



Pergamon

International Journal of Machine Tools & Manufacture 42 (2002) 417–426

INTERNATIONAL JOURNAL OF
**MACHINE TOOLS
& MANUFACTURE**
DESIGN, RESEARCH AND APPLICATION

Concurrent engineering in small companies

Marko Starbek, Janez Grum *

University of Ljubljana, Faculty of Mechanical Engineering, Ljubljana, Slovenia

Received 4 May 2000; accepted 20 July 2001

Abstract

In 1991, attainment of independence in Slovenia caused a drastic decrease in the domestic market for Slovenian companies. The companies which did not adapt to the new market conditions were destined for ruin. In this time several smaller companies were established which could adapt to new market conditions more easily. When these companies entered the world market they encountered several difficulties such as excessive flow times for development of new products. After a survey of available literature had been made it was found that those problems could be solved by transforming sequential engineering to concurrent engineering. The article presents the principles of sequential and concurrent product development processes. The market forces small Slovenian companies to a transition from sequential to concurrent engineering and as team work is the basic element of the concurrent engineering, special attention has been paid to workgroups forming in the loops of concurrent product development process in small companies.

A survey of published works in the field of planning teams in big companies has revealed that a three-level team structure is recommended in big companies. Analysis of the three-level structure has led us to the conclusion that a two-level team structure and matrix organisation should be preferred in small companies.

Presented are the results of planning a two-level team structure and matrix organisation of a small Slovenian company which produces mini-loaders. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Concurrent engineering; Team work; Matrix organisation; Track and loop technology

1. Introduction

An analysis of the world market has shown that the customer requirements regarding functions and quality of products are continuously increasing — but the customers are not willing to pay more for better products, neither do they accept prolonged delivery terms. Customers are becoming more and more demanding and their requirements are changing all the time. “Customer is the king” is becoming the motto of today [1].

In these circumstances only those companies can expect market success which offer customers the right products regarding their functions and quality, produced at the right time, at the right quality and at the right price. A product which is not manufactured in accordance with the wishes of the customers, which hits the market too

late, which is not of the proper quality and is too expensive cannot be successful.

The problems of unfulfilled wishes and requirements of customers and excessive times for product development are present in Slovene companies, as well.

23 individual and small-series production companies answered the questionnaire regarding unfulfilled wishes of customers and excessive times of product development. The answers show that these problems exist in all companies.

An analysis of the answers revealed that none of the companies had quality functions deployment (QFD) method integrated into their product development process — and QFD is the very method which is intended to solve the problem of unfulfilled wishes and requirements of customers; besides that, all companies use sequential engineering for product development.

The results of the questionnaire analysis were sent to all the participating companies and we tried to arouse their interest for co-operation in the project of gradual transition from the classic sequential to integrated con-

* Corresponding author. Tel.: +386-1-477-1103; fax: +386-1-2518-567.

E-mail address: janez.grum@fs.uni-lj.si (J. Grum).

current development of products (concurrent engineering).

A company which produces mini-loaders and silos in small series for the domestic market (and has plans for sales on the international market) decided immediately to participate in the project.

It was agreed with the company management that in the first phase of the planned implementation of concurrent engineering the problem of forming suitable teams for concurrent product development would be solved.

2. Concurrent product development

Concurrent (as well as sequential product development) usually consists of seven groups of activities:

- definition of goals,
- product planning,
- design,
- production process planning,
- production,
- manufacturing and assembly,
- delivery.

In concurrent product development there are interactions among individual groups of activities while there are no interactions in sequential product development. Track and loop technology was developed for the implementation of interactions [2]. The type of loop defines the type of cooperation between the overlapped activities. Winner [3] proposes the use of 3-T loops, where interactions exist between three groups of activities.

When 3-T loops are used (Fig. 1) the product development process consists of five 3-T loops.

On the basis of requirements and restrictions a transformation of input into output is made in each loop, as shown in the diagram of information flow in the track and loop process of product development (Fig. 2).

Analysis of the track-and-loop process of product development, as shown in Figs 1 and 2, reveals that the

concurrent engineering is not possible without well-organised team work.

3. Concurrent engineering and team work

We are dealing with team work when a team is oriented towards the solution of a joint task [4]. Team work is an integral part of concurrent engineering as it represents the means for organisational integration.

Requirements for team work are [2]:

- flexible, unplanned and continuous co-operation,
- feeling of obligations regarding achievement of goals,
- communication by exchange of information,
- ability to make compromises,
- consensus in spite of disagreement,
- reconciliation when carrying out interdependent activities,
- continuous improvements in order to increase productivity and reduce process times.

3.1. Setup of workgroups and team structure in big companies

Concurrent engineering is based on the multidiscipline product development team (PDT) [5,6]. PDT members are professionals from various departments in a company and representatives of strategic suppliers and customers (Fig. 3).

Team members communicate via a central information system (CIS) which provides them with data about processes, tools, infrastructure, technology, and existing products of the company. Representatives of strategic suppliers and customers — due to their great distance from the company — participate in the team just virtually, using the Internet technology (IIS — Internet information system) which allows them to use the same tools and technologies as the team members in the company [6].

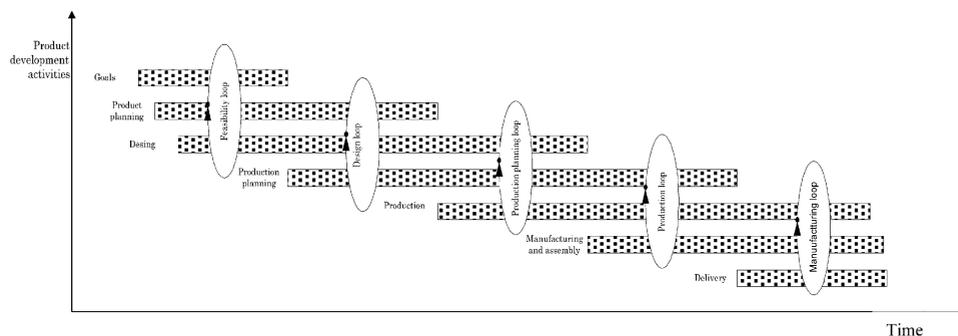


Fig. 1. Track and loop process in product development.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات