

# Chapter 4

## Implementation of Revenue Management in the Process Industry in North America and Europe

### 4.1 Background of the Second Empirical Study

To the best of our knowledge, when this second study was conducted, there were only two empirical studies on the use of RM in the manufacturing industry. The first, by Kuhn and Defregger (2005a, b), based on a sample of 107 companies in the paper, steel and aluminium industries analyzes whether the prerequisites for RM are met and whether RM is used, concluding that around 60 % of the companies analyzed fulfill the prerequisites but that RM is still not widely spread. The second study by Kolisch and Zatta (2009) investigates the use of RM in the German PI.

Thus, in this research the focus of the first study is extended to Europe and North America to both assess how RM is employed in these regions and to make comparisons between them. As in Kolisch and Zatta (2009), the PI is considered. To this end, the results of an exploratory study are reported and working hypotheses are derived. Thereafter, the results of the quantitative study are reported. This chapter ends with conclusions and a brief outlook for further research.

### 4.2 Exploratory Research and Hypothesis Derivation

Before starting the quantitative study, an exploratory study was conducted based on 22 interviews with experts from the PI in the chemical (5), pharmaceutical (5), metal (4), paper (3), oil (3) and glass industry (2). From the explorative study, we derived a number of statements on RM.

The relevance of RM was considered as high by all interviewees: ‘Several companies of the PI have focused their attention on cost-cutting activities in the last few years and many of those have succeeded in increasing profits by reducing costs. However, the scope for further cost cutting is limited. Therefore, RM will become increasingly important as a lever to increase profits’ (chairman,

international metal producer). ‘The use of RM in the PI is quite recent. Many companies of our sector intend to make extensive use of it. However, a standard solution does not exist. If there were one, nobody would do without it’ (division director of a pharmaceutical company).

Several interviewees stated that the importance of RM increases as the size of the company increases and the longer RM has been used. The Sales Vice President of a leading oil corporation stated: ‘We have been working on the cost and volume levers for years. RM and pricing have only recently become a top priority for us as well as for our competitors.’

Interestingly, the larger a company is, ‘the higher is the professionalism with which RM is used, as, compared to smaller companies, larger budgets and more resources are available’. According to the respondents, the period of use also has a positive impact: ‘The longer RM is in use, the stronger the learning-by doing effects are, especially in the first years following its introduction, and the higher is the success of this tool’ (Business Unit Manager, specialty chemicals company). In addition, a trend from single capacity-based to price- and capacity-based systems was observed: ‘During the first years of use RM was purely capacity driven. Already from the third year onwards we included a price component. Today, our RM system is based on an integration of price and capacity management’ (member of the board, international generics producer).

Another testimonial described the positive effect of integrating RM within the IT landscape: ‘The advantages of RM became more evident when we shifted from a basic Excel- to a SCM-application. This allowed us to monitor the machine parks of different plants in real time more efficiently and thus to detect and sell available capacities, while also increasing the acceptance of RM within the company’ (head of production, chemical corporation).

When asked about the future of RM in the PI, the experts expected an increasing use of RM applications: ‘There is a clear trend to put RM and pricing on the management agendas. This phenomenon will become more prevalent as fewer companies can afford to neglect sources of profitability. RM and price optimizations offer sources that were not sufficiently exploited in the past’ (supply chain manager, paper- and packaging company).

Differences between and within continents have also been highlighted: ‘The first significant RM applications in the manufacturing sector appeared in North America. Europe followed, with northern Europe being the pioneer, followed later by southern Europe. This was what I noticed both in our company, which has its own premises in all these regions, but also at major competitors’ (head of corporate business development, global oil company).

On the basis of the expert interviews, we formulate the following working hypotheses:

**Hypothesis 1:** The importance of RM is generally high and becomes higher with increasing turnover and the period of use.

**Hypothesis 2:** The peculiarities of the RM approach depend on the period of use. Over time, price- and capacity-based systems have been more frequently compared to pure capacity-based systems.

**Hypothesis 3:** The contribution of RM to revenue growth depends on the implementation.

On the basis of these working hypotheses, we want to obtain insight into the assessment and use of RM in the PI across different geographic regions.

