PROCEEDINGS
INTERNATIONAL CONFERENCE ON
COMPETITIVE MANUFACTURING
COMA ’07
The Challenge of Digital Manufacturing

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STELLENBOSCH, SOUTH AFRICA

Organised by
Departments of Industrial Engineering & Mechanical Engineering
PROCEEDINGS

International Conference on Competitive Manufacturing

COMA '07

31 January – 2 February 2007

Organised by

Departments of Industrial Engineering and Mechanical Engineering

Editor:
Dimitri Dimitrov
About CIRP

CIRP was founded in 1951 with the aim to address scientifically, through international co-operation, issues related to modern production science and technology. The International Academy of Production Engineering takes its abbreviated name from the French acronym of Collège International pour la Recherche en Productique (CIRP) and includes ca. 500 members from 46 countries. The number of members is intentionally kept limited, so as to facilitate informal scientific information exchange and personal contacts. In a recent development, there is work under way to establish a CIRP Network of young scientists active in manufacturing research.

CIRP aims in general at:
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- Promoting the industrial application of the fundamental research work and simultaneously receiving feedback from industry, related to industrial needs and their evolution.

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Foreword

Welcome to this third South Africa International Conference on Competitive Manufacturing hosted by the University of Stellenbosch and organised jointly by the Departments of Industrial Engineering and Mechanical Engineering.

In a small world where global trade is the new driving force conquering countries and continents alike, international competitiveness is becoming the ultimate challenge of the new millennium. It requires high quality products manufactured with state-of-the-art technologies at low cost under the assumption of highly efficient operations management as well as clear corporate goals and strategy. This in turn is facilitated by and dependent on improved engineering training, education, and relevant applied research, fueled by active interaction between academia and industry.

The main objective of the International Conference on Competitive Manufacturing (COMA '07) is to present recent developments, research results and industrial experience accelerating improvement of competitiveness in the field of manufacturing. The 70 papers selected to be delivered at the Conference deal with wide aspects related to rapid product development, agile manufacturing, operations management as well as enterprise design and integration. The worldwide participation and range of topics covered indicate that the Conference became truly a significant meeting of people striving similar aims. The event is an additional opportunity for communication between paper authors and attendees, which undoubtedly will serve as a further step towards exciting developments in the future. It also provides ample opportunities to further exploit international collaboration.

The Chairman and the Organising Committee express heartfelt thanks and gratitude to the Members of the International Programme Committee, who have given their help and expertise in refereeing the papers and will chair the technical sessions during the Conference, as well as to the authors for participating and ensuring that the high standards required on an International Conference were maintained. These thanks and gratitude is extended to our highly regarded keynote speakers.

The Chairman conveys sincere thanks to the conference sponsors for their generous support, which made this event possible, as well as to our exhibitors.

The International Academy of Production Engineering (CIRP) and the South African Institution of Mechanical Engineering are gratefully acknowledged for the scientific sponsorship given to the Conference.

Finally, the tremendous effort of the Organising Committee is appreciated. Grateful thanks are due particularly to the Conference Secretariat for ensuring the success of COMA '07.

We hope that you will find the Conference interesting and stimulating!

Prof. DM Dimitrov
Conference Chairman
ACKNOWLEDGEMENTS

Sincere thanks to our distinguished sponsors, whose generous support has contributed to success of the Conference

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QuickScan - An Assessment Tool for SME Based on the EFQM Excellence Model

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Abstract
Independent from branch of business, size, structure or maturity organisations need a management system to be successful. A lot of leaders of SME search for a suitable organisational concept for their business. The EFQM Excellence Model including RADAR seems for many leaders too complex. To deliver the thoughts of the model and RADAR to the responsible managers an efficient method was developed – called QuickScan. Starting by analysing the stakeholders and their expectations the QuickScan discovers the results used to assess the accomplishment of stakeholders’ expectations. The next QuickScan-step is to find out which activities, approaches or methods are deployed in the organisation, to manage processes, partnerships, finances, technologies, material, information and knowledge and employees. After answering the question “Which are the strategic goals of your organisation? Which are your key processes and indicators for deployment of policy and strategy?” the needs for action in the areas of improvement are prioritised.

