Integrated Enterprise Risk Management for Industrial Companies: A Critical Discussion of How to Improve Risk Evaluations

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Abstract

Risk management is widely established in companies of the financial services sector. The importance, benefit and value added of risk management are more and more acknowledged in industrial companies as well. Nevertheless, the comprehension of the objectives and the content of risk management vary significantly.

Legally requested risk management activities by far do not fulfill the requirements on a consistent and value-creating risk management. Instead, the effort is often held down to the minimum level that ensures receiving the “tick in the box” by accountants.

Risk management requires the identification and evaluation of chances and risks; they describe a potential deviation from the expected value (not from the planned value). The evaluation of chances and risks is often influenced by the personal interest of the respondents being asked for their evaluations. In this paper, four options will be discussed to address this topic.

It is essential for a sustainable enterprise risk management to cover “all risk-relevant issues and considerations.” This includes the financial risk management as well as operationally oriented issues of threat management and contingency plans within crisis management. An integrated approach will be presented in the second part of this paper. It will be shown that risk management is more than combining several processes and methods; it is much more a company-wide approach that enables an open dealing with chances and risks, requiring a change in culture, governance and decision rules across the whole organization.

1. Introduction

While widely established in financial services companies, the importance, benefit and value added of risk management is more and more acknowledged in corporate industrial companies as well. Until recently, risk management essays were focused on mathematical-statistical topics or the implementation of supervisory regulation, especially SOX in the United States and KonTraG and equivalents in Europe, but this mindset has already started to change.

It's surprising how companies run risk management as a separate exercise not linked to other planning or management tools. In the literature, risk management still is discussed as an isolated area of management next to strategic and financial management, financial structuring, controlling and others. At its best, the information generated in risk management such as risk limits utilization (e.g., VaR measurement and limit allocation) ends up as an additional piece of information as a report. In practice, the management often hopes that allocated risk limit usage does not exceed critical values, so that no activity is required. This often is the only consequence of an effortful implemented methodology and time consuming processes within the company: It mostly has to be seen as a sub-optimal investment, to put it modestly.

Of course there are a couple of reasons for this status quo. The first one is always right when criticizing a new concept that is pushed forward by regulation; the discussion focuses very much on the implementation of law and regulation such as SOX, and therefore on risk control instead of a value oriented risk management.

Secondly, financial risks dominate the risk profile in companies from the financial services sector. For these risks, evaluation parameters like volatility, actual prices, etc., can easily be generated from historical time series. For most kinds of risks in industrial companies, those data are not available. As industrial investments are never identical, risk evaluation is more complex due to the broad variety of risk drivers, lacking historical data of daily market prices, the interdependency between the own decision and competitors' action influencing the risk exposure and others. Due to these and other factors, the identification of risks and their assessment is more complex than for financial risks and has to rely on the know-how of the experts and risk owners. This is not without constraints, as they frequently have their personal and tactical interest in the evaluation of risks.

A third reason lies in the seamless integration of risk management into the financial, strategic and operative management approach. Risk management generates management impulses that have to be aligned to and combined with strategic management, ALM, operations and strategic and financial planning. Until today, it was often limited to avoidance of fraud, ensuring an accurate corporate reporting and avoidance of the company's bankruptcy by identifying and evaluating the biggest risks for a company. This is a very limited view on the information and the know-how that is being generated in the process.

Despite the varying directions of what is being discussed under the denomination "risk management," we think that nevertheless one could relatively easily agree upon the targets of risk management:

- To ensure the survival/avoid the bankruptcy of a company
- To minimize the damage in case of the entrance of a risk

- To be able to act on risks about to occur instead of having to react
- To deliver a value added for an optimized allocation of equity and therefore support to shareholder value management

2. Status Quo of Enterprise Risk Management

In industrial practice, a network or experts and specialists in varying organizational departments are involved in the identification and evaluation of business risks; this is done in alignment with and based on statements of the company's experts. Besides a description of the characteristics of the risk, a risk reporting typically contains an estimation of the damage in case of an occurring risk and its taxation of probability. A risk value is being calculated by a multiplication of probability and damage. If this risk value exceeds a certain level, the risk typically is being incorporated in a corporate risk reporting. In addition, the importance of risks is being demonstrated by developing a matrix consisting of dimensions of "probability" and "damage" and filling in the identified risks.

