Eindhoven University of Technology

MASTER

Configuration in business

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Award date:
2000

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Configuration in Business

Final thesis
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BaaN

Eindhoven, University of Technology
Faculty of Technology Management
Industrial Engineering and Management Science

Configuration In Business

Final thesis for the study
Faculty of Technology Management
Industrial Engineering and Management Science
Eindhoven University of Technology

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17th of May '99-17th of January '00

For reasons of confidentiality, not all information contained in the original report has been published in this version.

Abstract

This graduation report describes the results of a research project conducted at Baan Development, at the department ERP/Configurator. At ERP/Configurator configuration software is developed. Objective is to offer all Baan customers the best possible configuration solution. The goal of this research is to investigate how this can be done. The customers of the Baan ERP/Configurator department have been investigated along with the way they use and would like to use the software. Requirements and recommendations regarding optimal solutions are the result.

Acknowledgements

This is the report for my final thesis for the studies Industrial Engineering and Management Science at the Eindhoven University of Technology. It describes the research I have performed at the Baan Company in Barneveld from June 1999 until January 2000.
For eight months, I was part of the dynamic, complex and interesting world of software development for business applications. Being part of this world has given me the opportunity to learn a great deal about information systems. Not only because I got an insight view on high-tech software development, but also because I was able to observe the actual implementation of the Baan software at various customers' sites.

At this point, I would like to thank the persons with whom I cooperated for the last eight months and who contributed to this result.
At Baan, I would like to thank my supervisor Patric Timmermans. I am pleased that he was willing to take over my supervision when my initial supervisor, Mrs. Joyce de Jong left Baan. He provided me with a good mixture of practical experience and theoretical background. Furthermore, I would like to mention Marc Bles, who supplied me with an ongoing flow of information, which was essential during my project. I thank him for his good help and the innumerable amount of email-attachments. Besides, I thank Roel van den Berg, who helped me especially with the methodological part of my research.
In addition, a word of gratitude to all my colleagues within CF and the rest of Baan, whose door was always open for questions.

At the Eindhoven University, I would like to thank my supervisors, Mr. Hegge, Mr. Klarenaar and Mr. Wortmann for their support and critical remarks. They presented interestingly different points of view on the subject of my research.

Besides the aforementioned persons who were directly involved in the project, my special thanks go out to my friends Jasper van Rijn and Ralph Croes, who were my daily source of support, discussion and fun. Furthermore, I thank the people who reviewed my report and provided me with useful remarks.
Finally, I would like to thank my sorority l'Attaque Attique and other friends in Eindhoven, for all the joy but also all the support they have provided me with during my years of studies. And of course, my family.

I hope this report is interesting to the reader!

Arnhem, January 2000,

Paulien Pierik

Executive Summary

This executive summary contains a short version of the final thesis as performed from May 1999 until January 2000 at the Baan Company in Barneveld. Because the contents of this thesis are confidential, this summary focuses on the *process* that has been followed, more than on the contents.
It starts with a description of the overall research approach. The main structure throughout this summary then follows this main structure.

Overall research approach

A methodological framework has been used during the assignment. This framework, the regulative cycle of Van Strien [STR86],contains five high-level steps. The next figure shows these steps, in a slightly adapted version, where two steps have been added. This model is used to structure this executive summary.

The adapted cycle starts with an analysis of the environment where the project takes place (step 0). The actual cycle of Van Strien starts with the problem definition phase (step 1). The problem definition originates from the understanding that one or more persons are not satisfied with a situation and the need for a solution of this problem and results in an assignment definition and project plan. This phase is followed by the diagnosis-phase (step 2), which results in a description and analysis of configuration in general and existing configuration solutions. Based upon what is known from the diagnosis a 'plan' is made (step 3). This plan contains a use-case of the business processes supported by the ideal configuration software and a typology of Baan Configuration customers. The operation phase of the regulative cycle of van Strien regards the implementation of the plan. In this project, this step consists of a test in practice of both the use-case and typology (step 4). The cycle is concluded by an elaborate evaluation (step 5). At the end of this report conclusions are drawn, recommendations are made and some points of further research are proposed (the dotted arrow, step 6).
This summary briefly describes the steps 0 to 6, observing confidentiality policies.

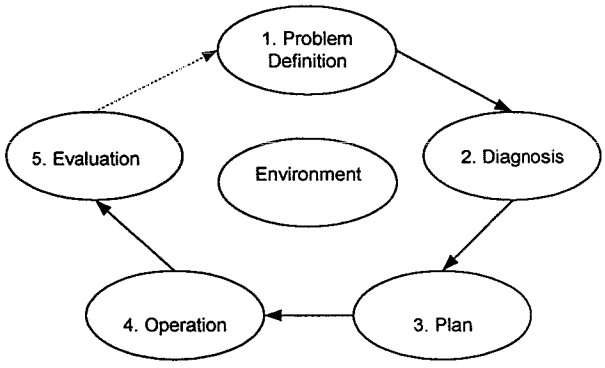


Fig. 1: Adapted Regulative cycle of van Strien

Step 0: Baan

The internship related to this final thesis is conducted at the department ERP/ Configurator of the Baan Company (Baan) in Barneveld, the Netherlands. Baan is a Dutch software company that was founded in 1978 by Jan Baan. It has dual headquarters, located in Barneveld, the Netherlands and Herndon (Virginia), USA. Baan Company is a global provider of enterprise business software. These applications are in use at approximately 13,000 customer sites worldwide. In the past year, Baan has gone through a major reorganization. Right now, more than 4,000 people are working at Baan Company.
The assignment was carried out for Baan Development. Two development departments are particularly relevant for the subject of this thesis: Baan Enterprise Resource Planning (BaanERP) and Baan FrontOffice (BaanFOS).BaanERP and BaanFOS are responsible for the development of the products in ERP and FrontOffice. BaanERP (to be more precise BaanERP/Configurator) is the actual initiator of the assignment. The reason for the involvement of BaanFOS is that it is working in development projects together with BaanERP. One of these projects uses the results of this thesis work as input for development efforts (the 'Golden Gate' project). The other part of Baan involved in this thesis work is Product Management (PM). PM is responsible for the 'business'-side of a product that is under development. The activities performed for the assignment are related to activities performed by Product Management of configuration.

Step 1a: Problem description

The initial problem description provided by the manager of ERP/Configurator at the start of the project was (very general): *"A lack of knowledge transfer exists concerning the new products of BaanERP/Configurator."* This provided a large possible domain of investigation at the beginning of the project. In order to come to the final assignment description, several orientational interviews were conducted. During these interviews, two important facts became clear, which represent the real problems underlying the initial assignment description. These two factors influenced the actual coming-about of the final assignment description. These are:

1. Business Knowledge, Requirements analysis
At the department CF, a new software solution, CTO (Configure to order) is under development.
The actual market requirements for CTO have not been investigated thoroughly during or before the development phase. Some evaluation of the predecessor of this product exists, but one could say that no profound knowledge exists of the way the Baan configuration software is used in its typical business environment (thus, use-cases are not available).

2. Solution thinking
Baan's product is standard software. The standard software can be tuned to the specific needs of a customer via parameter settings. Typically this is done per package and not in an integrated fashion. Expertise within Baan, both in development and in consultancy is also typically package oriented. However, the current market of information system users is not only looking for a standard package, but for a total business solution, that answers optimally to its needs. The challenge for Baan is to offer these customized solutions, yet to maintain the economies of scale of producing high volumes (standard products). Thus, Baan has to focus first on its customers, what do they look like, what do they need, and then try to offer each of them a fitting solution, yet consisting of standard software components. This counts for Baan as a company, but also for parts of the Baan-system, such as configuration. It might be possible to predict the typical requirements on a configuration-solution based upon the characteristics of a customer's company. These characteristics can be characteristics of the engineering, manufacturing, marketing or sales organization of the company.

Step 1b: Assignment definition

Combining the fact that the business processes (and thus the exact requirements) for the new configuration product are not completely clear and the fact that the solution principle is of interest for Baan, the following assignment definition has been defined:

Determine the business process (use case) for the ideal configuration-software for a variety of CTO-customers and for the integration between CTO and the FrontOffice Configurator. From this, new requirements can be the result, because of the gap that exists between what Baan has to offer and this ideal process.
Analyze the possibility of a way in which Baan can offer fitting solutions, consisting of standard BaanFOS/BaanERP components, with a focus on CTO.

Step 2: Diagnosis

This part of the research analyzes the emergence of configuration software, and the solutions that Baan has to offer.
The increasing importance of configuration software can be explained by looking at developments in the market during recent years. Customers express a growing need for individualized products. Many industries that used to produce standard products (doors, windows, furniture, recreational vehicles) are moving toward manufacturing on customer order to be able to meet this demand.

Hence, the market forces today's business to be capable of delivering a customer-specific product within the delivery time and with the delivery price of a standard product. In traditional information systems for production and inventory control (like Baan Manufacturing), product specific data are kept for each different product. This system is adequate for companies with a limited product range. However, if a large number of variants of a finished product are offered on customer order, the traditional information system may run into problems with respect to the quantity, complexity, and manageability of the product data and the need for timely availability of information that the system has to provide. Maintaining the data for all different variants is difficult. The database in which all data are kept will be too large to be easily managed. *Configuration* can be a solution to this problem. A configurator provides support that is based upon product documentation. This documentation is documented in the form of a generic bill-of-material that satisfies customer requirements and design constraints. The final product of the configuration process is the identification of a single variant (or a set of variants) [HEG95]. Configuration software thus translates the product structure into a modular product design with validation ("Can this be made?"') and decision support ("What will this cost?") functions, thus enabling the user to define a variant only when needed, instead of defining (and storing, maintaining) all possible variants in advance.

The information for the configurator is stored in a generic bill of material. In this bill of material, a product family is modeled. A product family is a group of variants with a similar bill of material (product structure) and a similar way of manufacturing (process structure). Through the eyes of the customer, each of these variants is different. In the generic bill of material all features and options are listed. An example of a part of a generic bill of material of a bicycle is given in the following picture:

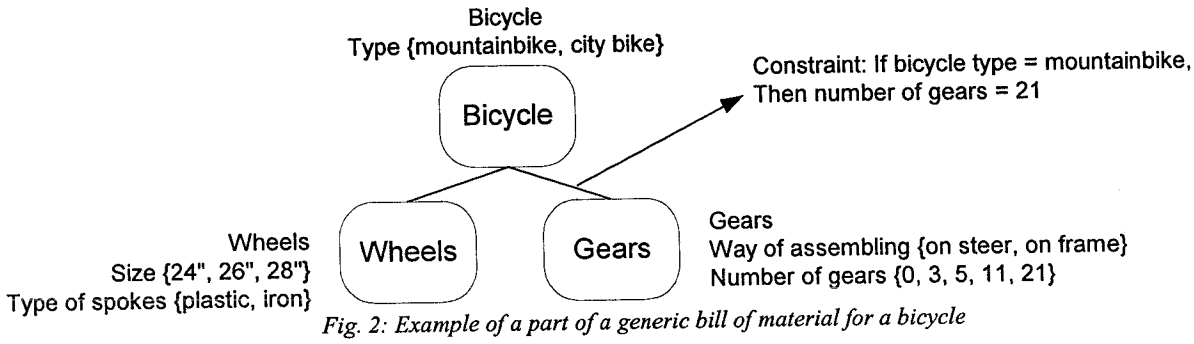


Fig. 2: Example of a part of a generic bill of material for a bicycle

Configuration solutions

As a result of the benefits of configuration software as described above, many companies have recognized the need for this type of software in the past years. Many companies use configurators that have been custom-made for their own business. However, the development of standard packages for configuration is relatively new. Baan is one of the leaders in this field.
At the ERP/Configurator department integrated systems for configuration in BackOffice are being developed. FrontOffice configuration products are also in development at the FrontOffice department. The reason that Baan offers different configuration products in FrontOffice and BackOffice is that the different areas of the customer's enterprise require different functionalities to support those different areas optimally. Looking at different steps in the business process, the following four main steps are typically supported by a configurator:

1. Needs assessment (What does the customer want, prices, discounts, graphical support)
2. Configuring a product (Choosing the desired options for each feature)
3. Generation process (Generating a variant-specific bill of material and routing)
4. Planning and manufacturing of the actual product

Baan's FrontOffice configuration products provide optimal support for steps 1 and 2, whereas BackOffice configuration products provide support for steps 2 to 4.

