In situations of customized products the price calculation is often part of the specification process. Decisions on prices may be formalized by fixed prices for materials, components or modules used, fixed prices for machine and man-hours and a fixed margin. Prices are often negotiable and thus decisions on prices may be dependent on the operational coordination between Sales and Production.

*Delivery time promising*

Delivery time promising concerns the decision of timing of the order. When the customer specifies a delivery time it has to be checked if the required delivery time is realizable. When the customer does not specify a delivery time the company has to calculate a realizable delivery time and propose a delivery time to the customer. The delivery time is dependent on the available materials and capacity, among others. When the purchasing of customer specific materials or components is triggered by a customer order the delivery time is also dependent on the delivery time of the supplier.

The decision on delivery time may be formalized by agreements on fixed delivery periods per product group. Delivery times may also be formalized on the basis of a cyclic production planning. To account for uncertainties in production slack may be used in promising a delivery time. The use of slack is also formalized when the actors involved agree upon the use of slack.
Allocating materials
Allocating materials for a specific customer order concerns the materials required for producing the ordered product and, consequently, the availability of materials. The decision on allocating materials is especially important in relationship with the material availability. The allocation of materials can be formalized by defining bills of material that prescribe per product ordered which materials are necessary. The necessary materials may be kept on stock, produced after order receipt or purchased after order receipt. For materials that are kept on stock material availability may be formalized by rules on inventory levels. For materials that need to be produced the decision on material allocation is at the same time a capacity allocation decision, because capacity is needed to produce the required materials (Bertrand, Wortmann, and Wijngaard 1990). For materials that must be purchased formalization concerns especially agreements with suppliers on delivery time of the materials.

Allocating capacity
The decision on allocating capacity is directly related to the capacity availability. Allocating of capacity can be formalized by defining a routing (see for instance Vollmann et al. 1997) that specifies what operations in what sequence are necessary to produce the product. Based on the necessary operations a customer order can be translated into production orders for the separate operations. This translation often takes place by means of a planning. The planning, in turn, may be formalized by a logistical concept that specifies planning rules, for instance on:
- planning horizon and frozen planning period,
- firm production lead-time per operation,
- production batches per operation,
- maximum capacity load per operation
- capacity reservation for rush orders or for specific customers and
- planning priorities.
To account for uncertainties in production two main strategies are used namely varying capacity and the use of slack. Varying capacity concerns rules for working overtime, working in shifts, outsourcing and so on. The use of slack in planning is mostly related to a longer production lead-time per operation planned than actually needed. When agreements on varying capacity and use of slack are made explicit we consider these as formalized.

Prioritizing customer orders
Prioritizing customer orders is associated with rearranging orders in cases of capacity shortages and with accepting or assigning rush orders. When a company accepts a request for a rush order this often results in a re-planning and, consequently, a rearranging of other orders already planned. Prioritizing customer orders may be
formalized by agreements on the type of customer, the order size or specific customers that account for a positive decision on prioritizing.

Table 3.1 summarizes the ways of formalizing logistical decisions as discussed in this section.

**Table 3.1 Ways of formalizing operational logistical decisions**

<table>
<thead>
<tr>
<th>Operational decision</th>
<th>Ways of formalizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepting orders</td>
<td>Defining product range, products modules and / or materials</td>
</tr>
<tr>
<td></td>
<td>Defining fixed prices for materials, machine and man-hours and fixed sales margin</td>
</tr>
<tr>
<td>Delivery time promising</td>
<td>Defining fixed delivery periods per product group</td>
</tr>
<tr>
<td></td>
<td>Defining a cyclic production planning</td>
</tr>
<tr>
<td></td>
<td>Defining agreements on the use of slack</td>
</tr>
<tr>
<td>Allocating materials</td>
<td>Defining bills of material</td>
</tr>
<tr>
<td></td>
<td>Defining rules on inventory levels</td>
</tr>
<tr>
<td></td>
<td>Defining rules related to capacity allocation</td>
</tr>
<tr>
<td></td>
<td>Defining agreements on delivery time of suppliers</td>
</tr>
<tr>
<td>Allocating capacities</td>
<td>Defining routings</td>
</tr>
<tr>
<td></td>
<td>Defining planning rules</td>
</tr>
<tr>
<td></td>
<td>Defining agreements on varying capacity</td>
</tr>
<tr>
<td></td>
<td>Defining agreements on the use of slack</td>
</tr>
<tr>
<td>Prioritizing orders</td>
<td>Defining priority rules based on type of customer, order size or specific customers.</td>
</tr>
</tbody>
</table>