It makes sense to rethink how to interpret the information being generated in the process. From the information on risk occurrence probability and damage height the complementary event can be described with parameters "1 – probability" and damage "zero," that the risk will not occur. The multiplication of probability and damage—assuming that both are being determined in the best possible way—leads to the expected value for the damage of the risk. Obviously, the expected value does not equal a risk in a financially statistical sense, where risk is being defined as a deviation of the expected value.

Is this differentiation a statistical sophistry? We do not think so. If the parameters for the calculation of the expected value are determined adequately, on average the annual damage will equal this value, but it can vary significantly over time: an estimated annual probability of 5 percent and damage in case of risk of $10 million result in an expected value for the damage of $0.5 million per year. On statistical average, the company realizes a damage of $10 million every 20^{th} year). The expected value is a statistical value, which (hardly) never occurs, as the volatility of occurrences will be high. The deviation of realizations from their expected value is the unexpected loss. Its determination and management is an essential part of enterprise risk management.

The significance of monitoring and managing unexpected losses becomes evident when comparing two exemplary risks, one with probability 10 percent and damage $10 million and one with 1 percent probability and damage $100 million. If a loss of $50 million leads to insolvency for a company, the second risk obviously is much higher, although both do have the same expected value. Whether a risk is bearable for a company can only be decided after having determined the risk profile and risk bearing capability for the whole company.

A systematic identification, evaluation and aggregation of all relevant risks must be elements of a value-oriented and insolvency-avoiding enterprise risk management. This also includes the alignment of the overall company risk with the company's risk bearing capability. Relevant risk management impulses can be derived from there. This approach also generates the decision basis for the necessary flexibility in production, the necessary equity ratio, an optimization of WACC, the identification of accumulation risk and insurance deductible, to list only a few examples.

The identification of relevant chances and risks and their description as a probability distribution of potential values are the foundation of risk management. For financial risk this is based on the econometric analysis of historical time series. For insurable risks, actuarial methods can be applied.

3. Evaluating Risks in Enterprise Risk Management

An evaluation of chances and risks should be an integral part of a financial planning process. While the planned value represents the most likely outcome of a project from today's point of view, the risk evaluation aims to describe the potential bandwidth of the different factors and their drivers. The same is true for the total periodical economic result for a company when aggregating all chances and risks. A special challenge is the evaluation of risks from investigations or risks of the value chain with highly company-specific characteristics. This is due to the lack of comparable historical experience or time-series of values. Therefore, all available information has to be considered to achieve the most realistic evaluation. Also, as a consequence, information sources have to be used that do not directly lie in the area of influence of the specialist department (e.g., historical adjusted data from former peer projects comparable with the one to be evaluated).

Despite this, the experience and estimation of the subject matter experts are an important factor for the evaluation. It has to be considered that the experts' evaluations are affected by tactical behavior (a lower target setting and the objective to show a good personal performance lead to an overweighting of risks and underestimation of chances) and political, departmental interests (to let the financial planning of a project appear especially good or bad).

Generally, the identification and evaluation of risks are carried out within a given framework, which describes methods, principles, processes and the basis of evaluation. This is defined by the central risk management department. The following possibilities to address the challenges of tactical and political misevaluations are worth being reviewed:

a. Written documentation of evaluations and simultaneous discussion and definition of risk drivers and cause-effect-relations as well as their update in the time-run

b. Consolidation of evaluations for one risk by different specialist departments as a corrective

c. Evaluation by the one responsible for the monetary planning (controller), who gathers information and the discussion results, and takes all that into consideration when putting together the risk evaluation

d. Incentivization to reveal one's opinion (based on signaling theory).

a. Documentation

When identifying chances and risks, they should be documented in a written manner and should be operationalized by the identification of risk drivers as well as the chains of cause and effect.