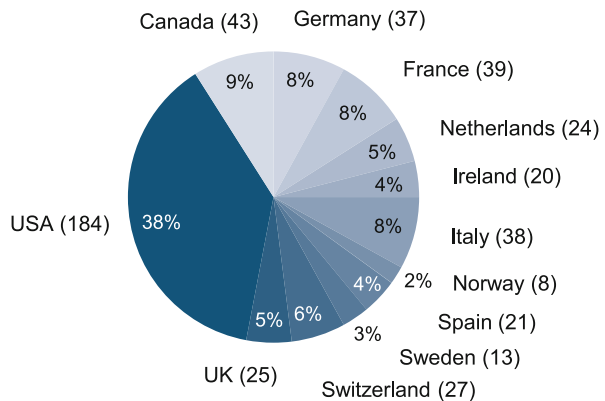
### 4.3 Quantitative Study: Data Collection

The study was conducted by personal interviews. Four hundred companies in the PI were contacted in North America and 500 in Europe. The companies were randomly selected using a Dun & Bradstreet database (Dun & Bradstreet Sales & Marketing Database 2005).

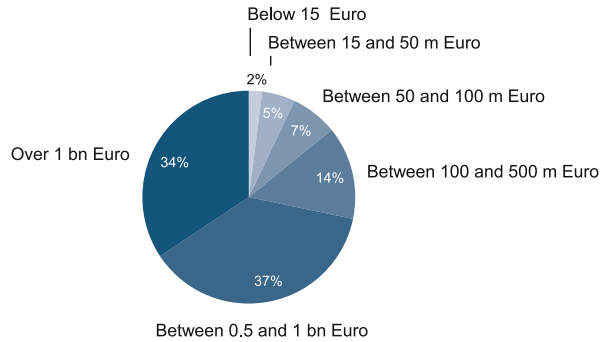
The data collection that involved 479 participating companies was completed in July 2009. A total of 227 of the participating companies were situated in the regional cluster North America (Canada and the United States), whereas 252 companies were located in the regional cluster Europe (Germany, France, Netherlands, Ireland, Italy, Norway, Spain, Sweden, Switzerland and the United Kingdom), see Figs. 4.1, 4.2 and 4.3.

Respondents were managers responsible for the activities linked to RM. Personal interviews were conducted on the basis of a semi-structured questionnaire (see Appendix A.2). At the beginning of each interview, we provided the definition of RM given by Phillips (2005): ‘Revenue Management refers to the strategy and tactics used by a number of industries . . . to manage the allocation of their capacity to different fare classes over time in order to maximize revenue’. In this way we were assured that there was a clear and consistent understanding of RM among the respondents of the study.

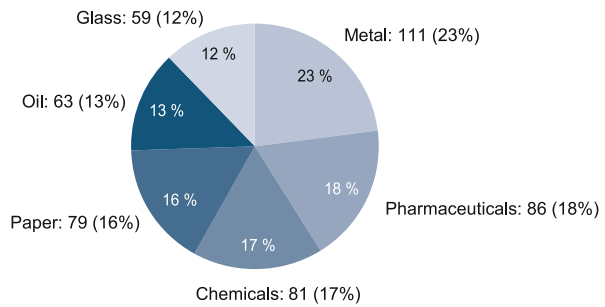
**Fig. 4.1** Distribution of the interview partners per country



**Fig. 4.2** Distribution of the interview partners per turnover



**Fig. 4.3** Distribution of the interview partners per industry



For the validity of the results, it is necessary to assess whether managers decided to participate in the study independently of their opinion on the importance of RM (Wolfe 2003). To verify this issue, all targeted interviewees were first asked about the importance they attributed to RM within their company. Three per cent of the non-participating target-interviewees and 2% of the participating interviewees attributed low importance to RM. From this it can be concluded that there was no non-response-bias.

## 4.4 Results: RM in Practice

### 4.4.1 Importance of RM

Respondents were asked to assess the importance of RM in the PI (Likert scale from 1—not important to 7—very important). The overall score was high, but a two-tailed t-test shows a highly significant difference ( $P=0.000$ ,  $T=9.881$ ,  $DF=477$ ) between the average value (AV) in Europe (5.87) compared to North America (6.78).

Participants were also asked to judge the future importance of RM in the PI for different time horizons (short, medium, long term). Two-tailed t-tests show for all time horizons that North American companies generally consider RM as more important than European companies. In the short term (within the next 6 months), the AV is 5.5 for Europe, whereas it is 6.42 for North America ( $P = 0.000$ ,  $T = 6.58$ ,  $DF = 477$ ); in the medium term (in the next 6–18 months), the AV is 5.75 for Europe, whereas it is 6.63 for North America ( $P = 0.000$ ,  $T = 7.31$ ,  $DF = 477$ ); and in the long term (not before the next 18 months), the AV is 6.58 for Europe, whereas it is 6.78 for North America ( $P = 0.011$ ,  $T = 2.549$ ,  $DF = 477$ ). An explanation for this difference could be the fact that North American companies introduced RM earlier than European companies (see the next sub-section); consequently, they judge its application as more valuable—as indicated in the exploratory study and hypothesized (Hypothesis 1). Although in the short and medium term, the difference between the AV of North America and Europe is still high, that is 0.92 and 0.88, respectively, it amounts to only 0.2 in the long term. On the basis of this gap reduction over time, we believe that in the long term RM will become equally important in the two continents.