The actual use of formal rules and procedures related to logistical decision-making depends on the position of the CODP, as we discussed in Chapter 2. The research of Konijnendijk (1992) shows that in ETO- and MTO-situations, logistical decisions concerning the processing of orders are difficult to formalize on a structural level. On the other hand, logistical decisions in MTS-situations can easily be formalized on a structural level. “(...) coordination possibilities beyond the operational level are limited in ETO and MTO situations. In MTS situations with standard products many issues can be coordinated at this level² setting a framework for the operational level” (Konijnendijk 1992 p.107). Thus, we assume that the degree of formalization of logistical decisions in the ordering process will depend among others on the position of the CODP. The variables influencing the formalization of the ordering process are discussed in the next chapter.

² Konijnendijk refers to the management control or tactical level that he defines as ‘coordination not related to actual customer orders’ (p.107).
3.4 Formalization of the information processing

In Chapter 2 we discussed that the ordering process can be considered as a sequence of information-processing activities, as a workflow. Order data must be processed through the different steps of handling an order, namely order quotation, order acceptation, order entry and order scheduling. The processing of order data is directly related to the information requirements and the information processing capabilities in the ordering process. The information requirements concern what information is required per activity and the information processing capabilities relate to the availability and accessibility of information.

On the basis of these insights and our definition of formalization we argue that studying formalization of the information processing means that we have to study the degree to which the workflow and the information requirements are controlled and coordinated by formal rules and procedures. In this respect, formal rules and procedures to control and coordinate information processing are related to the use of information processing capabilities such that the information processing capabilities may formalize the workflow and support the formalization of information requirements. First, we discuss formal rules and procedures with respect to the workflow and then we discuss formal rules and procedures with respect to information requirements.

Workflow

The workflow of the ordering process is related to the sequence of the information-processing activities, order quotation, order acceptance, order entry and order scheduling (see Section 2.6). In order to operationalize formalization of the workflow we are particularly interested in ways of formalizing both the activity itself and the sequence of the activities.

Formalizing the activities can be operationalized by specifying rules and procedures on how to perform the activities, for instance through work instructions (Mintzberg 1979). Work instructions specify how the order is to be handled, step-by-step, and which documents are to be used in handling the order. Formalizing the sequence of activities means that the organization specifies exactly which activity comes first and how the separate activities follow one another, thus a prescribed sequence of activities is defined. The sequence of information-processing activities may be prescribed by the order-processing information system. Table 3.2 presents an overview of ways of formalizing the workflow.

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Ways of formalizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
<td>Defining work instructions and using formalized documents</td>
</tr>
<tr>
<td>Sequence of activities</td>
<td>Prescribing the sequence</td>
</tr>
</tbody>
</table>
Information requirements and information processing capabilities

As argued, information requirements per activity in the workflow are linked to the availability and accessibility of information on the basis of the information processing capabilities. As discussed in Chapter 2, information-processing capabilities are mostly described in terms of ICT-capabilities. We also argued that the use of ICT in itself may be associated with a certain degree of formalization. Therefore, we argue that formalization of information requirements is closely related to the use of information processing capabilities because in processing information on demand and production the information requirements may be, at least partly, formalized through the use of information processing capabilities. Therefore, we discuss the information requirements per information-processing activity and relate these to the use of information processing capabilities in further operationalizing formalization of the information requirements.