The aforementioned steps are the steps that are *currently* supported by Baan's configuration software. A future extension of these steps is the support of product development and after-sales service.
The reason why Baan does not offer one large configurator supporting all steps at once is that FrontOffice users need to be able to work offline. These users are often sales people in the field, using a laptop with not always the possibility to connect to a network. It is impossible to store all the data needed for BackOffice Configuration on such a stand-alone system.

Thus, different configurators exist in BackOffice and FrontOffice. These specific configuration components could be able to work together to give Baan's customers the ability to work seamlessly without having to redo work done (e.g. enter data in both Front and BackOffice). This is currently not possible. An integration for FrontOffice and BackOffice configuration is under development for a short time now. Details on the configuration products offered by Baan are confidential.

Step 3: Plan: Design of business process and types of customers

During the plan-phase, a use-case of configuration software was designed, as well as a typology of customers of configuration.

Designing the use case

In order to establish the use-case, a description of the business processes that can be supported by configuration software, extensive information gathering was necessary. Alter [ALT96] gives a number of common sources of information to analyze information systems. Not all of these sources were available in the project. These sources are:

- *Interviews*
- *Documentation of the existing systems*
- *Observation in practice*
- *Benchmarking*
- *Questionnaires*

This procedure has led to a design of the business process supported by the ideal configuration software. Important to notice is that this business process represents the 'to be' situation, the picture of which business processes the software should support in the future. This is not equal to the 'as is' situation. The differences between 'to be' and 'as is' provide Baan with chances to add functionality in future releases of its products. Furthermore, by representing the 'to be' situation, requirements will be already acknowledged, also those that will only be part of future releases. This is useful for time scheduling and prioritization. In the use-case white boxes visualize the functionality that is part of the current products or the first release of the integration.

Types of customers of PCF/CTO and the integration

The use-case aims at describing the business processes of all customers. In solution thinking, it is important to make a distinction between different types of customers. Not all customers are the same and different customers will have a different subset of the overall business process as their business process to be supported.
To get a feeling for the differences between customers that can cause differences in the use of configuration software, two methods were used, which are discussed in the next section:

- Interviews with experienced consultants;
- Literature research [PIE99].

The following table summarizes the results of the interviews and literature research.

Table 1: Type of customer and use of configuration software

Type of customer	Consequence for use of configuration software
Number of variants in one model	- The higher the more complex modeling - The lower the more complex maintenance
Marketing strategy: level of exclusiveness	The more exclusive, the less PCF/CTO is applicable
Length of lifecycle	The shorter the more complex maintenance
Business-to-business or business-to-customers	PCF applies to Business-to Business
Complexity of assembly	- Line-assembly: LAC - Rest: PCF/CTO
Sales volume per year	The higher, the higher the requirements on performance and user friendliness
Recurrence of relationship	A few customers with an intense relationship is more applicable than many small, one-time customers
Intensity of interaction with customer	High intensity leads to high need of FOS configuration and thus for integration of FOS and ERP Configurators.
Multi-site (Size of the company)	Larger companies will require multi-site support of product models

Step 4: Test of business process design in practice

The standard business process cannot be seen as *the* way configuration software is used. In every company, deviations from this standard path will occur depending on its typical requirements or problems. Especially, not every company will have implemented all offered functionality, but will have its own adaptations to the standard business process. Some companies will even make their own customizations (adaptations to the standard software to adapt it to the customer's wishes). Of interest for Baan is to find out whether these differences can be attributed to specific characteristics of the company using it. If this is true and the characteristics are known, then Baan can get a better insight into the expected problems/requirements of its customers.

Test of business process: Company visits

The best test of ideas is to confront theory with practice. To do so, seven case studies on customers of PCF have been performed and some material existing within Baan on customers has been analyzed. Of course, the limitation of companies willing to participate in the interviews has to be taken into account.

Types of customers: Analysis of installed base PCF

Since CTO is still under development, no insight into the actual customers of CTO could be found. CTO will be the successor of PCF, and will offer almost the same solution as PCF. Assuming that the largest part of the customers of PCF will eventually transfer to CTO, knowing the installed base of PCF provides a substitute. The problem encountered however is that Baan makes only registration of installed software components on a high level (ERP, FOS etc.) but no registration on ERP-module level. Thus, the installed base of PCF was unknown within Baan. Therefore, an alternative method has been followed: An analysis of the database of Baan Support. This department keeps a database that lists all the support calls that have been made by a customer. (A support call concerns a question or problem about the Baan software. Baan is responsible for all support calls, also for those companies where external consultants have been leading the implementation (such as Ernst & Young)). According to BaanSupport, this system is used by the largest part of Baan customers (customers have to pay a fixed yearly amount for this support) and the assumption can be made that those customers calling support are a good sample (n=±500) out of the

whole 'population' of Baan customers. Another problem is that not all the fields have been filled in for all companies. This makes the samples per characteristic small. However, some interesting conclusions could be drawn from the analysis of the database:

- *Customer Order Decoupling Point (CODP)*
  Of those customers producing to order, 88 % also produces to stock. The conclusion can thus be drawn that for those companies that are part of the installed base of PCF the configurator is not only used in a typical MTO/ATO environment.
- *Multi-site*:
  Consultants indicated that an important requirement on configuration software is the support of multi-site. The database shows that indeed around 70 % of the installed base use a multi-site implementation.
- *Hardware*
  CTO will only be able to run on a Windows NT server. The analysis of the installed base shows that about 60% of the installed base will have to install different hardware, since only about 38 % of the installed base is using NT right now.
- *Baan Version*
  CTO will only run on BaanERP (Baan V). About 25 % of the installed base is using Triton or even an older version (2.x). For these customers it is hard to migrate to Baan ERP at once, because the differences are much larger, than in the case of migration from Baan IV. Therefore, they will probably not be able to start using CTO in the near future.
- *Size of company*
  The installed base of PCF regards for almost 100 % Midmarket and small enterprises.

Combining results from design and test-phases

Combining the results from the design phase and the test phase, conclusions can be drawn. These conclusions can be divided over the following sub-parts:

- Does the use-case really cover all business processes found in practice? Did any of the observed business processes not fit into the business process?
- Which differences between observed companies occur?
- Which differences between the observed business processes can be observed?
- Do similar companies have similar business processes? Does a clear connection between observed business process and observed type of company exist?

Comparing the companies

As was said before, seven companies were visited. This number companies cannot represent all customers that are present in the market place for 100 %. Nevertheless, it was tried to cover all customers as good as possible.
Two problems have to be taken into account:

- The installed base of PCF is not clear and
- It is not possible to choose all customers for a visit. Not all companies are willing to participate and not all companies are known. Furthermore, there was a limit to the available time.

However, all visited companies were different, so they give a reasonable representation of the installed base of PCF.

Comparing the business processes to each other

The most striking observation of the company visits is that all observed implementations of PCF are different. One reason for this is that different business processes require different implementations, but also that different customizations are made and total different ways of looking at a configurator exist. The fact that all these different implementations exist also means that PCF provides the customer with a flexible solution that can be tailored to his needs.

Companies and their business processes

Comparing the typology, the use-case and what was found in practice, leads to the main conclusion, that all observed business processes are different and that the subset of business processes that is supported by the configurator, is not easy to assign to objective characteristics of the company.
The characteristics determining these differences do not seem to be only the type of company (direct/indirect sales, type of production process, type of selling process etc.), but also 'contingency factors' like:

- What is the budget for implementation, what is the maximum time we want to spend on our implementation?
- Which department is powerful? Is all power in the hands of the IT department, or all more parties involved in the design of the information system?
- What is the amount of capacity available for maintenance? Is someone willing to spend time on maintenance?

The main reason for this is that consultants and end-users do not have a profound knowledge of the way PCF can and should be implemented in all the different types of companies. No standard methodology for implementation exists. Because of this, the implementation depends on the above mentioned factors and on the experience of the consultant (if a consultant is very inexperienced, he can implement the same implementation as the one he has done before, because he does not know a better or different way). Thus, the consultant is not aware of the types of companies and the type of solutions they need or the typical problems they will have. The reason for this might be due to the education possibilities offered by Baan. Thus, it can be said, that if all consultants were equally well experienced, these coincidental characteristics would still exist, but become much less important and the typology could be used to predict the implementation of PCF.

Step 5: Evaluation: How can Baan offer the best solution?

In general, the visited customers were satisfied with the way PCF supported their configuration problems. However, they also indicate that the solution offered to them could be improved in several ways. In addition, consultants provided ideas on how the configuration solutions can be improved.

The best possible solution is defined according to four sub-parts, discussed down here:

1. Good functionality
A list of requirements to be added to future releases has been established. However, this list is confidential.

2. Good solution throughout the lifecycle of the information system;
To provide a good solution throughout the lifecycle of the information system, Baan should provide its users with good migration possibilities. If Baan would offer no migration tool, migration would be a problem to current users of PCF in case they were migrating to CTO.
The following possible scenarios for the conversion problem are proposed:

1. Basic situation: Baan offers only CTO in new Baan version;
2. Baan offers both PCF and CTO in new Baan version;
3. Baan develops conversion tool for features and options;
4. Baan develops conversion tool for total PCF model;
5. Minimize the amount of data in PCF ('Meyn'-method).

3. Total solution
In order to provide a total solution Baan can provide users with both FrontOffice and BackOffice configurators with an integration.

4. Solution throughout the lifecycle of the product.
In the future Baan could also support after-sales and modeling with configurators. After-sales support is especially important for companies with products that need reparation (such as machines). Modeling is important for companies that use for example CAD/CAM systems in their product development.

Step 6: Conclusions and recommendations

Conclusions regarding requirements analysis and knowledge transfer

1. All companies visited in practice use only a part of the total functionality offered by PCF. As a reason for this, they indicate a lack of detailed knowledge on the functionality.
   Therefore, the challenge for Baan towards these customers in offering the best optimal configuration solution is not as much trying to offer as *much* functionality as possible. More it is to make sure users *understand* the functionality offered by the configuration products, to make sure they can *implement* it in an easy way and can keep using it throughout the total lifecycle without large migration problems. Especially programming constraints is hard and often provides a problem for users.
   CTO provides the user with much better implementation facilities than PCF, because the effort that has to be put into programming is much less.

2. In order to decrease the knowledge-transfer gap regarding the CF-products, the following results have been attained:
   - A use-case of the use of CTO, FrontOffice configuration and the integration between these two;
   - Case studies of configuration customers;
   - Insight into the installed base of PCF.

3. No implementation of the FrontOffice configurator is present in the Netherlands.

4. Of those requirements found in practice, most have been acknowledged by Baan and are part of the use-case.

5. Companies tend to let Baan-consultants do a lot of the modeling.
   However, it is important for the customers to do it themselves in order to get used to the product and to be able to maintain the models in the future. The same counts for making customizations.

Conclusions regarding solution's thinking

1. It is hard to make a typology of customers, because issues that cannot be characterized and determined in advance by Baan have a larger influence on the way PCF is implemented than the factors defined in the typology. These factors regard especially the experience of consultants, the experience of the IT-team at the customer's site and the budget (time and money) for the implementation.

2. A best configuration solution does not only provide the Baan customer with the best possible configuration functionality, but also with:
   - The best possible *migration* possibilities;
   - The best possible *integrated* solution;
   - The best possible support of all steps of the *lifecycle* of the customer's product.

General Conclusions

1. The new configuration-product CTO provides a better technology, which on its turn provides the customer with much better implementation possibilities. Since implementation is one of the problems with PCF, this certainly is a large improvement. In addition, if CTO will be integrated to FOS Configuration, this will provide large benefits to customers compared to PCF.
   However, the following point can become critical to the success of CTO in the market:
   - *Migration* possibilities from PCF (the old product) to CTO are small.
   - Object-oriented programming is very *complex* and has a different philosophy on its basis than programming in 4 GL. End-users, often engineers, will have to receive elaborate education, in order to be able to use the product.