Keywords
Total Quality Management (TQM), EFQM Excellence Model, Assessment for SME, QuickScan

1 INTRODUCTION: EFQM MODEL, RADAR-LOGIC, ORGANISATIONAL CONTROL CYCLE

Excellence models like the ‘EFQM Excellence Model’ (EFQM-European Foundation for Quality Management), the ‘performance excellence framework’ for the Malcolm Baldrige National Quality Award (MBNQA), the model for the Deming Prize (Japan) or the ‘performance excellence model’ in South Africa, are practical and appropriate tools to develop the applicable management system of the relevant organisation towards excellence respectively towards total quality management. The models include diverse and innovative approaches to achieve sustainable excellence in all aspects of performance.

An excellence model offers a framework to represent, analyse and assess the active efforts and results of an organisation and to support the active development in terms of proactive design.

The EFQM excellence model (Figure 1) is an open framework made up of nine criteria, five of them the so-called enabler criteria and four result criteria [1]. The models fundamental subdivision into enablers and results is based on the following questions: ‘How does an organisation achieve specific results?’ The results are attributed to the enablers. Innovation and learning from the results and the corresponding approaches close a control cycle.

The RADAR-logic represents the EFQM assessment model. It summarises concisely the requirements implied in enablers- and resultscriteria. RADAR is an acronym of Results, Approach, Deployment, Assessment and Review.

When applying the EFQM Model and the RADAR-logic to assess an organisation, the elements ‘approach’, ‘deployment’, ‘assessment & review’ are applied to every enabler-criterion-part, and the element ‘results’ to every result-criterion-part. Based on a gradual assessment this approach is quantified and leads to a measure of the company’s performance, the so-called excellence level.

The company’s organisational control cycle refers to the strategy definition process and the strategy implementation process and therefore focuses on the long-term control of the whole company. Finding a feasible balance between the different requirements of all stakeholders is the basic duty of management in the context of defining and realising the strategy [3,4].

![Figure 1 - EFQM Model for excellence](image-url)
2 FUNDAMENTALS ABOUT QUICKSCAN

The QuickScan is a form of assessment conducted with the top management during a workshop in which the as-is analysis of an organisation or department is performed. It is accomplished by using questions derived from the EFQM Model and the RADAR-logic. The participants do not need detailed information about the EFQM Model and the RADAR-logic and only have to answer the questions from their organisation's point of view.

The workshop's objective is to get a better common understanding of the entire organisation, its environment, its long-term goals and its current activities, performance and results using 'leading reflection'. This should reveal the core interrelations and action-impact cycles on which the EFQM Model and the RADAR-logic are focussing on. Based on this analysis the core improvement areas are defined in relation to the existing gaps [5].

The QuickScan workshop consists of the following steps [6]:

1. Recording the expectations of the organisation's stakeholders.
2. Questioning the existing key data and indicators and visualising them in Table form.
3. Resuming and recording in written form all used tools, instruments, programs, projects and procedures.
4. Making transparent the essential decision criteria used by the organisation.
5. Working out and prioritising relevant areas for improvement.
6. Working out a catalogue of measures with explicit responsibilities and deadlines.

It is recommended to document the participants' answers in standardised Tables (see Tables 1 to 5).

On approx. 20 flipchart pages a transparent written statement of the organisation's current situation is depicted with its essential interrelations and interconnections. This image describes what is both existent and working well. Not explicit are the missing or underperforming processes. Deficits affecting the action-impact cycles and non consistent interrelations as well as weak points with possible improvement areas are not a main theme of this assessment. Only after a rough drawing of the current situation of the organisation following the model criteria it makes sense to elaborate actions and improvement activities for the discovered gaps (e.g. missing integration of the applied instruments, missing correlation between key results and existing activities, etc.).