**Quotation**

Quotation is the activity related to specifying to a customer the proposed product, the related price and delivery time. Information needed for the quotation comes from the customer and concern the product specifications and the delivery time required. These information requirements may be formalized by the use of a checklist, whether or not automated. The configuration of a product may be formalized by the use of a selection program or a product configurator, being a software program mostly linked with the logistical information system.

Information on the price depends of course on the specific configuration quoted and this information may be formalized by the availability of a price catalogue in which prices per components, modules or products are made explicit, but also by agreements with specific customers on margins or discounts. These agreements may be formalized by making them explicit in a manually kept archive or in an information system by means of a customer-related database, often a customer relationship management module (CRM-module).

The delivery time is usually quoted as a commitment to the delivery time from the moment of order receipt, and it is based on information about fixed delivery times per product group, agreements with customers or information on average production lead times. This information may be formalized through a catalogue, a CRM-module or an overview of average production lead times per product group.

**Order acceptance**

Order acceptance is the activity in which all specifications of received customer orders are checked in order to decide on accepting the order. The decision of order acceptance is already discussed as part of the logistical decision-making. For the activity order acceptance we focus on the information required to check the order, namely the credit limit of the customer, the availability of the requested items, the price and the delivery time requested.
When the order is a result of a quotation the quoted information is mostly the basis for checking the order specifications, except for the credit limit and the delivery time. When the order is not based on a quotation all specifications need to be checked.

Checking the credit limit is mostly based on information about creditworthiness of customers and is provided for by a credit report of these customers. Nowadays, logistical information systems almost always have an application to automatically check the credit limit, resulting in a blocking of orders from customers with credit problems. Checking of the specifications and price is already discussed at quotation. The information requirements and the possibilities of formalizing the information requirements for checking of specifications and price are the same for order acceptance as for order quotation.

A requested delivery time can be checked on the basis of fixed delivery times, formalized for instance in a catalogue, or on special agreements with customers, formalized in a CRM-module. In those cases that no fixed delivery times are available, information is required about capacity and material availability. A formalized production planning may provide for information about capacity availability. Often a further check of the actual capacity availability is necessary by asking the production planner. Not only the capacity but also the material availability must be checked. For materials on stock, information is required of inventory levels that may be formalized by an inventory control system, almost always linked with the information system.

**Order entry**

Order entry is mostly linked to the logistical information system in which data about customers and previous orders of customers are kept. The customer order and information about the customer formalizes the information required for order entry. The information output of order entry is mostly an internal order form to be further processed as order confirmation to the customer and as production order to production. The internal order form can be transmitted automatically by the information system used or is sometimes transmitted to the order scheduling by email, by fax or by the internal post.

**Order scheduling**

Order scheduling translates the customer order information into a production order. Depending on the production situation the order scheduling will have different information requirements. In MTS-situations, order scheduling primarily concerns scheduling of order picking and distribution. Information requirements in these situations concern availability of stock of end items and availability of capacities of the related activities (warehouse and distribution).

In order-driven production situations, order scheduling concerns the production planning of one or more production units. In these order-driven situations information requirements relate to capacities (operations, machines) and materials needed to
produce the product. This information is mostly provided for by the use of routing files and bills of material prepared during quotation or via a link with order entry. Necessary materials are often automatically translated into purchasing orders via the logistical information system used. The production orders are scheduled in a production scheme that may be formalized by planning rules that are sometimes integrated in the logistical information system. Based on the production scheme or schedule the final due date of customer orders can be calculated.

Table 3.3 presents an overview of the ways of formalizing the information requirements as discussed in this section.