2. Not much information is available within the Baan Development organization about the market.

3. Looking at the integration, one could say that the reason that so much development effort has to be put into building this integration is partly a result of a lack of communication between the different development departments of Baan.

4. An important use of the configurators is the combination between to-stock and to-order environments. This means that it should not only be possible to configure configurable variants, but also standard items.

5. A lot of data-entry during the modeling phase of PCF is performed by hired and unskilled data-entry-persons. However, since these persons do not have any knowledge of the information system, they can cause a large amount of typing errors, which in its turn causes errors in bills of material and routings. However, customers can blame Baan-system for not functioning optimally.

Recommendations

1. To successfully introduce CTO into the market, the following recommendations are made:
   - Baan seems to go more and more in the direction of Microsoft products. Visited customers indicate that they would like to see that Baan would support all kind of platforms (like Unix). For CTO, this provides problems, since CTO will only support NT platforms. Therefore, it is recommended to pay attention to the causes of this NT-only policy.
   - Possible migration scenarios for configuration solutions were proposed in this project. More research on the costs, advantages and disadvantages of these migration scenarios is necessary.
   - Baan should look into the way the education of both consultants and end-users on the field of object-oriented programming can take place.

2. To be able to provide end-users with the best possible knowledge on the functionality of the configuration products, Baan should focus on:
   - Educating final users;
   - Educating consultants.

3. In order to increase knowledge of the market within Baan Development the following recommendations are made:
   - It is recommended to look into the possibilities of improving communication between account management, consultants and indirect channel partners and Baan Development.
   - Investigate the possibilities of registration of the total installed base on a module level, instead of on the high-level (ERP, FOS) as it happens now.
   - Increase the frequency of direct contact between Baan Development and customers.

4. In order to increase the number of implementation of the FrontOffice configurator, the following is proposed: Look further into the possibilities of increasing the product familiarity of FOS Configurator on the market.

5. The product of Proloq is relatively new in the Baan suite and relatively unknown. However, it can provide a good solution in some cases where the configurators fail. Recommended is therefore to look into how to position Proloq compared to the configuration products and how to benefit optimally of this addition to the Baan product line

Table of contents

ABSTRACT I

ACKNOWLEDGEMENTS II

EXECUTIVE SUMMARY III

OVERALL RESEARCH APPROACH III
STEP 0: BAAN III
STEP 1A: PROBLEM DESCRIPTION IV
STEP 1B: ASSIGNMENT DEFINITION IV
STEP 2: DIAGNOSIS IV
STEP 3: PLAN: DESIGN OF BUSINESS PROCESS AND TYPES OF CUSTOMERS VI
STEP 4: TEST OF BUSINESS PROCESS DESIGN IN PRACTICE VII
COMBINING RESULTS FROM DESIGN AND TEST-PHASES VIII
STEP 5: EVALUATION: HOW CAN BAAN OFFER THE BEST SOLUTION? IX
STEP 6: CONCLUSIONS AND RECOMMENDATIONS X
GENERAL CONCLUSIONS X
RECOMMENDATIONS XI

TABLE OF CONTENTS XII

PROLOGUE 1

1. INTRODUCTION 2

1.1 BAAN COMPANY 2
1.2 PRODUCTS 3
1.3 COMPETITORS 3
1.4 THE MARKET 3
1.5 PRODUCTION PROCESS: THE BAAN DEVELOPMENT METHOD (BDM) 4

2. PROBLEM DESCRIPTION AND ASSIGNMENT 5

2.1 PROBLEM DEFINITION 5
2.2 INITIAL PROBLEM AND RESEARCH DOMAIN 5
2.3 GOAL WITHIN THE RESEARCH: ASSIGNMENT DEFINITION 6
2.4 METHODOLOGY 7
2.5 RESEARCH PLAN 9

3. CONFIGURATION 10

3.1 CONFIGURATION; WHY? 10
3.2 CONFIGURATION SOLUTIONS 12

4. DESIGN OF BUSINESS PROCESS AND TYPES OF CUSTOMERS 15

4.1 METHOD 15
4.2 DESIGN OF BUSINESS PROCESSES FOR CONFIGURATION~ THE USE-CASE 15

5. TEST OF BUSINESS PROCESS DESIGN IN PRACTICE 19

5.1 INTRODUCTION 19
5.2 COMPANY VISITS 19
5.3 ANALYSIS OF INSTALLED BASE PCF 20
5.4 EVALUATION OF DESIGN AND TEST-PHASES 20
5.5 COMPARING THE STANDARD BUSINESS PROCESS TO THOSE FOUND IN PROCESS. 20
5.6 COMPANIES AND THEIR BUSINESS PROCESSES COMPARED 20

6. EXAMPLE OF A CASE STUDY 23

COMPANY DESCRIPTION 23

7. EVALUATION: CONFIGURATION SOLUTIONS 24

7.1 HOW CAN BAAN OFFER THE BEST SOLUTION? 24
7.2 IMPROVED FUNCTIONALITY 25
7.3 GOOD SOLUTION THROUGHOUT THE LIFECYCLE OF THE INFORMATION SYSTEM 25
7.4 A TOTAL SOLUTION 26
7.5 A GOOD SOLUTION THROUGHOUT THE LIFECYCLE OF THE PRODUCT 26
7.6 A GOOD SOLUTION FROM A MARKETING POINT OF VIEW 26

8. CONCLUSIONS AND RECOMMENDATIONS 28

8.1 CONCLUSIONS 28
8.2 GENERAL CONCLUSIONS 29
8.3 RECOMMENDATIONS 29

LIST OF REFERENCES 30

Prologue

One of the most influential technological developments in the last decades is the increasing penetration of software in our society. Because the (business) relevance of software increased considerably over the years, the way it is bought and sold has also matured. "Software" is no longer a sellers market and a different marketing approach is needed.

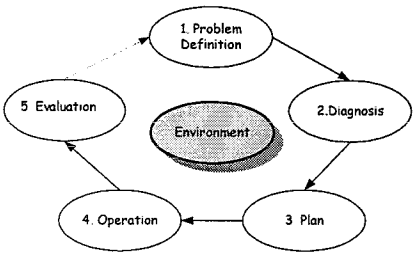
In the early days of software development, the users of software had to build themselves what they wanted to use. The next step was that experienced software developers would sell their time to develop software that was of business-use to others. Not surprisingly, initially the dominating development model was one of tailor-made "one of a kind" production, dedicated to the needs of a specific customer. Software development was a craft. Many software development firms are still organized accordingly.
Over time however, more and more vendors started to organize themselves around production of standard software. The standard software can be tuned to the specific needs of a customer via parameter settings. In this way, large economies of scale can be gained and some of the most successful companies in the 1990s were producers of standard software, in particular Microsoft. Standard software also provides clear benefits for the customers. In recent years especially, a growing number of companies have decided to implement standard information systems to support their business processes.

But the current market of information system users is not only looking for a standard package, but for a total business solution, that answers optimally to its needs. Customers in the current market still have the desire for customized products that provide them with a perfect solution. The challenge for standard software providers is to offer these customized products, yet to maintain the economies of scale of producing high volumes (standard products).
This requires a significant transition in the orientation of these firms.

This final thesis discusses how the Baan Company, one of the major companies in standard software development, can make this transition towards solution's thinking. To do so, first of all, the (potential) customers have to be known. Then, their business processes have to be identified along with the impact these business processes have on the software that is needed to support them.
This means: knowledge of the market should be present throughout the organization. However, in the high-tech environment of Baan, this is not always recognized.

Thus, it is critical to make *knowledge of the market the foundation of software development,* in order to stay competitive in the current market. I hope that this project has added to this awareness!

1. Introduction



The internship related to this final thesis is conducted at the department ERP[1]/Configurator of the Baan Company (Baan) in Barneveld, the Netherlands. To clarify the position of this department in the total Baan organization, this chapter first describes the Baan Company and the way it is organized. Baan's competitors and its market are discussed along with the 'production process' of Baan. The products of the departments involved in the project are introduced briefly.

1.1 Baan Company

Baan is a Dutch software company that was founded in 1978 by Jan Baan. It has dual headquarters, located in Barneveld, the Netherlands and Herndon (Virginia), USA. Baan Company is a global provider of enterprise business software. These applications are in use at approximately 13,000 customer sites worldwide.

Organization in departments

In the past year, Baan has gone through a major reorganization. Right now, more than 4,000 people are working at Baan Company. The assignment was carried out for Baan Development. Besides Baan Development, several country-based sales offices perform consultancy for pre-sales and sales courses with (potential) customers. Baan also has its own consultants who perform implementations at customers' sites. Besides that, Baan works together with several partners (e.g. KPMG, IBM) to whom implementation is outsourced (indirect channel). The figure below shows the divisions:

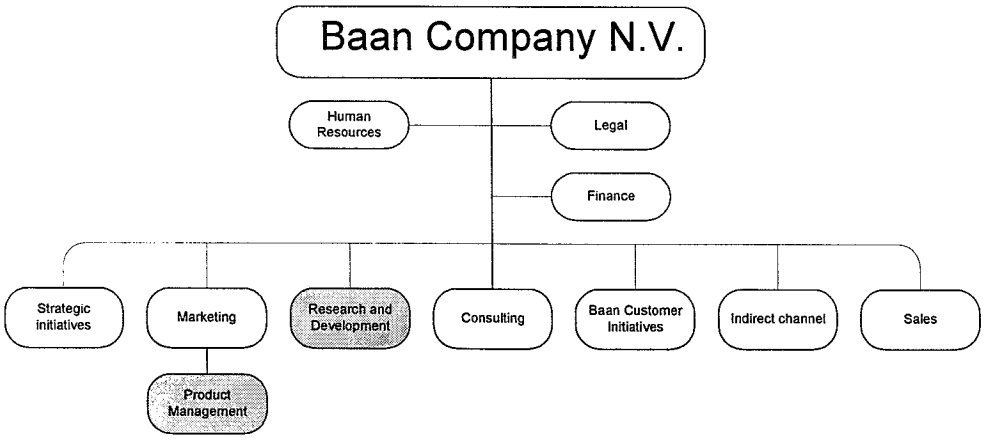


Fig. 1.1: Organizational chart Baan Company N.V.

Two departments are particularly relevant for the subject of this thesis: Baan Development and Product Management (marked gray in figure 1.1). Within Development, the departments Baan Enterprise Resource Planning (BaanERP) and Baan FrontOffice (BaanFOS) are involved in this project. BaanERP and

[1] *Appendix 1 contains a list of abbreviations, appendix 2 a list with definitions of technical words*

BaanFOS are responsible for the development of the products in ERP and FrontOffice. BaanERP (to be more precise BaanERP/Configurator) is the actual initiator of the assignment.

The reason for the involvement of BaanFOS is that it is working in development projects together with BaanERP. One of these projects uses the results of this thesis work as input for development efforts (the 'Golden Gate' project). Product Management is responsible for the 'business'-side of a product that is under development. Examples of tasks are managing planning and communications, creating and maintaining product plans, identifying and quantifying target markets and defining requirements. The activities performed for the assignment are related to activities performed by the product management of configuration.

1.2 Products

Baan's family of products consists of several main parts of which the following are most important:

- BaanERP;
- FrontOffice;
- Corporate Office;
- Supply chain solution (SCS);
- E-Enterprise.

Important to identify here is the difference between back office and front office products. A front office system supports the business processes of communication with customers, whereas back office supports processes inside a company, such as planning, manufacturing and service.
Baan offers BaanERP as back office system and BaanFOS as front office system in an integrated suite. The previous back office products are called Baan Triton and Baan IV. At ERP/Configurator three applications are currently being developed: PCF, CTO and LAC.