### 4.4.2 Focus, Implementation and Period of Use of RM

Figure 4.4 illustrates that 67 % of RM applications are capacity based, whereas only 22 % are based on price management and 11 % rely on price and capacity management. When comparing the two continents, a highly significant difference emerges ( $P = 0.000$ ,  $X^2 = 36.619$ ,  $DF = 2$ ), see Figs. 4.5 and 4.6: Companies in North America use proportionally more price-based approaches, that is 47 % of the North American companies choose price- or price- and capacity-based RM applications, compared to European companies, where this percentage amounts to 21 %.

In contrast, 79 % of European companies indicate that they use RM based on capacity management, whereas in North America this holds true only for 53 %.

RM implementation is carried out by over half of the companies through electronic data interchange (52 %), for example Excel-based tools. In 29 % of the

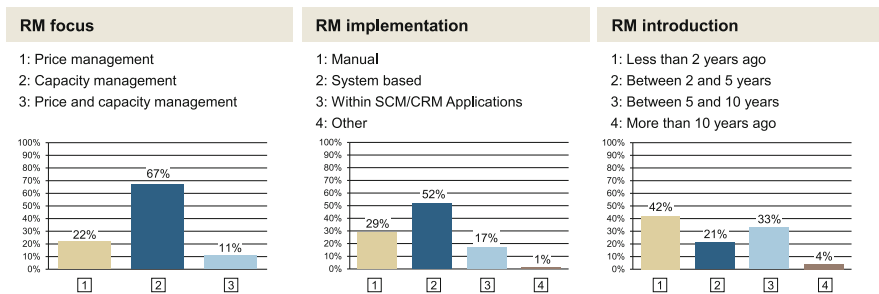


Fig. 4.4 Focus, implementation and period of use

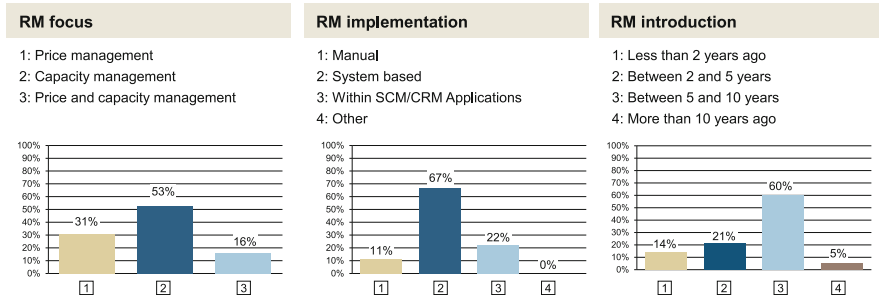


Fig. 4.5 Focus, implementation and period of use in North America

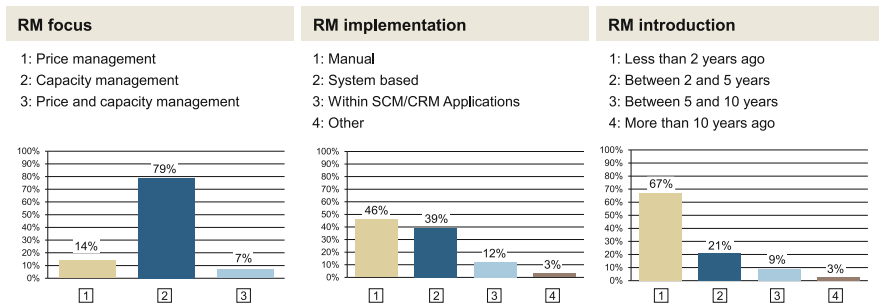


Fig. 4.6 Focus, implementation and period of use in Europe

cases, the data are recorded manually, whereas in 17 % it is processed through automated IT-systems, typically integrated in SCM or CRM applications, as illustrated in Fig. 4.4. In Europe, manual applications prevail with a share of 46 %, followed by system-based applications with 39 % and SCM/CRM applications with 12 % (see Fig. 4.6). In North America, the dissemination of system-based applications is with the highest 67 %, followed by SCM/CRM applications with 22 % and manual applications with 11 % (see Fig. 4.5). This indicates a more sophisticated use of RM in North American companies.

In 63 % of the cases, the period of use of RM is 5 years or less, as illustrated in Fig. 4.4. More specifically, the period of use of 42 % of the respondents is 2 years or less, whereas for 21 % of the respondents the period of use is between 2 and 5 years and 33 % of the respondents report a period of use between 5 and 10 years. The period of use is more than 10 years for only 4 %. In contrast to the service industry, and more specifically to the airline industry, the experience with RM in the PI is thus much more limited. In accordance with the findings of the exploratory study, differences with respect to the period of use of RM can be detected between North America and Europe.

Although European companies had typically introduced RM less than 2 years previously, the majority of North American companies had introduced RM 5–10

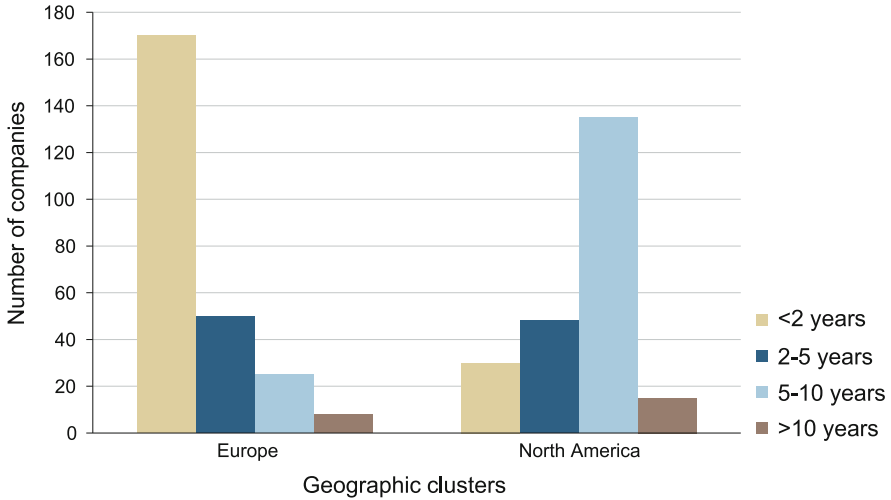


Fig. 4.7 Period of use in North America and Europe

years previously ( $P = 0.000$ ,  $X^2 = 175.45$ ,  $DF = 3$ , see Figs. 4.5 and 4.6. As illustrated in Fig. 4.7, the cluster of North America clearly shows a longer period of use compared to Europe. Within the European countries, it can be observed that the southern countries Italy and Spain have used RM significantly less than the other European countries ( $P = 0.000$ ,  $X^2 = 26.770$ ,  $DF = 3$ ). Apart from the above stated differences between European countries, no further significant differences could be found.

### 4.4.3 Current Use of RM

The overall importance of RM is generally high and increases—as indicated in the exploratory study and hypothesized (Hypothesis 1)—with a higher turnover of the responding company. Figure 4.8 illustrates the degree to which companies regard RM as important depending on the companies’ size measured in turnover. Highly significant differences ( $P = 0.000$ ) emerge when the importance of RM is assessed in relation to company size measured in yearly turnover in North America and Europe, both in terms of main effects and in terms of interaction effects. Main effects demonstrate that in both continents the importance of RM increases with company size. Interaction effects show that for companies with a low turnover, North American firms attribute a higher importance to RM than European companies, whereas the difference is less distinct for companies with a high turnover.

There is a positive correlation between the period of use (in years) and the importance of RM ( $R_{\text{Spearman}} = 0.293$ ,  $P = 0.000$  one-tailed), which supports

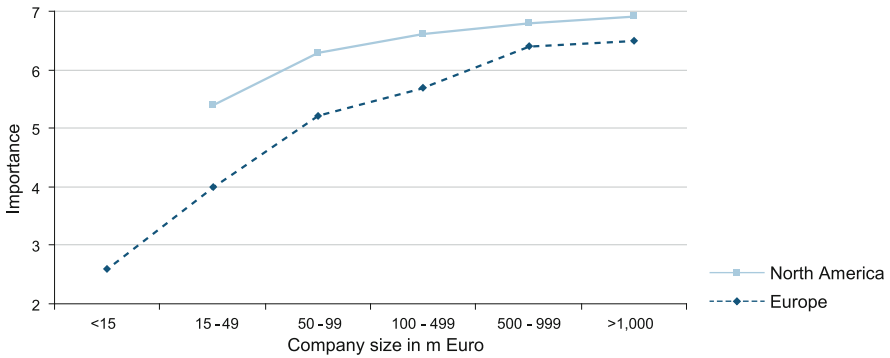


Fig. 4.8 Importance of RM in relation to company size (turnover)

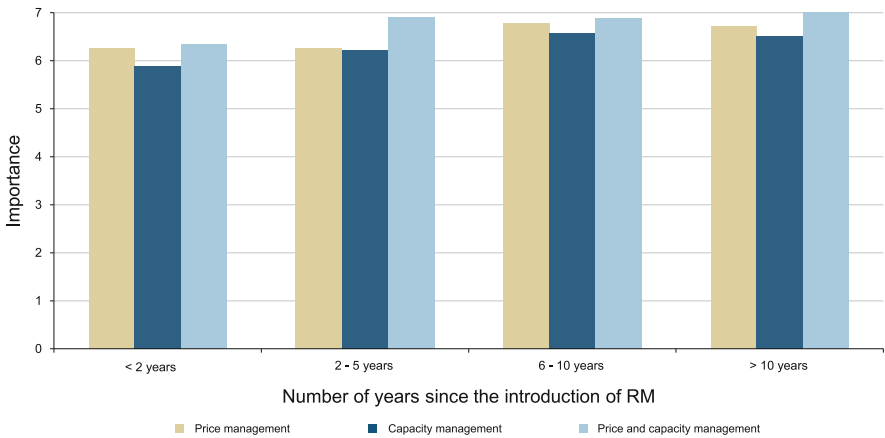
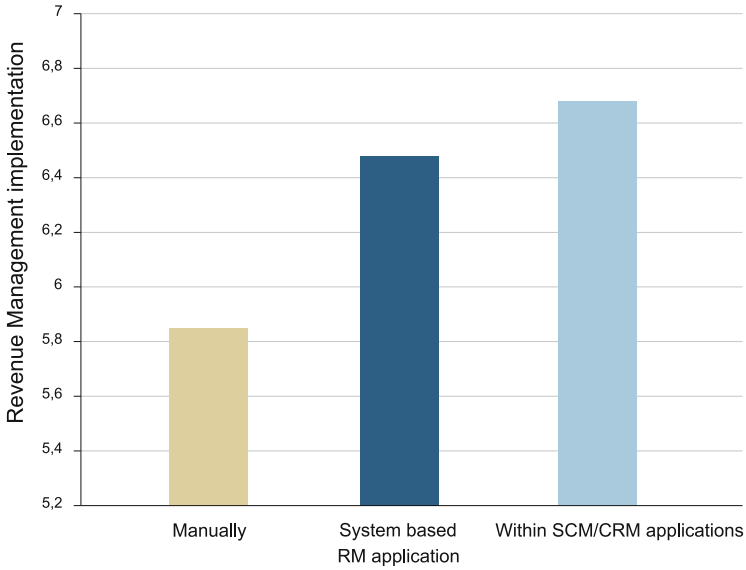


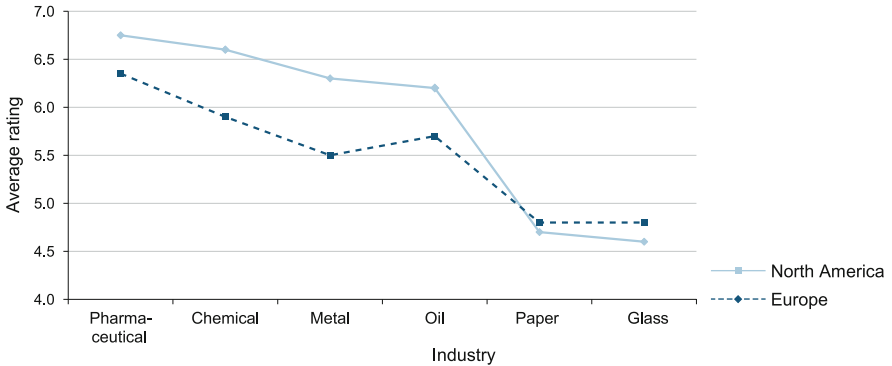
Fig. 4.9 Perceived importance of RM concepts in relation to period of use

Hypothesis 1. A possible explanation for this observation is that companies have to learn about the effective use of RM systems. The comparison of RM importance in relation to the approaches reveals significant differences ( $P = 0.000$ ): Price- and capacity-based approaches are classified as most important, followed by price-based and capacity-based approaches (see Fig. 4.9). Figure 4.10 shows the importance of RM in relation to the type of application (Hypothesis 3). In the case of a manual application, there is no systematic data integration in the IT landscape, whereas a system-based RM application implies some kind of integration within the existing IT-systems, typically supported by Office products such as Excel or Access databases. In the third case, RM is integrated within an SCM, CRM or Enterprise Resource Planning system. ANOVA with post hoc tests (Bonferroni) shows a significant difference in the importance between manual and system-based application (ANOVA,  $F = 3.588$ ;  $P = 0.014$ ; Bonferroni,  $P = 0.007$ ).





**Fig. 4.10** Importance of RM in relation to its implementation



**Fig. 4.11** Future use of RM in different industries in Europe and North America

#### 4.4.4 Future Use of RM

The interviewed companies in the PI expect an increase in the use of RM throughout the industry (AV = 5.66; standard deviation 1.61; 1–7 Likert scale), especially in the pharmaceutical (AV = 6.55) and the chemical (AV = 6.26) industry.

North America expects a higher use of RM in all industries except for the paper industry (see Fig. 4.11). The ratings of the respondents vary highly significantly from industry to industry (ANOVA (within subjects):  $F = 113.4$ ;  $P = 0.000$ ).

## 4.5 Trends

### 4.5.1 Barriers to the Introduction of RM

The respondents mentioned a number of barriers related to the implementation of RM (Fig. 4.12). In decreasing order of importance, these are: (1) Lack of a clearly defined and/or communicated price strategy, (2) no suitable RM approach identified, (3) fear of price decreases or margin losses, (4) no or limited experience with RM, (5) lack of data availability, (6) inappropriate or lack of IT-systems for the support of RM applications and (7) lack of support from top management.

Several interviewees stated that pragmatic concepts that can be implemented in practice would be helpful in overcoming the inability to identify a suitable RM approach. Even if the literature contains RM concepts for the manufacturing industry, their practicability is regarded as limited. Inappropriate IT-systems on the customer side, the lack of an RM culture within the company or inappropriate supporting processes are not considered critical barriers to the use of RM. The lack of acceptance of an RM system on the client side has not been mentioned. Interviewees do not fear that their clients will get used to and permanently request low prices. When confronted with the benefits and risks of RM, companies assess benefits higher than risks (Table 4.1). In terms of benefits, interviewees mention the increase of turnover and capacity utilization, cost reduction, the use of idle capacities, efficiency gains and access to new clients and markets. Additional ‘soft’ benefits mentioned are career opportunities for production or plant managers, the introduction of a culture of profit maximization, company-wide and cross-production site harmonization of capacity management approaches, as well as the enhanced control of capacities.

Considering risks, interviewees mentioned overdrawn expectations with respect to an increase in profit, high investments in the IT-systems, resistance to the introduction of RM within the company, lack of know-how, complexity increase, as well as the loss of management focus.

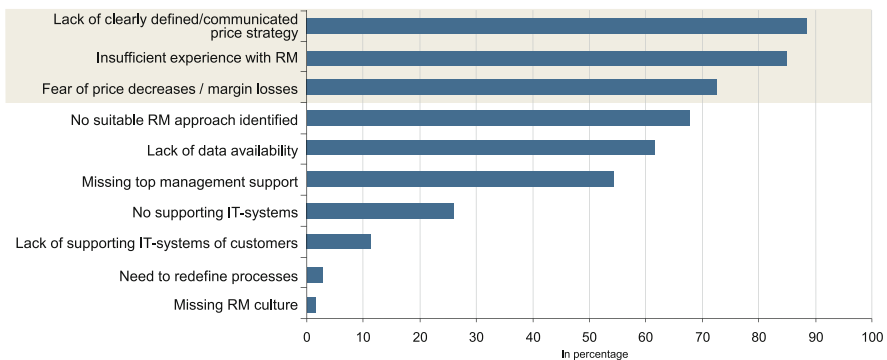
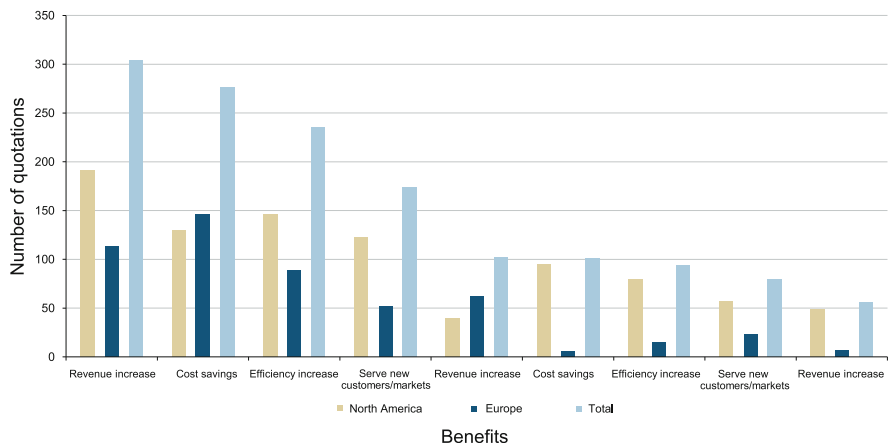


Fig. 4.12 Barriers to the introduction of RM

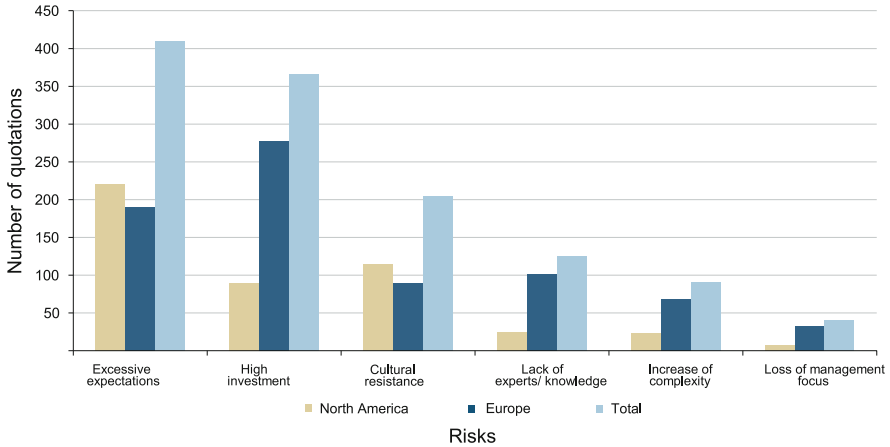
**Table 4.1** Perceived benefits and risks of RM, ranked by frequency of nominations (multiple nominations possible)

Benefits	Risks
<ul style="list-style-type: none"> <li>• Revenue increase through enhanced pricing and better capacity utilization</li> <li>• Realization of cost savings based on maximum use of current machines and over-capacity dismantlement</li> <li>• Efficiency increase</li> <li>• Possibility to serve new clients or new markets via better capacity management</li> <li>• Possibility to obtain new revenue streams due to optimal capacity management</li> <li>• Professional enrichment of production managers becoming revenue managers</li> <li>• Harmonization of different capacity handling strategies in corporations with multiple production sites through a single and consistent RM approach</li> <li>• Enhanced monitoring of existing capacity</li> <li>• Introduction of a revenue-maximizing oriented production management</li> </ul>	<ul style="list-style-type: none"> <li>• Creation of excessive expectations of revenue and turnover increase</li> <li>• High investment in new IT-systems or upgrade of existing IT-systems</li> <li>• Corporate culture resistant to the introduction of RM</li> <li>• Lack of experts/knowledge to implement RM in the organization</li> <li>• Increase of complexity</li> <li>• Loss of management focus</li> </ul>



**Fig. 4.13** Benefits named by North American versus European companies

When discussing benefits, North American companies mention on average four benefits, whereas European companies mention only two. The chance that North American companies see most frequently is revenue increase through enhanced pricing and improved capacity utilization (mentioned 191 times out of 909 in the North American sample), whereas European respondents name the realization of cost savings based on maximum use of current machines and reduction of over-capacity most often (mentioned 146 times out of 513 in the European sample, see Fig. 4.13).



**Fig. 4.14** Risks named by North American versus European companies

Comparing risks, European companies mention on average three risks, whereas North American companies mention two risks. The risk that European companies see most often is a high investment in new IT-systems or the upgrade of existing IT-systems (mentioned 277 times out of 759 in the European sample), whereas North American companies name overly high expectations with respect to revenue and turnover increase most often (mentioned 220 times out of 478 in the North American sample, see Fig. 4.14).

Two explanations why European companies name more risks than their North American counterparts are difference in experience and in risk-taking attitude, respectively. Less experience with the use of RM on the part of European companies might lead to the listing of more risks. A more risk-seeking and more innovation-friendly attitude in North America (see, for example, Weber and Hsee 1998; Beckmann et al. 2008; Martin et al. 2009) might lead to a different perception of existing risks.

### 4.5.2 Alternatives to RM

When asked for alternative approaches to RM, approximately 35 % of the interviewees mentioned various alternatives to introduce flexible production capacities. More specifically, the following alternatives were mentioned: (1) Outsourcing of production capacities to legally and economically independent companies, (2) the relocation of value-added generating production steps to suppliers, (3) cooperation with legally and economically independent companies within production networks and (4) the transfer of production capacity from their own facilities to low-cost locations.

However, 55 % of the interviewed companies do not recognize alternatives to RM. The introduction and use of production planning systems to improve the matching of orders with existing capacities are considered additional alternatives by 10 % of interviewees.

### 4.5.3 Statements on RM

In the last part of the empirical study, the interviewees were asked to express their degree of agreement or disagreement with a series of statements on RM (see Fig. 4.15).

An RM approach with a focus on price management is thought to offer a higher potential compared to pure capacity management approaches: In this context, it was pointed out that in the past capacity management played a major role in optimizing inventory, whereas price management has gained considerable importance in the past few years. The statement that RM leads to an increase in turnover obtained the second highest agreement, while the statement that RM does not show any potential within the PI was clearly denied.

For all the statements above, North American companies show a significantly higher agreement compared to European companies with the exception of statement 6 (RM applications are limited in the PI), which does not display a significant difference. For statement 12 (RM is not beneficial), we observe a significantly lower consensus from the North American correspondents than from the European ones ( $P = 0.000$ ).

By using a cluster analysis (hierarchical, Ward’s Method) on the 12 statements, it was possible to create two clusters could be built: One less supportive of RM (including Italy, Spain and France) and one more supportive of RM (including United States, United Kingdom, Canada, Switzerland, Germany and Norway).

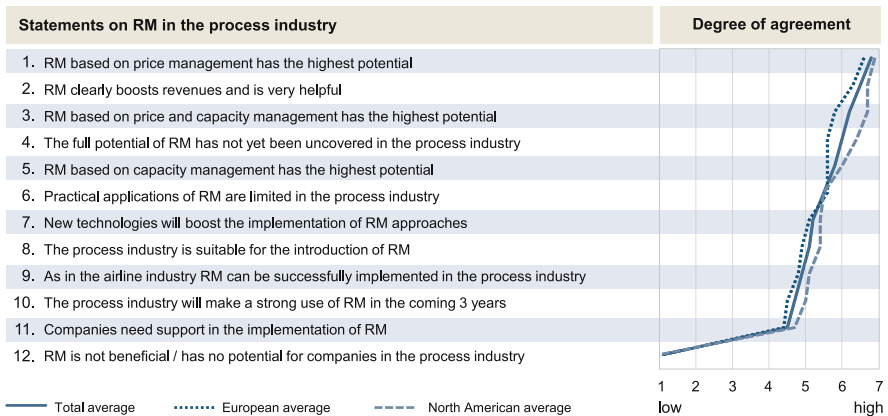


Fig. 4.15 Statements on RM

Apart from the above differences between country clusters, no further significant differences were detected.

## 4.6 Conclusions

To the best of our knowledge, this exploratory research, based on interviews with 479 companies in North America and Europe, represents the first study that provides comparative insights into the implementation of RM in the PI between these two regional clusters. The primary results, limitations and outlook can be summarized as follows.

### 4.6.1 Results

In the literature, it has generally been agreed that prerequisites for the application of RM in the manufacturing industry exist. This study confirms this, by showing that, to a large extent, RM is already used in the PI. Eighty-six per cent of the companies in our sample use some kind of RM concept.

The importance of RM is generally regarded as high, but the average importance is higher in North America than in Europe. The importance of RM increases on both continents with company size measured in turnover. However, for companies with a lower turnover, North American firms attribute a higher importance to RM than their European counterparts, whereas differences between companies with a higher turnover are less distinct.

There is also a positive correlation between the period of use and the importance of RM. RM was introduced earlier in North America compared to Europe, and even within Europe there are differences in the period of use: Southern European countries introduced RM later than northern European countries. The first RM applications were mainly capacity based. Now there is a trend towards integrating the price-perspective or to purely price-based RM approaches.

North American companies value RM as more important than European firms. In addition, there are significant differences in the valuation depending on the form of application: Users of system-based RM applications value the appropriateness of RM higher than users of manual applications.

The main barriers to the implementation of RM are the lack of a clearly defined price strategy, no identification of a suitable RM approach and the fear of price decreases or margin losses.

### **4.6.2 *Limitations and Outlook***

Our study is a cross-country and cross-industry study, which does not take into account changes over time. Hence, a longitudinal research could be undertaken in order to eliminate this issue. Such research would also allow causal conclusions (Rindfleisch et al. 2008).

Within our study, we interviewed only one person per company. Hence, a single-source bias cannot be excluded. In addition, the interviewees identified as responsible for RM often held different functions (marketing, sales, production, SCM, strategic planning).

This research as well as existing academic research yields limited insights into the profit impact of RM: Even if RM is regarded as contributing to revenue and profit improvement it would be interesting to compare the *a priori* estimation of profit improvement to the *a posteriori* realized profit improvement and also compare similarities and differences between the two regions, i.e. Europe and North America. Future studies could also use more interviewees in different functions within a company in order to obtain a differentiated, function-specific perspective.