**Table 3.3** Ways of formalizing information requirements

<table>
<thead>
<tr>
<th>Activities</th>
<th>Information requirements</th>
<th>Ways of formalizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quotation</td>
<td>Info from customer</td>
<td>Checklist</td>
</tr>
<tr>
<td></td>
<td>Info about specifications</td>
<td>Catalogue/ Product configurator</td>
</tr>
<tr>
<td></td>
<td>Info about price</td>
<td>Catalogue/ CRM-module</td>
</tr>
<tr>
<td></td>
<td>Info about delivery time</td>
<td>Catalogue/ CRM-module/ average production lead-time</td>
</tr>
<tr>
<td>Acceptance</td>
<td>Info on creditworthiness</td>
<td>Credit report</td>
</tr>
<tr>
<td></td>
<td>Info on specs and price</td>
<td>Quotation itself or catalogue/ product configurator/ CRM-module</td>
</tr>
<tr>
<td></td>
<td>Info on delivery time</td>
<td>Production planning/ Stock levels</td>
</tr>
<tr>
<td>Order entry</td>
<td>Info from customer order</td>
<td>Internal order form</td>
</tr>
<tr>
<td>Scheduling</td>
<td>Capacity and material needed</td>
<td>Routing files and BOM</td>
</tr>
<tr>
<td></td>
<td>Capacity availability</td>
<td>Production schedule/ planning rules</td>
</tr>
</tbody>
</table>

We note that the actual use of formal rules and procedures related to the information processing depends, among others, on the position of the CODP, as we discussed in Chapter 2. When the CODP is positioned more upstream information on customer orders is uncertain until order arrival, more information has to be exchanged between the parties involved and the sequence of information-processing activities may differ per customer order. The variables that influence the formalization of the ordering process are discussed in the next chapter.

### 3.5 Formalization of the organizational setting

In Chapter 2 we argued that the ordering process consists of several activities in which different actors are involved. These actors may be part of various functional disciplines, as defined by the hierarchical structure, but in processing the orders the actors involved
also form an operational network. We also argued that the relationships between the actors involved in the ordering process are characterized by the degree of interdependency, the clarity of their tasks and their responsibilities and also the power they have within the ordering process. In coordinating demand and production the actors involved and their relationships play an important role, not only in processing customer orders and translating customer orders into production orders, but also in finding the optimal trade-offs between customer wishes and production possibilities. In exchanging information and making trade-off decisions we argue that not only the hierarchical structure, but also the operational network, especially the lateral consultative structure may be important in formalizing the organizational setting.

On the basis of these insights and our definition of formalization we argue that in studying formalization of the organizational setting we must study the way that working relationships within the ordering process are controlled and coordinated by formal explicit rules and procedures. The rules and procedures, therefore, relate to the hierarchical structure, to the clarity of tasks and responsibilities, and to the lateral consultative structure. In this section we operationalize the formalization of the organizational setting by discussing the aforementioned elements.

Hierarchical structure
A hierarchical structure is a structure in which the positions of different actors and their responsibilities are specified. The hierarchical structure may be formalized by explicitly documenting it. A formalized hierarchical structure also specifies who is to be consulted when an actor in the ordering process is confronted with an unusual or unanticipated event. In the ordering process of manufacturing companies with customer specific demand these kind of unanticipated events occur more often than in companies with standard demand. In cases of unanticipated events in the ordering process, we often see that a sales representative or a planner consults their superior in order to obtain guidelines for handling the exceptional customer request.

Tasks, competencies and responsibilities
Tasks, competencies and responsibilities involved may be formalized by defining rules on how to perform the job. According to Mintzberg (1979), formalization by job means linking specifications to the job itself and is mainly documented in formal job descriptions. By defining job descriptions companies try to formalize tasks and accompanying competencies and responsibilities in order to provide for clarity about and balance between tasks, competencies and responsibilities.

Lateral consultative structure
The lateral consultative structure refers to the structure of lateral relations used to exchange information and make decisions in the ordering process. The term ‘lateral relations’ is adopted from Galbraith (1973) who states that lateral relations are designed
to increase discretion at lower levels of the organization. Lateral relations may arise spontaneously in the ordering process, specifically at those moments that an actor cannot decide on a specific customer order without consulting another actor. When this kind of informal contact is used frequently, the lateral relations themselves may be formalized. Galbraith also argues that “these informal processes are necessary as well as inevitable, but their use can be substantially improved by designing them into the formal organization” (Galbraith, 1973, p.47). So, we argue that lateral relations within the ordering process can be formalized to control and coordinate the working relationships within the ordering process. Lateral relations are formalized when the relations are no longer ad hoc and when the actors involved are officially appointed to participate in the lateral relation. When agreements on the lateral relations are made we consider them as part of the formal organizational structure (Jansen and Jägers 1995). The lateral relations that are relevant for the ordering process are direct (bilateral) contacts, meetings and specific task groups or teams.