1.3 Competitors

The main competitors of Baan in ERP-systems are: SAP, PeopleSoft, Oracle and JD Edwards.
In the field of FrontOffice configuration the most important competitors are: Clarify, Oracle, Siebel, Trilogy and Vantive (PeopleSoft). The revenue of the Top 20 vendors amounts to 86 % of the total ERP Market and that of the top five to 64%. Based upon research of AMR [AMR99], a SWOT-analysis relevant for the background of this project. It is summarized in the following table:

Table 1.1: SWOT-analysis Baan Company [AMR99]

Strengths	Challenges/Weaknesses
Confidential	

1.4 The market

Looking at the family of products of Baan, the following table gives the market growth rates for 2000 as expected by analysts:

Table 1.2: Summary of Market Growth Rates in 2000 [BAA99]

Product Line	Anticipated Market Growth '00
Front Office	About 50%
Supply Chain	About 50%
E-commerce	About 100%
ERP	About 10%

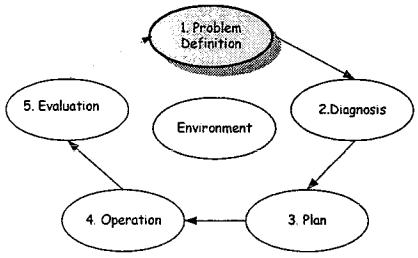
As can be seen from this table, the market for ERP is expected to decline in growth. Therefore, original ERP-vendors are continuing to expand the reach of what they offer by adding front office, supply chain management and corporate financial capabilities to their core systems and focusing on selling more licenses to existing customers [AMR 99].
Except for dividing the market according to users of the several parts of the Baan systems, the market can also be divided according to industry. Baan offers several solutions that are tied to the specific needs of a

certain industry. Today Baan offers industry solutions for Aerospace & Defense, Automotive, Consumer Packaged Goods, Electronics, Engineering and Construction, Forest Products, Heavy Equipment, Primary Metals, Project, Semiconductor, Specialty Chemicals and Wholesale. More information on the actual customers of the Baan Configuration Software is given later in this report (5.3).

1.5 Production Process: The Baan Development Method (BDM)

The "production process" at Baan differs significantly from the production process found in companies manufacturing discrete products. First of all, software is not a discrete and visible product; Baan does not hold any physical inventory. No warehouses and no blue-collar workers are present. The actual manufacturing process is the development of the software. The development at Baan is performed according to the eight development steps, known as the Baan Development Method (BDM). This method, very generally, starts with defining what should be contained in a new or modified version. Then the functionality is chosen and functional requirements are made. These are translated into technical requirements. Then the actual production process, the technical realization starts based upon these requirements. Finally, the software is tested.

2. Problem description and assignment



Chapter 1 made clear where the project is situated. In this chapter, the motive for the project will be discussed. The chapter starts with the original problem statement, to clarify the reason why the project was initiated. This results in an assignment description, consisting of research questions and specified in a project plan. Finally, some remarks on the followed methodology are made.

2.1 Problem definition

The initial problem description provided by the manager of ERP/Configurator at the start of the project was (very general): *"A lack of knowledge transfer exists concerning the new products of BaanERP/Configurator."* This provided a large possible domain of investigation at the beginning of the project. To find the real problems underlying this first problem description, further research was needed. Therefore, assistance of literature has been used to determine a well defined, realistic assignment description and project plan. Verschuren [VER92] provides a good guideline. He distinguishes between the goal *of* a research project and the goal *within* a research project. Both goals are equally important and have to be analyzed thoroughly before making the project plan. The goal *of* the research concerns the problem to be solved: Why is the project started; what is the final goal of the project? This is discussed in section 2.2. The goal *within* the research concerns the questions to be solved (What?): What knowledge is needed to reach the goal of the research? How are these questions to be answered? This is described in section 2.3

2.2 Initial problem and research domain

In order to come to the final assignment description, several orientational interviews [KEM96] have been conducted with:

- people involved in the development of CTO and LAC;
- management of the department CF;
- people from product management.

During these interviews, two important facts became clear, which represent the real problems underlying the initial assignment description. These two factors influenced the actual coming-about of the final assignment description. They are discussed in the following two sections.

1. Business Knowledge, Requirements analysis
At the department CF, a new software solution, CTO (Configure to order) is under development.
The actual market requirements for CTO have not been investigated thoroughly during or before the development phase. Some evaluation of the predecessor of this product exists, but one could say that no profound knowledge exists of the way the Baan configuration software is used in its typical business environment (thus, use-cases are not available).

2. Solution thinking
Baan's product is standard software. The standard software can be tuned to the specific needs of a customer via parameter settings. Typically this is done per package and not in an integrated fashion. Expertise within Baan, both in development and in consultancy is also typically package oriented. However, the current market of information system users is not only looking for a standard package, but for a total business solution, that answers optimally to its needs. The challenge for Baan is to offer these customized solutions, yet to maintain the economies of scale of producing high volumes (standard products). Thus, Baan has to focus first on its customers, what do they look like, what do they need, and then try to offer each of them a fitting solution, yet consisting of standard software components. This counts for Baan as a company, but also for parts of the Baan-system, such as configuration. It might be possible to predict the typical requirements on a configuration-solution based upon the characteristics of a customer's company. These characteristics can be characteristics of the engineering, manufacturing, marketing or sales organization of the company.

2.3 Goal within the research: Assignment definition

Combining the fact that the business processes (and thus the exact requirements) for CTO and for the integration CTO-FrontOffice Configurator are not completely clear and the fact that the solution principle is of interest for Baan, the following assignment definition has been defined:

> *Determine the business process (use case) for the ideal configuration-software for a variety of CTO-customers and for the integration between CTO and the FrontOffice Configurator. From this, new requirements can be the result, because of the gap that exists between what Baan has to offer and this ideal process.*
> *Analyze the possibility of a way in which Baan can offer fitting solutions, consisting of standard BaanFOS/BaanERP components, with a focus on CTO.*

Based upon this assignment description, an initial project plan including dates and deliverables has been established. Initially, the project plan was based upon the assumption that during July/August '99 the names of Beta-customers of CTO would be known that could serve as cases to study the use and implementation of CTO. However, since the development of CTO has not been finished yet, several adaptations of the project plan were necessary during the project.
The assignment definition can be split up in a number of parts, each leading to several research questions:
* *Determine the business process for the ideal configuration-software...*
- What is configuration software?
- What is the ideal configuration software?
- Which business process does this configuration software support?

* *...for a variety of different CTO-customers and for the integration between CTO and the FrontOffice Configurator....*
- Who will be the customers of CTO?
- Which customers would like to integrate FOS and ERP configurators?

* *...from this, new requirements can be the result, because of the gap that exists between what Baan has to offer and this ideal process....*
    - What does Baan have to offer?
    - What is the difference between what Baan has to offer and the ideal situation?

* *...then analyze the possibility of a way in which Baan can offer fitting solutions, consisting of standard BaanFOS/BaanERP components, with a focus on CTO.*
    - What are the characteristics of a fitting solution?
    - How can Baan offer these?

The following picture shows the interdependencies between the research questions and the goals of the research:

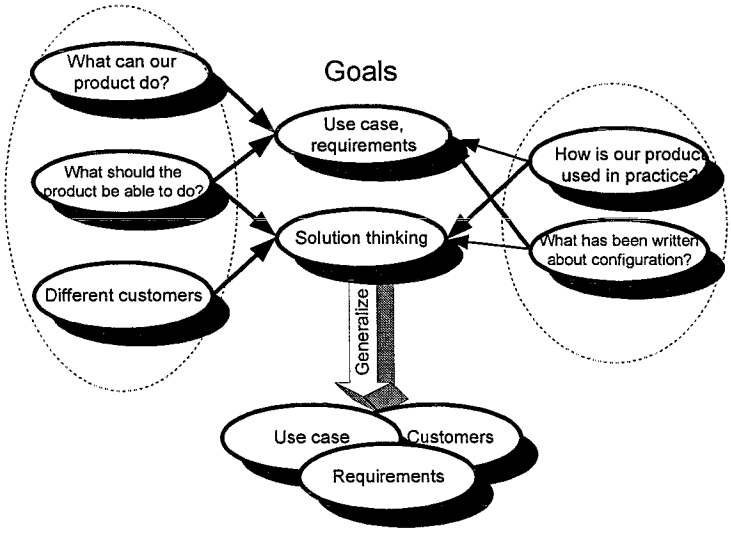


Fig 2.1 Interdependence of research questions and goal of research

2.4 Methodology

Besides the objectives as described in the previous section, the methodology is an important aspect of a project to consider in advance. Kempen and Keizer [KEM96] give a framework, which is used as a standard guideline for final thesis works for the studies of Industrial Engineering and Management Science. However, Kempen and Keizer give a model for consultancy-like projects. These type of projects focus on finding one solution and implementing this solution. However, this thesis' essence is to create knowledge, not to find one solution to a problem and perform a total implementation. Thus, only part of this model is particularly relevant for this project. Because literature on this subject is prevalent, another model was looked for that is more applicable to this specific project. The chosen model is the subject of the following section.

2.4.1 Overall research approach

In order to answer the research questions and the goal of the research properly, a methodological framework has been used during the assignment. This framework, a slightly adapted version of the regulative cycle of Van Strien [STR86] contains five high-level steps. The next figure shows these phases as well as their relation to the various chapters of this report.

The cycle starts with the problem definition phase. The problem definition originates from the understanding that one or more persons are not satisfied with a situation and the need for a solution of this problem and results in an assignment definition and project plan. This phase is followed by the diagnosis-phase (step 2), which results in a description and analysis of configuration in general and existing configuration solutions. Based upon what is known from the diagnosis a 'plan' is made (step 3). This plan contains a use-case of the business processes supported by the ideal configuration software and a typology of Baan Configuration customers. The operation phase of the regulative cycle of van Strien regards the implementation of the plan. In this project, this step consists of a test in practice of both the use-case and typology (step 4). The cycle is concluded by an elaborate evaluation (step 5). At the end of this report conclusions are drawn, recommendations are made and some points of further research are proposed (the dotted arrow).

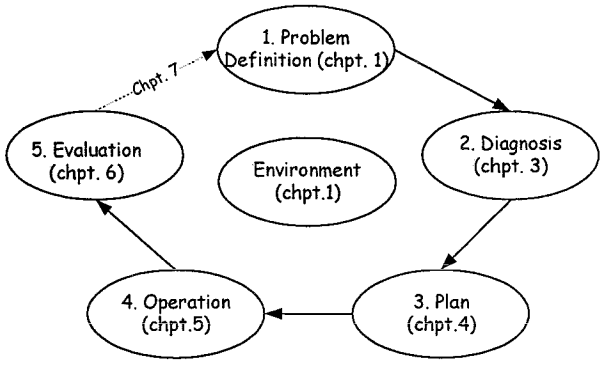


Fig. 2.2: Adapted Regulative cycle of van Strien

2.4.2 *Case study research*

Step 4 (operation) of the research cycle as presented in figure 2.2 contains research with customers of Baan. It comprises a test of what had been 'designed' in step 3 (plan). In order to decide which research strategy to use for this test in practice, three conditions are decisive [YIN90]:

- The type of research question. Is an easy answer to the research questions possible? (Questions in the form of 'Who, what, where, how many, how much?'). Or are questions complex, interrelated and in the form of 'How, Why?'
- The actual control the investigator has over actual behavioral events (can the investigator manipulate his environment directly, precisely and systematically? Is this necessary?)
- Does the research focus on contemporary or historical events?

The following table shows the relationship between these conditions and the five possible main research strategies:

Table 2.1: Relevant Situations for Different Research Strategies [YIN90]

Strategy	Form of research question	Requires control over behavioral events?	Focuses on temporary events?
Experiment	How, Why?	Yes	Yes
Survey	Who, what, where, how many, how much?	No	Yes
Archival analysis	Who, what, where, how many, how much?	No	Yes/no
History	How, why?	No	No
Case study	How, why?	No	Yes

This project regards the interrelationship between types of companies, business processes and information systems. This makes the subject of the research complex and the questions highly interrelated and the type of research question a 'how, why?' question.
Furthermore, since the research regards observing business processes, where the researcher is a complete outsider, limited control over behavioral events exists. The project focuses on contemporary events, because it looks at the way companies are working on this moment.

Looking at table 2.1, the conclusion for this assignment is that case studies provide the best strategy for the research in practice. This is why the choice in this project was to test the design of the use-case by visiting a number of customers of Baan, and look at their business process thoroughly.

2.5 Research plan

Now the research questions defined in section 2.3 and the research approach discussed in section 2.4 can be combined into the following research plan:

Step 0: *Introduction*. First, Baan is described, its organizational structure, its products and its strategy. This is described in chapter 1.

Step 1: *Problem definition*. In this step, the reasons for starting the project are analyzed and the problem definition, assignment definition, research approach and research plan are formulated. This chapter discusses this.

Step 2: *Diagnosis*. This step focuses on answering the following research questions (chapter 3):
- What is configuration software?
- What does Baan have to offer?

Step 3: *Plan*. During the plan-phase, a use-case of configuration software is designed, as well as a typology of customers of configuration. This step answers the following research questions:
- What is the ideal configuration software?
- Which business processes does this configuration software support?

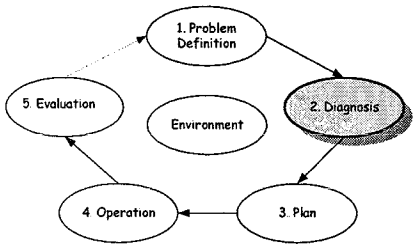
This is done by analyzing information available within Baan, on the Internet, by interviewing consultants and by performing a literature survey. Chapter 4 describes this research step.

Step 4: *Operation*. The use-case that was developed in step 4 is tested in practice. As described in section 2.4, this is done by performing seven case studies with PCF-customers. Also, the installed base of the current configuration products is analyzed. This step answers the following research questions:
- Who will be the customers of CTO?
- What is the difference between what Baan has to offer and the ideal situation?

Step 5: *Evaluation*. This step evaluates the previous research steps, and summarizes the research results, by answering the research questions:
- What are the characteristics of a fitting solution?
- How can Baan offer these?

Step 6: *Conclusions and recommendations*. Finally the project as a whole is evaluated in chapter 8, where conclusions and recommendations are made.

3. Configuration



This chapter describes the diagnosis-phase of the project. First, the reason for the emergence of configuration software is explained. This serves as a background to the project. The solutions offered by Baan are discussed as well as a brief discussion of what is offered by competitors in the marketplace.

3.1 Configuration; why?

3.1.1 From Baan's customer's point of view

The increasing importance of configuration software is caused by developments in the market during recent years. Customers express a growing need for individualized products. Many industries that used to produce standard products (doors, windows, furniture, recreational vehicles) are moving toward manufacturing on customer order to be able to meet this demand. Several reasons exist for this increase in variety of products [EER99]:

- Many companies face a sharp decrease in *commercial* life cycles of new product types introduced to the market. However, the *economic* lifetime of products installed in the field is not decreasing. Thus, the variety of products that are actually alive in the market is increasing in proportion to the new product-launches.
- Increased competition in mature markets leads to an intensive search for niche markets, with dedicated product types.
- The variety of products is a way to obtain customer satisfaction, a large set of options increases the number of choices offered to the customer and thus satisfaction.

Hence, the market forces today's business to be capable of delivering a customer-specific product within the delivery time and with the delivery price of a standard product. According to a survey of the research company Advanced Manufacturing Research (AMR) among large manufacturing companies, 73 % are scheduling their production based on actual customer orders, rather than on an exploded plan (i.e. on forecast) [CON99].

In traditional information systems for production and inventory control (like Baan Manufacturing), product specific data are kept for each product-variant. This system is adequate for companies with a limited product-range. However, if a large number of variants of a finished product can be produced (on customer order), the traditional information system may run into problems with respect to the quantity, complexity, and manageability of the product data and the need for timely availability of information that the system has to provide.

The number of variants can grow explosively as the number of offered features to customers increase. To give an illustration of the number of possible variants:

- Simple products like bicycles with only a few features such as: color, wheel-size and frame-size, can still have quite many variants. Having seven options for the colors, two frame-types and four wheel-size options results in 56 variants.
- Personal computers, with more features (2 hard-disk options, 3 CPU's, 3 types of casing, 4 colors, 3 types of screens and 2 country versions, resulting in 452 possible variants)
- Expensive cars may have hundreds of features that can be defined by the customer. If each of these features has several options, this will easily lead to millions of possible variants.

Maintaining data for all different variants is difficult. The database in which all data are kept will be too large to be easily managed. For example, if a component that is part of all product variants changes, a very large number of changes will have to be performed manually in the data of each variant.
Therefore in the case of many product variants, it is almost impossible to define the product structure (the way in which a product is built up from purchased parts and semi-finished products [ERE92]) for all the versions of all finished products in advance. *Configuration* can be a solution to this problem. A configurator provides support that is based upon product documentation. This documentation is documented in the form of a generic bill-of-material that satisfies customer requirements and design constraints. The final product of the configuration process is the identification of a single variant (or a set of variants) [HEG95]. Configuration software thus translates the product structure into a modular product design with validation ("Can this be made?"') and decision support ("What will this cost?") functions, thus enabling the user to define a variant only when needed, instead of defining (and storing, maintaining) all possible variants in advance.

Besides the benefit of much easier maintenance, a configurator is the following: especially in companies with complex products (like machine-building companies) the knowledge about the products and the way the products should be manufactured is in the head of a few people (engineers). Every time a product (variant) is ordered, these people have to replicate their knowledge (check whether the variant can be manufactured or not). This can be a waste of effort, since these people are often already very busy. By modeling all possible products in a generic product family the knowledge of these people is 'saved' in the configurator, and instead of having to ask these people, the configurator can answer questions about manufacturability by checking constraints that have been modeled once in a large, concentrated effort.

Tiihonen et al. [TII98] use a definition of a configurable product as being a product with the following basic properties:

- Each delivered variant is tailored to the individual needs of an individual customer.
- The product has been *pre-designed* to meet a given range of different customer requirements (market knowledge is imbedded in the product model).
- Each variant is specified as a combination of pre-designed components or modules. Thus, no need to design new components exists as a part of the sales-delivery process. (This means that it is not possible to make adaptations to the generic bill of material due to customer wishes).
- The product has a pre-designed general structure (manufacturing bill of material).
- The sales-delivery process requires only systematic variant design, not adaptive or original design.

This definition focuses on the fact that all possible variants of a product have to be specified by the manufacturing company. This means that they are responsible for pre-defining all possible options that will be later on options for their customers.
However, it is not always possible to determine all possible options in advance. Therefore, in practice it is also important that a configurator can support variants that have not completely been identified in advance. This happens in the case of make to order or engineer to order.

As said before the information is stored in a generic bill of material. In this bill of material, a product family is modeled. A product family is a group of variants with a similar bill of material (product structure) and a similar way of manufacturing (process structure). Through the eyes of the customer, each of these variants is different. In the generic bill of material all features and options are listed.
This can be done on single-level (all features regard the end product), or multi-level (some features regard the end product, other just components).
An example of a part of a generic bill of material of a bicycle is given in the following picture:

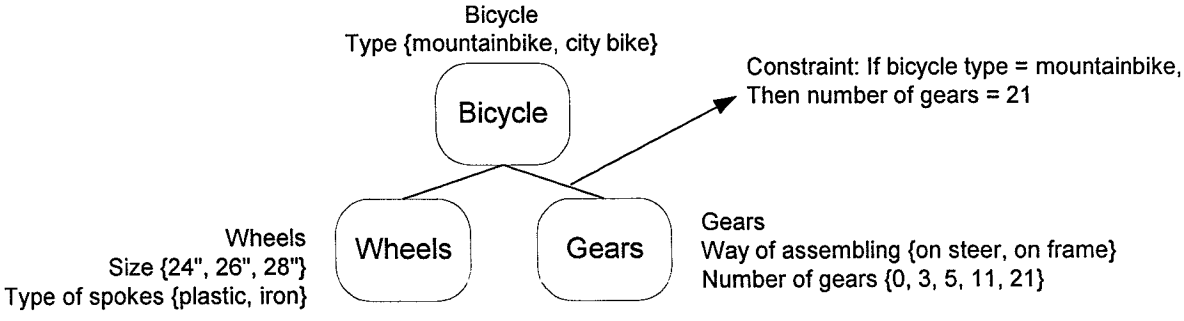


Fig. 3.1: Example of a part of a generic bill of material for a bicycle

Choosing some options only influences a few steps in the manufacturing process, whereas others might have a larger impact. For example, if a bicycle does or does not have a bicycle bell, will have less influence than if is has or does not have gears. Not only the gearing system is influenced by this decision, but also, the frame has to be adapted and different gear wheels will have to be used. These types of interdependencies are modeled in the generic bill of material by adding constraints and rules to the data. As an example: If number of gears = 0, then number of rear gear wheels = 1.
Apart from the product structure, also the processing structure of the product has to be modeled. This is the way in which the variant will be manufactured (on which machine, with which tools?). This is done in the process model. Here also constraints are used like: If number of gears = 12, then tool x is needed on machine y. Apart from information from engineering, also information from sales and marketing is used to model a generic product family. For example, certain countries will desire certain options (in for example color, or size) and because of trends, certain variants will no longer be sold after a certain date.

3.1.2 From the customer's customer's point of view

Besides the advantages offered to Baan's direct customer, a configuration system could also provide benefits to the customer of this Baan-user, since it makes the sales process easier. For example, if a sales person visits a customer to discuss products and the customer has to go through a paper list with numerous possible variants, without any pictures, he will be offered a more user-friendly solution if the sales person brings along a notebook on which graphical representation of the products can be established, and where the customer can answer a number of questions, view his product and know the sales-price.

3.2 Configuration solutions

As a result of the benefits of configuration software as described in section 3.1, many companies have recognized the need for this type of software in the past years. Many companies use configurators that have been custom-made for their own business. However, the development of standard packages for configuration is relatively new. Baan is one of the leaders in this field.
This section describes the standard configuration solutions offered in the marketplace, focusing on Baan's solutions.

3.2.1 Available configurators

[LIE99] distinguishes two basic types of configurators:

- Add-on configurators. These are separate from the production and inventory control system. Data are kept in the system and a redundant database has to be kept in the configurator. This invokes problems with keeping data up-to-date (synchronization problems).
- Integrated systems are integrated with the production and inventory system, using either the same data files or data coexisting with the inventory and production system and synchronizing data bi-directional. As Baan is strongly working on offering integrated systems, Baan configuration products are also (being) integrated with the rest of the systems.

3.2.2 Baan's configuration components

At the ERP/Configurator department integrated systems for configuration in BackOffice are being developed. FrontOffice configuration products are also in development at the FrontOffice department (located in the USA and Denmark).
The reason that Baan offers different configuration products in FrontOffice and BackOffice is that the different areas of the customer's enterprise require different functionalities to support those different areas optimally. Looking at different steps in the business process, the following four main steps are typically supported by a configurator:

1. Needs assessment (What does the customer want, prices, discounts, graphical support);
2. Configuring a product (Choosing the desired options for each feature);
3. Generation process (Generating a variant-specific bill of material and routing);
4. Planning and manufacturing of the actual product.

Baan's FrontOffice configuration products provide optimal support for steps 1 and 2, whereas BackOffice configuration products provide support for steps 2 to 4.
The aforementioned steps are the steps that are *currently* supported by Baan's configuration software. A future extension of these steps is the support of product development and after-sales service.
The reason why Baan does not offer one configurator supporting all business processes is that FrontOffice users need to be able to work offline. These users are often sales people in the field, using a laptop with not always the possibility to connect to a network. It is impossible to store all the data needed for BackOffice Configuration on such a stand-alone system.

Thus, different configurators exist in BackOffice and FrontOffice. These specific configuration components could be able to work together to give Baan's customers the ability to work seamlessly without having to redo work done (e.g. enter data in both Front and BackOffice). An integration for FrontOffice and BackOffice configuration is under development for a short time now. The following sections discuss the existing and future configuration products in Baan's BackOffice and FrontOffice.

Configuration in BackOffice

Confidential.

Some technical and functional information

Confidential.