3 QUICKSCAN EVALUATION

During the development of the QuickScan the practical application of this methodology was performed and evaluated within a survey including 00 SME's from different industries, e.g. service and production and maintenance companies, hospitals and education institutes [7].

4 QUICKSCAN PROCEDURE

The following is a description of an ideal type of QuickScan. It summarises the most important five steps and indicates the relevant fields of analysis and questions. The example 'managing customer relation' concretises the single steps in order to clarify the QuickScan's application and results.

The QuickScan begins with a short description of the workshop's procedure and its objective followed by the definition of the relevant stakeholders of the organisation.

4.1 Step 1: Stakeholders and their expectations

The purpose of this step is to clarify the relevant groups of employees, customers, partners/suppliers, shareholders/owners and society which are interested in the organisation respectively its performance and which are actively looked after by the organisation.

The specific expectations and demands of every group are recorded. Relevant information about the respective stakeholders can be gained from interviews or from workshop protocols. This step seems to be very simple at first sight. The experiences from previous QuickScans show that it is not always possible to gain a homogenous concept about the identification and classification of the stakeholders as well as of their expectations.

Example: customer group expectations

Table 1 shows exemplary two customer groups, their expectations and requests.

<table>
<thead>
<tr>
<th>Customers/ Customer groups</th>
<th>Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common expectations of both customer groups</td>
<td>- High quality</td>
</tr>
<tr>
<td></td>
<td>- Adherence to delivery date</td>
</tr>
<tr>
<td></td>
<td>- Short delivery time</td>
</tr>
<tr>
<td></td>
<td>- Availability</td>
</tr>
<tr>
<td></td>
<td>- Low prices</td>
</tr>
<tr>
<td></td>
<td>- Product Innovations</td>
</tr>
<tr>
<td></td>
<td>- Technical support</td>
</tr>
<tr>
<td></td>
<td>- Smooth processing</td>
</tr>
<tr>
<td>Final customer</td>
<td>- No failures</td>
</tr>
<tr>
<td>Distribution partner</td>
<td>- Specific contact person</td>
</tr>
<tr>
<td></td>
<td>- High margin</td>
</tr>
</tbody>
</table>

Table 1 - Example: Customer groups and their expectations.

At the end of this step the most important stakeholders and their core expectations are highlighted. A brief reflection concludes step 1.
4.2 Step 2: Results

In this step we obtain an overview of all the key results used for the organisation's control. Backgrounds of the questioning are the result criteria of the EFQM Model: key performance indicators (monetary and non-monetary), society-related results, employee as well as customer-related results and indicators.

Therefore, it is especially important to consistently and rigorously observe the correlation with the stakeholders' expectations clarified in step 1. To obtain a closed action-impact cycle and consistent interrelations, the used key data and indicators basically have to provide information and facts about the fulfillment of the stakeholders' expectations. For the results of the EFQM Model the core RADAR-logic questions are:

- Which key indicators or results are used?
- Over how many years do these recordings date back? Is it possible to identify trends (3 years)?
- Which target values exist for the specific results? How are these targets set?
- Are there comparisons with other organisations?
- Are the results segmented (e.g. different customer groups, employee groups, products, processes, locations)?

According to the EFQM Model trends, targets, external comparisons and segmentations must exist for every indicator (see Table 2).

<table>
<thead>
<tr>
<th>Customer results</th>
<th>Trends</th>
<th>Targets</th>
<th>External comparisons</th>
<th>Segmentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Number of new customers / year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Customer related performance indicators</td>
<td>Trends</td>
<td>Targets</td>
<td>External comparisons</td>
<td>Segmentation</td>
</tr>
<tr>
<td>Rate of return of the customer satisfaction</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Delivery times</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Number of customer complaints</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Costs of customer complaints</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 2 – Example: Customer related results and performance indicators.

Example: Customer related results and performance indicators

In this step it has to be clarified which key results and indicators are used to evaluate customers' satisfaction and how their expectations of the organisation are fulfilled. Additionally, indirect indicators have to be recognised. Some selected results and performance indicators from the customers' point of view are represented in Table 2.

For all four result dimensions the existing key results and indicators of the organisation are listed. The participants' reflexions on the coach's questions are recorded. Referring to the customer related results and performance indicators (see Table 2) this example clarifies the improvement potential that is discovered during the QuickScan.

Because customer reviews have only been introduced recently, trends are not available, neither can these results be compared with other organisations. According to the concept of excellence and the EFQM Model, these results have to be completed as well as indicators for image and loyalty.

At this point in time we still don't discuss the indicators' relevance nor possible alternatives; these issues will be taken care of in a later stage. In the QuickScan's current phase the focus is on the representation of the current situation. A second reflexion concludes step 2.

4.3 Step 3: Enablers

Using the EFQM Model's five enabler criteria all kind of existing procedures, methods, tools, projects, activities, programs etc. in the organisation are collected and recorded in written form. Basically this collection takes place at the criteria level of the EFQM Model, for some areas even at the level of criterion parts question are raised.

For the enablers of the EFQM Model the RADAR-logic refers to the different approaches and demands answers to the following questions:

- Is the approach well-founded and integrated? A well-founded approach in terms of excellence means, that it is clearly justified, that implementation processes are defined and that it is orientated towards the stakeholders' expectations. An approach is integrated, if it supports the policy and strategy and is integrated reasonably with other procedures.

- Is the approach implemented systematically? An approach is implemented systematically in terms of excellence, when the implemented areas are determined clearly and realised based on a defined structure.

- Has the approach been assessed and reviewed? An approach is assessed and reviewed in terms of excellence, when the efficiency of the approach and its deployment is measured, when the organisation learns from best practices.
when potential improvement areas are identified and prioritised and when these improvement’s implementation is planned.

The main idea of the RADAR-logic regarding the connection between enablers and results, is to question thoroughly the consistency of the action-impact cycles and interrelations of the organisation’s key results and indicators.

**Example: Managing the customer relations**

In this step it has to be clarified what the organisation undertakes to intensify its customer relation and to satisfy the customers' expectations. Some selected approaches to manage the customer relation are represented in Table 3.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Founded &amp; Integrated</th>
<th>Systematic &amp; Structured</th>
<th>Assessed &amp; Reviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer reviews</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Management of customer complaints</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Sales conferences</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Training offers for customers</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Seminar offers for customers</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Engineer and customer meetings</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 3 – Example: Procedures to manage customer relation.**

The existing approaches of the organisation are recorded for all enabler dimensions. According to the procedure to manage the customer relations (Table 3) this example points out the improvement potential that appears during the QuickScan. There are a number of tools/procedures to manage the customer relations which are neither implemented systematically nor its effectiveness measured. At this point - like for the results - their relevance and possible alternatives are not yet discussed; these topics will be evaluated at a later step. At the current QuickScan phase the analysis is focused on the current situation.

**Example: Policy and Strategy – Closer to the customer**

After the managers' representation of their entire organisation with its relevant key data and activities it is useful to mention strategic contents and objectives.

This step should clarify the strategies and the organisation's objectives as well as the key processes to achieve the named strategies. As an example for the organisational control cycle the strategy 'closer to the customer' will be described (Table 4).

This table has to be worked out for all the identifiable/defined strategies of the organisation.

<table>
<thead>
<tr>
<th>Key process</th>
<th>Owner</th>
<th>Stakeholder</th>
<th>Key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensify customer relation</td>
<td>sales director</td>
<td>Customer Employees Owner</td>
<td>- Customer satisfaction - Sales from current customers - Offer realisation rate - Number of new customers - Sales from new customers</td>
</tr>
</tbody>
</table>

**Table 4 – Example: Strategy - Closer to the customer.**

After having created this table the coach has to focus the attention back to the key indicators and results of step 2. These indicators coincide ideally with the identified indicators of the key processes or can be derived from them. Now the organisation's interrelations are drawn completely and the correlation between enabler and result criteria is transparent.

If there are serious inconsistencies it is up to the coach to reveal them.

In the example ‘managing customer relation’ there is one main indicator for the key process 'intensify customer relation' (offer realisation rate) that does not appear in the customer related results and indicators (see Table 2). Therefore this indicator which is already measured within the organisation will be integrated in the reporting system. The customer satisfaction and the number of new customers per year are already recorded (see Table 2) and used in the reporting system; the sales indicators (old and new customers) are related to the results and also integrated in the reporting system.

The results have a strong correlation in this concrete example. But large gaps in the organisational control cycle exist due to missing procedures to achieve the strategy 'closer to the customer'. Therefore, the organisation implements a program that analyses all approaches and activities that imply direct customer relations and elaborates measures to intensify them. At the same time the sales director is charged to work out new concepts for the customer handling.

Furthermore a very important reflexion potential over interrelations and action-impact cycles is developed through the comparison of the enabler and result dimensions. Figure 2 shows exemplary correlations questioned during the QuickScan.
Figure 2 - Correlations analysed during the QuickScan.

To go more into details the following questions (questions are related to Figure 2) can help to analyse the interrelations with the objectives to find out incoherence, derive improvement areas and to close the action-impact cycles.

1. (How far) Can the results give information about the expectations and their changes?
2. (How far) Is the approach verified by results?
3. (How far) Is the approach derived from the expectations?
4. Company's organisational control cycle:
   - On which results is the strategy based?
   - On which assumptions is the strategy based?
   - Which key processes implement the strategy?
   - Are the key processes verified by results?
5. Is the approach derived from the strategy?
A basic principle in the application of the QuickScan is to make interdependencies (e.g. between processes) transparent. The step 3 is concluded by a reflexion about the action-impact cycles and the organisation's interrelations.

4.4 Step 4: Determination of the main decision factors
Before expressing specific areas for improvement it is important to clarify how the organisation takes in principal decisions on improvements, projects etc. The required decision factors address practical and understandable aspects to set priorities in Step 5 and must not be theoretical or of higher value.
Example: Determining decision factors
1. Realise areas for improvements that lead to sustainable improvement.
2. Realise areas for improvements which can be done during the day-to-day business with little supplementary effort.

4.5 Step 5: Listing and prioritising areas for improvements and improvement proposals
In this step the participants are asked to mention relevant areas for improvement and improvement ideas from their organisational and overall point of view on moderation cards.
After clustering these suggestions and prioritising the improvement clusters using the decision factors determined in step 4 it is verified whether the improvement clusters coincide with those worked out during the QuickScan.

Example: Prioritisation and measures to manage customer relation

<table>
<thead>
<tr>
<th>No.</th>
<th>Priority</th>
<th>Measure proposal</th>
<th>Owner</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>Add key indicator „Offer realisation rate into the reporting system</td>
<td>Head of controlling</td>
<td>date</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Analyse current customer activities and develop proposals for intensification</td>
<td>Sales director</td>
<td>date</td>
</tr>
<tr>
<td>3</td>
<td>2/3</td>
<td>Develop new concept for customer relation</td>
<td>Sales director</td>
<td>date</td>
</tr>
</tbody>
</table>

Table 5: – Example. Improvement proposals and prioritisation.

It is necessary to execute Step 4 to achieve traceable and prioritised improvement proposals that are transparent for the employees. Finally a rough planning of the improvement clusters regarding deadlines and responsibilities takes place and finally a final reflexion completes the QuickScan.
5 SUMMARY
Within the one-day lasting coached workshop with the management of the organization, the whole organization is mapped into the EFQM Excellence model but no scoring is performed. Interestingly, applying this tool to SMEs, it turned out that also business units of big companies, holdings or hospitals are eager to perform an efficient one-day lasting QuickScan to get to a common understanding within the management of these organizations. If you use the QuickScan also to determine the excellence level, you need at least two full days for the workshop and also two experienced assessors.

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7 REFERENCES

8 BIOGRAPHY
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