Direct contact is a lateral relation in which two actors in the ordering process try to solve a problem that extends over their task domains without consulting a hierarchical superior (Jansen and Jägers 1995). As already mentioned, direct contact often arises spontaneously whenever during the order processing a specific problem occurs that cannot be solved by the actor itself. This type of direct contact may be formally established to some degree by specifying which actors must contact each other on specified moments during a day or a week. The direct contact itself can take place by phone, by face-to-face communication or by email. The use of email in direct contact guarantees that the agreement made is in black-and-white and, therefore, the agreement itself is formalized.

A meeting is a lateral relation in which several actors involved in a specific process gather to exchange information and/ or make decisions. According to Huber (1990), a meeting creates a situation where the decision-related information exchange among the key participants is higher than outside such a meeting. For that reason meetings are often used related to the processing of customer specific orders. Customer specific demand means that demand cannot be anticipated in all its aspects. Due to the interdependency between the functional disciplines involved much information must be exchanged to make decisions on customer specific wishes. This information is often not available beforehand due to the uncertainty associated with customer specific demand. Meetings are frequently used to inform the actors involved on relevant issues like the production progress on customer orders, the actual capacity availability and specific customer wishes that ask for a coordinated decision. Formalizing meetings may relate to officially appointing the participating actors and to specifying the frequency of meetings and to defining the subjects to be discussed. We argue that the more aspects of a meeting are formally made explicit, the more formalized a meeting is.
The task group is another form of a lateral relation that is installed to solve a certain problem or accomplish a certain task. A task group may be compared with a project team; both are installed on a temporarily basis to realize a certain result. A task group consists of employees of different functional disciplines involved in the problem. In the ordering process we encounter these kinds of task groups or project teams in ETO-situations in which a first quotation or order has to be processed and planned from initial customer request to final product installation. The installation of a project team, the appointing of the members and the definition of the task domain is formalized in these situations. This type of lateral relation is mostly used in highly complex and uncertain order processing situations.

Table 3.4 presents an overview of the ways of formalizing the organizational setting as discussed in this section.

**Table 3.4 Ways of formalizing the organizational setting**

<table>
<thead>
<tr>
<th>Organizational setting</th>
<th>Ways of formalizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks, competencies and responsibilities</td>
<td>Defining job descriptions</td>
</tr>
<tr>
<td>Hierarchical structure</td>
<td>Documenting the hierarchical structure</td>
</tr>
<tr>
<td>Lateral consultative structure</td>
<td>Defining lateral relations between actors involved, such as direct contact, meetings and / or task groups</td>
</tr>
</tbody>
</table>

The actual use of the possible ways of formalizing the organizational setting will depend on the specific order-processing situation. As we argued in Chapter 2, order-processing situations differ for the number actors involved in the ordering process and the interdependency between these actors based on the position of the CODP. When the CODP is positioned more upstream, more parties will be involved in processing the customer orders, as the products must be produced or even designed according to customer specifications. The parties involved will also be more interdependent, as the decisions to be made are more interrelated. In the next chapter we discuss in some more detail the variables that influence the formalization of the ordering process.

### 3.6 Considerations with respect to the degree of formalization

In structuring the ordering process manufacturing companies may consider using one or more ways of formalizing the ordering process. In considering the degree of formalization, three questions may arise, namely if formalization is necessary, if
formalization is possible and if formalization is desirable. In this section we discuss the considerations in using formalization from a theoretical point of view.

On the basis of our definition of formalization we argue that the necessity to formalize is actually the necessity to control and coordinate the ordering process by means of formal rules and procedures. In general, formalization is used to reduce variability of behavior in order to predict and control it (Mintzberg 1979). In other words, formalization prescribes what is to be done by developing rules and procedures (Daugherty, Stank, and Rogers 1992). Formalization is particularly used to achieve repetition and, as a result, to ensure efficiency (Mintzberg 1979), but also to ensure that customers are treated equally and, for instance, that products always have the same quality. For the ordering process this means that in being able to operate efficiently, it might be necessary to define rules and procedures to routinize the ordering process. For instance, in order-processing situations in which a large number of orders have to be processed it might be necessary to use formalization. In those situations formalization helps to routinize activities and decisions and, as a consequence, eliminates the need for treating each situation as new (Shtub 1999; Bowersox et al. 1992).

The possibility to formalize can be defined as the ability of the organization to make explicit formal rules and procedures in order to control and coordinate the ordering process. Organizations are commonly able to define formal rules and procedures in situations in which there are few uncertainties and in which activities are repetitive (Shtub 1999; Mintzberg 1979). In general, we therefore assume that formalization of the ordering process is possible in predictable, simple order-processing situations. In more complex order-processing situations, it is not always possible to define rules and procedures for the handling of customer orders on a detailed level, because of, for instance, the uncertainty of customer demand and the interdependency involved in order processing tasks.

Therefore, we assume that processing standard orders, by definition, will be easier to formalize than processing customer specific orders that are often accompanied by non-routine tasks and decisions. Non-routine decisions are ad hoc decisions that are not often made and are based on the intuition and experience of the decision-maker, according to Shtub (1999). Customer specific orders mostly result in uncertainties about order specifications that cannot be anticipated in advance and thus need to be decided on when the order arrives at the company. In these situations, logistical decisions are interrelated, there are many actors involved in handling the orders and the interdependency between these actors is also high, as discussed in Chapter 2. We assume that in manufacturing companies with a customer specific demand it will probably be more difficult to formalize the ordering process than in manufacturing companies with standard demand. In the study of Konijnendijk (1992) on the coordination between Sales and Production it was concluded that formal tactical
coordination (formalization of logistical decisions by structural coordination) was less important in ETO companies than in other types. According to this study: “Reasons for not having a tactical level of coordination varied from unnecessary (we know everything from each other) to impossible (everything will change the moment we write something down)” (Konijnendijk 1992 p.107).

Not only the possibility to formalize but also the desirability of formalization may vary per order-processing situation. Negative effects of formalization are mostly related to certain rigidity associated with the use of formalization. In organizational literature formalization is often mentioned as a counterpart in reacting innovative and adaptive to changes (Volberda 1992). Formalization is believed to lead to a reactive approach focusing on solving problems instead of a proactive approach focusing on searching for opportunities (Daft 1998; Mintzberg 1979).

As we discussed before, formalization prescribes activities and behavior. As a logical consequence, formalization results in a decrease of the actor’s autonomy and thus less leeway for the actor involved in handling an order. The decrease of autonomy may have a negative effect on the flexibility or resilience in unforeseen situations (Bax, Steijn, and De Witte 1998). That means that whenever an unforeseen situation occurs the actors do not longer know how to react because they are only capable of working according to the rules and procedures. These kinds of situations may occur in highly formalized organizations or processes. When organizations are highly formalized they are generally referred to as bureaucracies. Bureaucracies have a negative connotation that mainly consists of a strong reliance on rules and procedures and hiding behind those rules and procedures to avoid risks (Crozier 1964). It is argued that bureaucracies obstruct creative, proactive behavior and discourage the pursuit of opportunities (Volberda 1992; Mintzberg 1979). These studies thus imply that a high degree of formalization may lead to rigidity. In order-processing situations with customer specific demand the actors must be able to respond flexibly to unforeseen customer requirements and thus, according to this line of argumentation, formalization is not desirable in customer specific order-processing situations.

Other studies have shown that formalization may also have interesting advantages. In a study of Bowersox et al. (1992), it was found that using formal rules and procedures to direct logistics operations also improves the operating flexibility. “Formalization allows the logistics manager to avoid continuously operating in ‘crisis mode’. With well-defined rules and procedures, the logistical organization is in position to react to special requests in a highly flexible manner” (Bowersox et al. 1992 p.45). For the ordering process this means that the actors involved do not have to worry about standard (routine) orders because these can be handled in a routinized manner. They can concentrate their effort on handling the non-routine, customer specific orders.
Another advantage of the use of formalization is that it helps clarifying priorities and avoiding ambiguity (Daugherty, Stank, and Rogers 1992). Because plans and goals for order processing are made explicit, priority setting can be based on these plans and goals. The dimensions in the ordering process that are formalized can be interpreted only one-way thus avoiding ambiguity. It is thus interesting to study if formalizing complex, ambiguous order-processing situations to some degree is possible in order to reduce the complexity and to reduce the ambiguity.

On the basis of the discussion of the necessity, the possibility and the desirability to formalize the ordering process we argue that different order-processing situations probably call for varying degrees of formalization. Because formalization of the ordering process relates to different dimensions of this process it might be possible to formalize only one or two dimensions. For example, in order-processing situations that are too complex to adequately formalize logistical decision-making it might be possible to formalize the organizational setting in such a way that logistical decision-making is embedded in an efficient and effective lateral consultative structure. On the other hand, in order-processing situations in which the logistical decision-making and information processing can be formalized, there might be no further need to formalize lateral relations. The degree of formalization may thus vary for the three dimensions of the ordering process.

Varying the degree of formalization for the three dimensions may also be helpful in using the advantages of formalization without having to suffer of the disadvantages. Formalization may be used to routinize those activities and decisions that are amenable to this routinization. Activities and decisions that need more elaborated information-exchange than can be provided for by formalization have to rely on other strategies. For example, the use of direct contact, meetings or project teams can stimulate information exchange based on intuition and experience. At the same time the consultative structure in itself may be formalized to guarantee the necessary information exchange. Thus, varying the degree of formalization on the three dimensions may be helpful in achieving efficiency and leaving enough room to react flexibly on complex order processing issues.

3.7 Summary

In this chapter we started with a general discussion of the concept formalization and we defined formalization as the degree to which decisions, activities and working relationships are controlled and coordinated by formal explicit rules and procedures. Based on this definition we further conceptualized formalization of the ordering process by discussing the ways of formalizing of the logistical decision-making, the information
processing and the organizational setting of the ordering process. This resulted in a detailed operationalization of formalization per dimension of the ordering process.

We argued that formalization of the logistical decision-making within the ordering process can be operationalized by the formal rules and procedures used to control and coordinate logistical decisions. We discussed ways of formalizing operational logistical decisions by elaborating the rules, procedures or agreements involved in taking the decisions. With respect to formalizing the information processing within the ordering process we argued that formalization refers to the workflow within the ordering process and to the information requirements. We discussed ways of formalizing the workflow and the information requirements supported by the use of information processing capabilities. With respect to the organizational setting, we argued that this dimension of the ordering process can be operationalized by the formal rules and procedures used to control and coordinate tasks, competencies and responsibilities, the hierarchical structure and the lateral consultative structure. We discussed ways of formalizing these three issues related to the organizational setting of the ordering process. The operationalizations of formalization per dimension of the ordering process are used in our empirical study that will be further described in Chapter 6.

We discussed theoretical considerations in using formalization to structure the ordering process. We argued that the degree of formalization is linked to the necessity, the possibility and the desirability to formalize. We further argued that the advantages of formalization relate to efficient order processing and clarifying priorities and reducing ambiguity. The disadvantages relate to the negative effects of formalization on the ability to respond flexibly. Based on this discussion we argued that there is a wide range of possible degrees of formalization. We assume that varying the degree of formalization per dimension of the ordering process may be helpful in considering ways of formalizing.

The variables that influence formalization of the ordering process and the effects of formalization are further discussed in the next chapter along with a presentation of our conceptual model.