Configuration in FrontOffice

FrontOffice (FOS) Configuration has a customer focus and deals with needs-assessment in broad terms: *What* products and services are demanded to provide a certain customer solution? FOS offers good graphical support; customers can see what their product will look like when choosing different options. In addition, FOS Configuration offers navigating-assistance to understand pro's and con's of a solution. For example, if a certain color of the outside of a car is chosen, the configurator will indicate that this limits the colors that can be chosen for the inside of the car. If an incorrect option is chosen, the configurator offers interactive adjustment of the solution. Baan offers three different front office configuration solutions. The type of solution depends on the type of selling process of the customer, which is explained in more detail under the next figure, which describes the three types of selling processes.

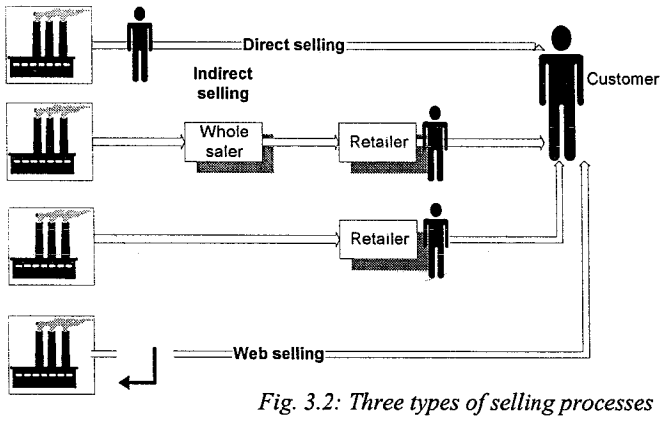


Fig. 3.2: Three types of selling processes

The three different selling processes and their solution are:

- *Direct selling*
  Direct selling regards selling where a sales-person of the manufacturing company is selling directly to the customer (most often an actual meeting takes places). This type of selling concerns mostly business-to-business environments.
  For direct selling, the total Baan FrontOffice package is offered as a solution.
- *Indirect selling*
  Indirect selling is the selling of a product to the final customer by a person who is not directly related to the manufacturing company. This happens in the case of the use of wholesalers and/or retailers. (Most often in business-to-customer environments).
  To provide a good solution for this type of selling, Baan offers BaanInteractiveSelling instead of Baan FrontOffice.
- *Unassisted selling (web-selling, direct buying)*
  This type of selling is relatively new. It can also be called technology enabled *buying*, where the previous two types can be called technology enabled *selling*. For this type of selling without assistance, through the Internet, Baan offers E-Sales.

The following table summarizes the FrontOffice solutions:

Table 3.1: FrontOffice solutions

Customer-type	Solution
Customer with direct selling process	Total FrontOffice Package
Customer with indirect selling process (dealers)	Baan Indirect Selling
Customer with web-based selling (e-commerce)	E-sales

The Proloq solution

This section describes the Proloq solution. Proloq (founded by ex-Baan employees) has developed a specific application that runs on the Baan IV system. In September '99 Baan acquired Proloq. Therefore, Proloq has become an extension to the Baan product- line.
The core of this Proloq application (Baan Dimensions) is managing dimensions and specifications. It has the ability to manage multiple characteristics, such as width, thickness, grade, surface finish, packing, and scrapping requirements. These characteristics are comparable to features and options in a configurator. This section explains the differences and similarities between Baan Dimensions and PCF.

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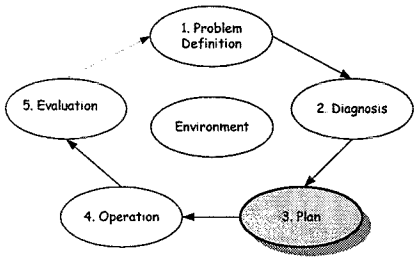
3.3 Competitors

4. Design of business process and types of customers

"Achieving competitive excellence in configure-to-order business requires "front end to back end" configuration solutions"



The first part of the assignment definition is 'Determine the business process for the ideal configuration-software for a variety of CTO-customers and for the integration between CTO and the FrontOffice Configurator'. This chapter first describes this business process and the way it was established, followed by a categorization of the different CTO-customers.

4.1 Method

This chapter makes up step 3 in the regulative cycle of van Strien. After thorough analysis of the situation regarding configuration at Baan, the next step was to determine the business process and the types of customers. Several steps were undertaken to do so. These are visualized in the next figure and explained in sections 4.2 and 4.3:

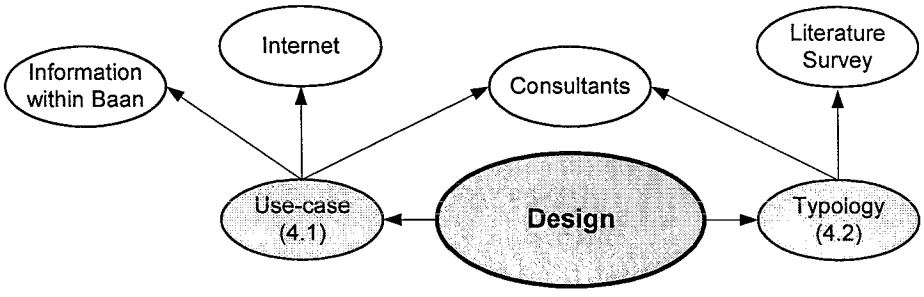


Fig. 4.1 Relation between research steps-plan phase

4.2 Design of business processes for configuration~ the use-case

4.2.1 Introduction

The final thesis project started at the same time as the FrontOffice-BackOffice-Configuration- Integration development project (Golden Gate). In this project a new integration between CTO and the new FrontOffice configurator is developed. In order to gather the requirements for this integration in a structural and thorough way, the Golden Gate team started its work with looking for a good way of listing all steps involved in using CTO and FrontOffice configuration in an integrated way. This list of steps should give a 'standard' process, a process in which the business processes of all potential customers are aggregated. It can then be used to derive functional requirements for the integration. From these functional requirements, technical requirements can be drawn, from which then the actual programming can start.
Therefore, the first goal of the Golden Gate project was to establish a *use-case.* The contents of this use-case had to contain the following things:

- A visual representation of the steps in the business process. A business process can be defined as a set of logically related tasks or activities performed to achieve a defined business outcome [BAU99]. Specifically for Baan, it is a logistical process consisting of activities such as BAAN sessions;
- The actors (person responsible for this step);

- The module (ERP or FOS);
- A short description in words of each step.

4.2.2 *Visual representation: Petri-nets*

When starting to make an overview of the use-case, it became clear that making a description just in words was complex and did not provide satisfactory insight. Therefore, a way to visualize the process steps was needed. Baan has developed a tool to represent business processes in a standard way. This is the Dynamic Enterprise Modeler Strategic Execution, DEMse, which uses petri-nets to model business processes.
A petri-net is a network, composed of passive components -called places- and active components –called transitions- representing events, transformations or transportations (Baan: processing activities). Places and transitions are connected by connections (Baan: relationships). Tokens are the dynamic objects that flow from one place to another when activated by the transitions. Tokens represent objects, for example people, goods or orders. Tokens are not visible in DEM. A change in a petri-net occurs when the distribution of the tokens over the different places is changed. This happens when a processing activity takes place, which is called 'firing'. If there is a token in the input-place, then a transition can 'fire', this means that the token will be moved from the input to the output-place. (See figure 4.2, example of a petri-net). [AAL95]

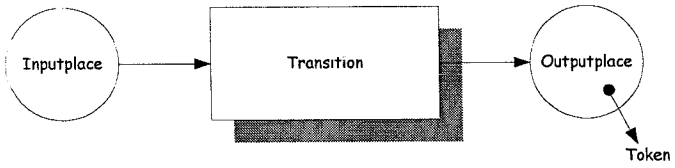


Fig. 4.2: Example of a petri-net

As shown in figure 4.2, circles depict places, rectangles depict processing activities. Arrows indicate connections and the direction of the arrows show the direction in which the token will flow through the network.

4.2.3 *Establishing the use-case*

In order to define all different steps that make up the business process, extensive information gathering was necessary. Alter [ALT96] gives a number of common sources of information to analyze information systems. Not all of these sources were available in the project. They are explained here:

- *Interviews*
- *Documentation of the existing systems*
- *Observation in practice*
- *Benchmarking*
- *Questionnaires*

The used procedure is the following: Based upon a basic document within Baan Development, a first draft of the use-case and petri-nets was written. Then it was elaborated, using the aforementioned sources of information. Thus, a quite elaborate draft of the use-case was created (with main focus on ERP functionality). Then this was sent to the Golden Gate team and reviewed. In this way, the case was completed (especially by adding remarks regarding FrontOffice configuration provided by the FrontOffice team in Golden, USA).
This procedure has led to a design of the business process supported by the ideal configuration software. Important to notice is that this business process represents the 'to be' situation, the picture of which business processes the software should support in the future. This is not equal to the 'as is' situation. The differences between 'to be' and 'as is' provide Baan with chances to add functionality in future releases of its products. Furthermore, by representing the 'to be' situation, requirements will be already acknowledged, also those that will only be part of future releases. This is useful for time scheduling and prioritization. In the use-case white boxes visualize the functionality that is part of the current products or the first release of

the integration. Gray boxes represent future functionality. Thus, by detailing the steps described in gray boxes requirements can be derived.

4.2.4 *Types of customers of PCF/CTO and the integration*

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4.3.1 *Introduction*

The use-case described in the previous section aims at describing the business processes of all customers. In solution thinking, it is important to make a distinction between different types of customers. Not all customers are the same and different customers will have a different subset of the overall business process as their business process to be supported.
To get a feeling for the differences between customers that can cause differences in the use of configuration software, two methods were used, which are discussed in the next section:

- Interviews with experienced consultants;
- Literature research [PIE99].

4.3.2 *Method: Interviews and literature research*

Since consultants have worked in different companies, they can provide examples of factors that cause different needs on configuration solutions within companies. Therefore, several interviews were performed. The factors indicated by consultants as the most important are discussed in the next section, along with the way they influence the solution needed by a customer. Some factors can be used to divide customers into sub-types of customers of PCF/CTO; others divide possible customers into customers that are offered a good solution with PCF/CTO and those that are not. Based upon the knowledge gathered from the interviews with consultants, a literature survey was performed in order to look for typologies supporting the ideas that were gathered in the interviews. Several typologies of companies and of departments of companies can be found in literature as well as descriptions of different aspects of the marketing and sales organizations of companies [PIE99].

4.3.3 *Typology*

The following table summarizes the results of the interviews and literature research. A more detailed explanation is given underneath:

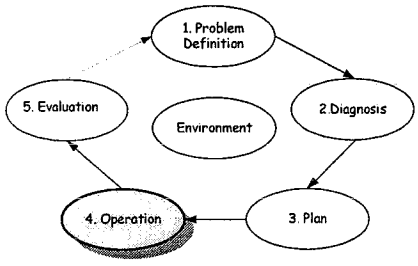
Table 4.1: Type of customer and use of configuration software

Type of customer	Consequence for use of configuration software
Number of variants in one model	- The higher the more complex modeling - The lower the more complex maintenance
Marketing strategy: level of exclusiveness	The more exclusive, the less PCF/CTO is applicable
Length of lifecycle	The shorter the more complex maintenance
Business-to-business or business-to-customers	PCF applies to Business-to Business
Complexity of assembly	- Line-assembly: LAC - Rest: PCF/CTO
Sales volume per year	The higher, the higher the requirements on performance and user friendliness
Recurrence of relationship	A few customers with an intense relationship is more applicable than many small, one-time customers

Intensity of interaction with customer	High intensity leads to high need of FOS configuration and thus for integration of FOS and ERP Configurators.
Multi-site (Size of the company)	Larger companies will require multi-site support of product models

- *Number of product models*
  The number of product models, is an important decision for a company to make, because it influences the number of variants that will have to be modeled in one product model. The number of variants that are modeled in one product family can be as large as 50,000 and as small as 10 or 20. DAF has even modeled 4 billion variants in six product lines. These differences each have their own problems. Modeling a large amount of variants in one product family will need much knowledge on how to do this. Thus, experienced consultancy becomes important in the implementation phase. Also, the more options modeled in one product model, the larger the need for good performance of the system during 'solve'. Also, modeling becomes more complicated, because the number of constraints increases.
  A company with many, though relatively easy product models will have to perform much maintenance, and thus the 'maintenance-friendliness' of the configuration system is more important as well as the possibility of re-using data (meaning that data do not have to be reentered over and over).
- *Marketing strategy: level of exclusiveness*
  Depending on the way a company wants to position its product in the market, the influence of the customer will be larger. A more exclusive car for example, (Mercedes) will have much more choices for the customer to choose than a Volkswagen. For a Mercedes, a customer can maybe order some none-standard parts, created especially for him. The more options pre-defined, the better PCF/CTO can be used. Connected to the marketing strategy, as a more general differentiator can be mentioned:
- *Length of lifecycle*
  If a product has a short lifecycle, this implies that often a new product-variant will be introduced, or even a whole new product line. Every new product-variant increases the demand for maintenance-friendliness. A whole new product-line increases the demand on easiness of modeling. The faster new product models will be needed and the more attention to change orders is needed.
- *Business-to-business or business-to-customers*
  In a business-to-customer environment, more standard products are sold. Since configuration software typically aims at products that are non-standard (standard products do not have options), it is more applicable to business-to-business environments.
- *Complexity of assembly*
  In typical line-assembly environments (assembly of airplanes), PCF is not successful, because a lot of additional functionality is needed to plan for instance arrival of components on the assembly line. In the future Baan will offer LAC as a solution for this environment, which is much more elaborate than CTO and contains much new functionality.
- *Sales volume per year*
  A high sales volume relates to a high number of orders. If a company has to enter a large amount of orders on a daily basis, it will require a system with a good performance.
- *Recurrence of relationship*
  Companies with a large amount of customers often sell standard products, and thus will not have a large need for a configurator. Companies with a few large customers will have increased demands on service. Also they have an interest in knowing which of their products is installed where and which customer has bought which product.
- *Intensity of interaction with customer*
  If a company uses quotes that have to be adapted often before a product is actually sold, they will have more need of support by an information system of the actual contact with the customer. Thus, they will have an increased demand on integration between FOS and ERP configurators.
- *Multi-site (Size of the company)*
  A company that is globally present uses a multi-site structure. This requires support of multi-site by PCF/CTO. These companies will also have a need for EDI, e.g. to be able to enter sales orders in a different country.

5. Test of business process design in practice



In the previous chapter, the use-case was introduced and a list of characteristics that distinguish different types of customers.
This chapter describes the test of the use-case and the typology in practice. In the next chapter, a 'confrontation' between the design of typology and the standard business process and what was found in practice is given.

5.1 Introduction

The standard business process described in chapter 4 cannot be seen as *the* way configuration software is used. In every company, deviations from this standard path will occur depending on its typical requirements or problems. Especially, not every company will have implemented all offered functionality, but will have its own adaptations to the standard business process. Some companies will even make their own customizations (adaptations to the standard software to adapt it to the customer's wishes). Of interest for Baan is to find out whether these differences can be attributed to specific characteristics of the company using it. If this is true and the characteristics are known, then Baan can get a better insight into the expected problems/requirements of its customers.
The following picture visualizes the steps (methods) used in order to test and adjust the use-case and the impression existing within Baan of the customer-base of PCF.
First, the company-visits will be described in section 5.2 . Then, an analysis of the installed base is given. From this conclusions are drawn.

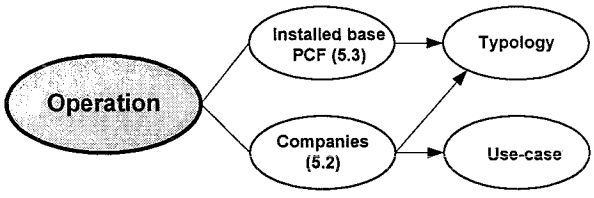


Fig. 5.1 Relationship between research-parts test-phase

5.2 Company visits

The best test of ideas is to confront theory with practice. To do so, seven case studies on customers of PCF have been performed and some material existing within Baan on customers has been analyzed. Of course, the limitation of companies willing to participate in the interviews has to be taken into account.

5.2.1 Selecting the cases

In selecting the cases of a multiple-case case study, it is important to make sure that either: (a) each case predicts similar results (a literal replication) or (b) each case produces contrasting results but for predictable reasons (a theoretical replication) [YIN90]. The cases in the research are chosen for the second reason. They each have different characteristics and therefore are expected to have contrasting results. Goal was to try to find customers that fit in each of the categories of table 4.1and that represent the installed base of PCF.

5.2.2 Goal

The goal of the case studies is to make a generalization, to say something about all potential CTO-customers. This is not done by collecting data on a sample and then making an inference about the whole population (or universe) on the basis of these empirical data (statistical generalization), but based upon a detailed research of several current customers: analytical generalization [SWA96]. The number of cases is

based upon the available time, the available companies and the extra-value per company visited. After each company visit, a trade-off was made on whether or not to make more company visits.

5.2.3 Method

To get the necessary information the following people were the best to interview:

- The person(s) responsible for making and maintaining the product/process models;
- The person(s) using PCF in practice (salespersons and/or production managers).

However, it has become clear that the knowledge on the use of PCF is often concentrated in the IT-department. The people responsible for PCF have often been working for a long time in their company and have a good knowledge of the sales and manufacturing processes.
To be able to compare the results of the different interviews in an adequate way, a 'standard' list with questions has been followed during all interviews.

5.3 Analysis of installed base PCF

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5.4 Evaluation of design and test-phases

The previous sections have discussed the test in practice. This section makes the connection between chapter 4 and chapter 5. So: What are the consequences of the results of the test of chapter 5 for the design of chapter 4.
The following questions are discussed:

- Does the use-case really cover all business processes found in practice? Did any of the observed business processes not fit into the business process? Goal is to complete the use-case of chapter four (5.5);
- Which differences between observed companies occur? (5.6.1);
- Which differences between the observed business processes can be observed? (5.6.2);
- Do similar companies have similar business processes? Does a clear connection between observed business process and observed type of company exist? (5.6.3).

5.5 Comparing the standard business process to those found in process.

As was mentioned in section 2.4 the goal of the use-case was to provide a business process into which *all* business processes of customers of Baan would fit. Looking at the companies that were visited, a number of processes have been observed, that are not part of the use-case. In addition, some deviations of the standard use-case are worth mentioning here:
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5.6 Companies and their business processes compared

The following section evaluated the use-case on completeness. This section discusses which subsets of the use-case (which processes) are supported by PCF in which company. First, the different types of companies are discussed, followed by the business processes.

5.6.1 Comparing the companies

- As was said before, seven companies were visited. This number of companies cannot represent all customers that are present in the market place for 100 %. Nevertheless, it was tried to cover all customers as good as possible.

The next table compares the different companies on the characteristics of table 4.1

Table 5.1: Companies compared

	A	B	C	D	E	F	G
Product	Furniture	Furniture	Glasses	Fences	Machines	Doors	Car mats
Number of variants in one model	High	Low	Low	High	High	High	High
Exclusiveness	High	High	High	High	High	Low	Low
Length of lifecycle	Long	Long	Short	Long	Long	Short	Short
Customer	Business	Business	Business	Business	Business	Business	Business
Sales volume	Medium	Medium	High	Low	Low	Medium	High
Recurrence of relationship	High	High	Low	Medium	High	Medium	Medium
Intensity of customer interaction	High	High	Low	High	High	Low	Low
Multi-site	Yes	Yes	No	Yes	Yes	Yes	No

5.6.2 *Comparing the business processes to each other*

In section 3.2.2, six business processes that could be supported by a FOS or ERP configurator were described. The table on the next page compares the business processes, which are supported in the visited companies. Here the six processes are listed again, followed by the name used in the table on the following page. The generation process is split up into generation of a bill of material, a routing and tooling, because not all companies have supported all of these.

1. Product development, creation of models (Visual support, CAD/CAM) (modeling);
2. Needs assessment (What does the customer want, prices, discounts, visual support (sales order creation, the quote phase of the sales process);
3. Configuring a product (Choosing the desired options) (sales order entry);
4. Generation process (Generic BOM, Generic Routing, Generic Tooling);
5. Manufacturing and planning of the actual product (Planning);
6. After-sales (Service).

Current Baan functionality only supports steps 2 to 5. The next table compares the visited companies on the business processes supported by PCF. For modeling and service, desired future support by a configurator is shown.

Table 5.2: Business processes supported by PCF

Confidential	A	B	C		E	F	G

Looking at this table, the following comments can be made:

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5.6.3 *Companies and their business processes*

Comparing the typology of section 4.3, the use-case of section 4.2 and what was found in practice, leads to the main conclusion, that all observed business processes are different and that the subset of business processes that is supported by the configurator, is not easy to assign to objective characteristics of the company.

The characteristics determining these differences do not seem to be only the type of company (direct/indirect sales, type of production process, type of selling process etc.), but also 'contingency factors' like:

- What is the budget for implementation, what is the maximum time we want to spend on our implementation?
- Which department is powerful? Is all power in the hands of the IT department, or all more parties involved in the design of the information system?
- What is the amount of capacity available for maintenance? Is someone willing to spend time on maintenance?

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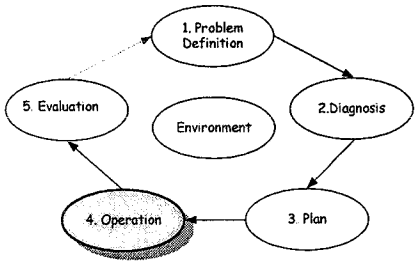
6. Example of a case study

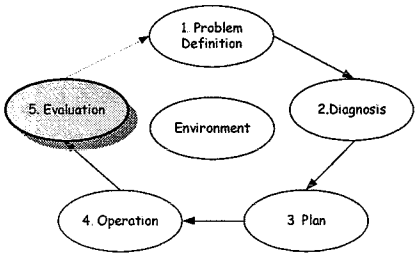


Seven case studies were performed during the assignment. This chapter provides the reader with one of these cases: Ahrend, an office design company. The Ahrend case was chosen, because Ahrend has a very thorough implementation of PCF. Both front office and back office processes are supported.
Goal of this chapter is to give an overview of the complexity of all issues regarding the implementation and use of a configuration-product in practice.

Company description

Total case is confidential.

7. Evaluation: Configuration Solutions



This chapter treats the subject of solution's thinking applied to the case of Baan configuration products. It tries to answer a number of questions. Do the Baan configuration products provide a good solution? To whom? How? What are important factors to evaluate when deciding on how to offer products to the market?

7.1 How can Baan offer the best solution?

In general, the visited customers were satisfied with the way PCF supported their configuration problems. However, they also indicate that the solution offered to them could be improved in several ways. Apart from customers, consultants also provided ideas on how the configuration solutions can be improved. This chapter discusses solution's thinking regarding the configuration products of Baan.

Alter [ALT96] lists a number of ways, in which an information system can be competitive, based upon the competitive strategies of Porter. The first one is by competing on price to the customer. However, since PCF is part of a total package with a fixed price, this is not relevant here. The second is competing on product differentiation. Alter gives the following ways to compete on product differentiation:
1. making sure the product fits the customer's needs;
2. making it easier to use the product;
3. making it easier to maintain the product.

With these criteria as a basis, the solutions offered by Baan can be evaluated. This is done in the first part of this chapter, according to the following four sub-parts:

1. Improved functionality: In which way can functionality be added to the current product-suite in order to make the solution better? This is described in section 7.2.
2. Good solution throughout the lifecycle of the information system; Assuming perfect functionality of the products, what can Baan do to also offer a good solution in the lifecycle of the customer's information system, meaning, also in the transition phase from one to another Baan version? Section 7.3 describes this.
3. Total solution: Even a perfect functionality throughout the lifecycle of the information system is dependent upon the rest of the information system. What can Baan do to embed the configuration products optimally in the total information system? This is the subject of section 7.4.
4. Solution throughout the lifecycle of the product, which is handled in section 7.5.

The analysis according to these four points regards merely the *contents* of the Baan system. In order to provide a broader point of view on solution's thinking, section 7.6 discusses how Baan could offer the best possible configuration solution from a *marketing* point of view; what should Baan consider regarding the marketing strategy of PCF/CTO? This is important to consider, since a good solution reaches further than just the information system itself.

The relationship between the ways of competing as mentioned by Alter and the four evaluation-criteria is visualized in the picture on the following page. This picture also shows the broader view from a marketing perspective.

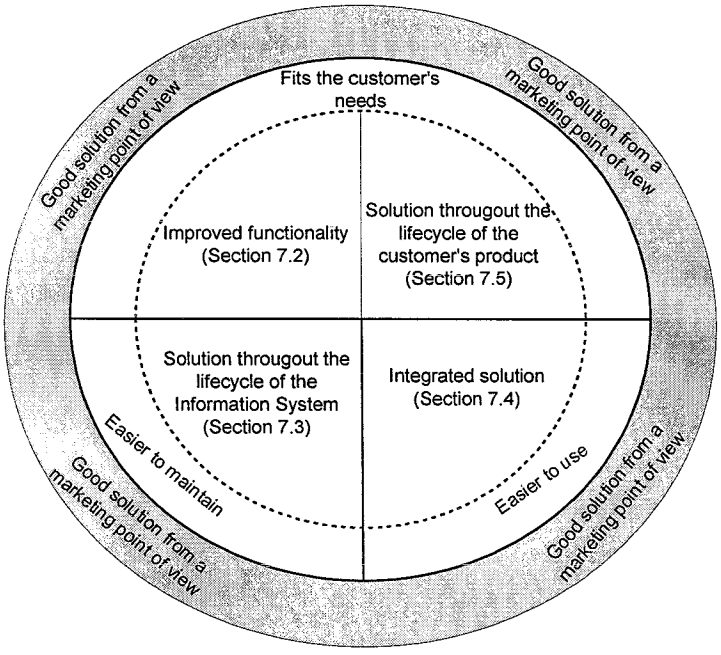


Fig. 7.2: Configuration solutions

7.2 *Improved functionality*

On the question on future expectations/wishes regarding the new Baan configurator, the general answer is, that one is satisfied with PCF's functionality, meaning that the need for the new configurator to have a large amount of new functionality is not very big.
Part of the problem statement was: *"...from this, new requirements can be the result, because of the gap that exists between what Baan has to offer and this ideal process...."*
The following sources for requirements were present in this project:

- Literature (appendix 11);
- Interviews with people within Baan (included in use-case, appendix 12);
- Consultants (appendix 13);
- Companies (appendix 16).

Most of the requirements that can be acquired from these sources have already been included in the use-case. However, some are not or not explicitly mentioned in the use-case. These are listed in this section along with some requirements that were mentioned very often.
The requirements marked with an asterisk (*) are not included in the first release of CTO, and are worth discussing for future releases.
Confidential.

7.3 *Good solution throughout the lifecycle of the information system*

A good solution is not only a solution that provides the best possible solution on this moment, but also in the future. One aspect of this is, that Baan should try to offer customers a solution with as low as possible total costs. The total costs of any system include the cost of building or buying the system plus the cost of ownership. The total costs of ownership are defined as: the total cost of implementing, operating and maintaining an information system [ALT96].

In order to minimize the costs two aspects are important:

- *Cost of building or buying--> Cost of hardware*
  Confidential.

- *Cost of implementing, operating and maintaining an information system--> cost of migration*

Based upon discussions with engineers within Baan, people from Product Management and customers with technical knowledge, the following possible solutions for the conversion problem have been formulated:

1. Basic situation: Baan offers only CTO in new Baan version
2. Baan offers both PCF and CTO in new Baan version
3. Baan develops conversion tool for features and options
4. Baan develops conversion tool for total PCF model
5. Minimize the amount of data in PCF ('Meyn'-method)

Rest of section is confidential.

7.4 A total solution

ERP configuration software with perfect functionality and good migration possibilities, but not integrated to other parts of the information system (standalone system) is still not an optimal solution. It also needs to be integrated.

Rest of section is confidential.

7.5 A good solution throughout the lifecycle of the product

As was explained in section 5.6, in the future configurators could support more steps in the lifecycle of a product. Two of those are support of product development in CAD/CAM and support of service. Table 7.3 indicates the customers that might need this type of support

Table 7.3: Solution throughout lifecycle of the product

Customer-type	Solution
Customers with complex products that need CAD/CAM support in product development phase	Support CAD/CAM (integrate to CAD/CAM)
Customer with a product that is repairable, needs maintenance	Support service

7.6 A good solution from a marketing point of view

The sections 7.2 to 7.5 discussed the contents of the information system; what should the information system be able to do, for which types of customers? This section discusses solution's thinking regarding the configuration products from a broader point of view. It discusses the 4 P's [KOT88] of PCF/CTO; which factors are important for Baan to consider when bringing this product to the market?

P1: Product
Regarding the contents of the product, some important factors were discussed in the sections 7.2 to 7.5. However, during the company visits, as discussed in section 5.6.3, it became clear that the value of the solution offered by Baan does not only consist of functionality of the system, but also of:

- The level of education of end-users;
- The level of education of consultants;

- The quality of documentation of functionality.

Therefore, these are important factors to improve in the future.

P2: Price

Baan delivers PCF/CTO as one of the parts of the Baan ERP-module. The customer pays for the total Baan ERP-module; independent of which parts of this module he wants to implement. Thus, the price of PCF/CTO on itself is not a competitive factor. Since PCF/CTO is strongly integrated to the rest of the ERP-module, it cannot be sold stand-alone. However, in the future, this might be a consideration.
Though it is outside the actual scope of this project, the following comment can be added: Customers must pay additional money for each additional Baan-user. If PCF/CTO is the most important part of the system and few people use the rest of the system, a customer can decide to purchase only few licenses for the total Baan ERP system to reduce costs. Thus, not everyone will have access to the configurator. This might not be a desirable situation.

P3: Place

As described in figure 1.1, Baan uses an indirect channel for sales and implementation of the Baan system. In this way, Baan gives away part of the control that it would have if it would provide sales and implementation itself. Thus, it is important for Baan to optimize communication with these indirect channel partners. At this moment, no established medium for communication with this indirect channel exists. However, these partners are a very good source of, for example, information on types of customers and requirements.
Another remark regarding the place is, that the Baan product is not equally known in all countries.

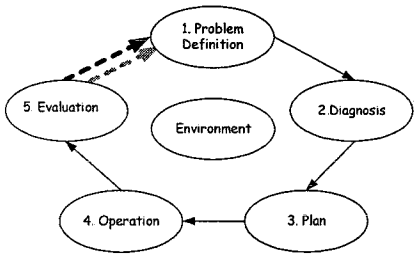
P4: Promotion

A large part of the promotion of the products of Baan is the responsibility of pre-sales consultants, who can approach possible customers (prospects) if they think that the Baan system might provide a good solution for them. Therefore, to attain good promotion of PCF/CTO, it is important for Baan to educate these pre-sales consultants on the possibilities of the product. Especially because it is a flexible product and it can be implemented in many different environments, as long as the right implementation is chosen. In America, promotion is additionaly partly the responsibility of the department Business Development, which has an active role in approaching prospects. Another part of the promotion is the responsibility of the indirect channel, Baan's partners. As discussed also in the previous paragraph, it is very important to keep the indirect channel up to date on e.g. new products.
Furthermore, it can be said that marketing efforts of the Baan products are currently concentrated on e-commerce and supply chain solutions and not as much on the ERP products. This might make it harder to increase the familiarity of the ERP products.

P5: Personnel

As an additional P to the traditional 4 P's, a fifth P can be added; personnel.
An observation is that a striking gap exists between the attitudes of the departments of Marketing/Product Management and Development towards development activities. While Marketing has a strong external market-oriented view, software engineers present a clear internal view, focusing on new technologies and sophisticated software solutions and less on customer requirements. It is a challenge for Baan to bring these two departments closer together, for example by improving communication between the two.

8. Conclusions and recommendations



This chapter evaluates the several steps that were executed during the assignment and the results of the assignment as a whole.
It starts with conclusions regarding the project plan, followed by some general conclusions. Each of these conclusions leads to recommendations/points of further research.

8.1 Conclusions

As was explained in section 2.2.1 two factors form the groundwork of this final thesis work. First of all requirements analysis and knowledge transfer regarding the configuration products and second, solution's thinking. These two factors are evaluated in the next two sections. Recommendations are given in section 8.3.

Requirements analysis and knowledge transfer (confidential version)

1. All companies visited in practice use only a part of the total functionality offered by PCF. As a reason for this, they indicate a lack of detailed knowledge on the functionality.

2. In order to decrease the knowledge-transfer gap regarding the CF-products, the following results have been attained:
   - A use-case regarding the use of CTO
   - Case studies of configuration customers.
   - Insight into the installed base of PCF. However, this insight is based upon incomplete figures, because no good registration of the installed base exists.

3. No implementation of the FrontOffice configurator is present in the Netherlands. This also means that no implementation exists of the e-configurator. Since e-selling is a real hype on this moment, this is remarkable.

4. Of those requirements found in practice, most have been acknowledged by Baan and are part of the use-case. Some additional requirements are listed in section 7.2.

5. Companies tend to let Baan-consultants do a lot of the modeling. However, it is important for the customers to do it themselves in order to get used to the product and to be able to maintain the models in the future. The same counts for making customizations. This improves the usability after implementation.

Solution's thinking

Chapter 7 treated solution's thinking applied to the special case of Baan configuration products. Here a more general evaluation of solution's thinking is given.

6. It is hard to make a typology of customers, because issues that cannot be characterized and determined in advance by Baan have a large influence on the way PCF is implemented compared to the factors defined in the typology..

7. A best configuration solution does not only provide the Baan customer with the best possible configuration functionality, but also with:
   - The best possible *migration* possibilities, throughout the total lifecycle of the information system. This has been investigated for the configuration product line, but also regards the whole Baan product line. Only a minor level of conversion is possible between the models in PCF and CTO. From the interviews with consultants, it has become clear that the modeling takes a lot of time and effort. Moreover, the people that have to do the modeling are sometimes unwilling to do so. If a company that has already PCF has the possibility to choose between CTO and PCF, the possibility exists that they will choose to stay in PCF.
   - The best possible *integrated* solution.
     In October, the Golden Gate project has been postponed because of priorities elsewhere (no capacity available). However, an integration between CTO and FOS Configuration will provide a lot of added value.
   - The best possible support of all steps of the *lifecycle* of the customer's product.
   - A well thought-about marketing strategy.

   This was discussed in chapter 7.

8.2 General Conclusions

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8.3 Recommendations

1. To successfully introduce CTO into the market, the following recommendations are made:
   - Baan seems to go more and more in the direction of Microsoft products. Visited customers indicate that they would like to see that Baan would support all kind of platforms (like Unix). For CTO, this provides problems, since CTO will only support NT platforms. Therefore, it is recommended to pay attention to the causes of this NT-only policy.
   - Possible migration scenarios for configuration solutions were proposed in this project. More research on the costs, advantages and disadvantages of these migration scenarios is necessary.
   - Baan should look into the way the education of both consultants and end-users on the field of object-oriented programming can take place.

2. To be able to provide end-users with the best possible knowledge on the functionality of the configuration products, Baan should focus on:
   - Educating final users;
   - Educating consultants.

3. In order to increase knowledge of the market within Baan Development the following recommendations are made:
   - It is recommended to look into the possibilities of improving communication between account management, consultants and indirect channel partners and Baan Development.
   - Investigate the possibilities of registration of the total installed base on a module level, instead of on the high-level (ERP, FOS) as it happens now.
   - Increase the frequency of direct contact between Baan Development and customers.

4. In order to increase the number of implementation of the FrontOffice configurator, the following is proposed: Look further into the possibilities of increasing the product familiarity of FOS Configurator on the market.

5. The product of Proloq is relatively new in the Baan suite and relatively unknown. However, it can provide a good solution in some cases where the configurators fail. Recommended is therefore to look into how to position Proloq compared to the configuration products and how to benefit optimally of this addition to the Baan product line.

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