Both items result in an objectification of the discussion. As a risk evaluation has to be updated regularly, the documentation leads to a certain effect of disciplinary behavior, as the

evaluators are confronted frequently with their statements. Changes in evaluations have to be reasoned by changes in values of risk drivers via the cause and effect relationships.

This effect appears only over time, so that a project might already be decided before a transparency of chances and risk is achieved. The specification of chances and risks with chains of cause and effect also allow the operationalization of risk management and the link towards early warning system.

b. Multiple risk evaluation

A risk evaluation should always be done by several specialist departments. Practical experience shows that the discussion in a bigger group across different departments brings forward a group dynamic process, which in itself produces a value added. This is especially true when the process aims for an agreement upon one evaluation within the group instead of averaging everybody's evaluation. It has to be ensured that the specialist department with the most specialized know-how is not outvoted and therefore will participate with less interest in the process in future.

c. Consolidation of risk evaluation by the person responsible for planning

A risk evaluation should always be an integrated part of financial business planning. The responsible associate (typically from the controlling department) for business planning is therefore also responsible for the risk evaluation and its consolidation. Even if he is not able to combine all the specialists' know-how, the controller is typically able to appraise the argumentation and evaluation as well as their substance given from the specialists, e.g., based on past experience. This means that a controller must be able to judge if a risk evaluation is a content-driven or a tactical one and to adjust accordingly.

To ensure the comparability of risk evaluations, the central risk management department also holds a regulatory function, as it defines the standards for risk identification and evaluation and supports the evaluation (e.g., by analysis of external and internal historic information). In this context, we have to mention the characteristic differences between a business case and a risk evaluation. As the first one is the basis for a target agreement, it has to be supported and agreed upon by both sides.

The risk evaluation equals estimation in monetary units for what can happen and does not need to be agreed upon between the target giving and target taking department. The statements met by specialist departments are interpreted by controlling in an adequate manner and are then integrated in the risk evaluation.

All the discussions develop within the controller a deeper feeling for a material deviation of targets (e.g., for a project) as well as their break-down towards individual departments.

The following has to be taken into consideration: The bigger the deviation of the set target from the estimation of the specialist department and the less transparent the risk evaluations are being generated, the lower is ceteris paribus the acceptance of the risk evaluation methods in the company for the decision making. The motivation also decreases in the specialist departments, when their opinions are not being considered; as a consequence the quality of risk evaluations declines.

d. Signaling Approach

The signaling approach, which has been developed as part of the agency theory, could be helpful (in the author's opinion) in relation to risk evaluation not yet discussed. Within the process of risk management, the department being asked for its evaluation represents the agent holding an information advantage. The controller running the risk evaluation and proposing the target setting represents the principal. The basic idea of the approach is based upon the consideration that the agent is incentivized to reveal his realistic opinion and information status with regard to the estimation of chances and risks. This mechanism works if the financial consequences of an intentional misjudgment are high. The following example should explain this: A specialist department receives a target setting of 100. The bonus payment is in every case a linear function from the relative level target achievement. It equals 100 percent in case of an exact target achievement, but is limited to 200 percent. The slope of the function through 100 can be fixed by the target accepting party (principal): The choice of a slope of 1 would follow in a bonus of 99 percent, if a value of 99 can be achieved; a value of 101 would result in a bonus of 101 percent. A chosen slope of 2 means a bonus of 98 percent when a value of 99 is achieved; if 101 are realized, the bonus would equal 102 percent, etc. As the department representative is interested in the highest possible bonus, he—assuming risk neutrality—will choose a slope of the incentive structure so that the expectation value, calculated on his set of probabilities of the bonus, maximizes.

From this economic calculus follows that a possible high slope of the function will be chosen, if the probability for (over)achieving the target value is estimated to be above 50 percent. The opposite is true for an estimation of target achievement of lower than 50 percent: in this case a low slope would be chosen by the specialist department; as for those combinations, the expectation value for the bonus can be maximized. By this choice the agent has revealed a part of his estimation about achieving the target. The structure of this example can be arbitrarily refined by differentiating the incentive structure and by repeating to question the agent with different choice combinations. By doing this the complexity increases accordingly, which is the biggest point of criticism. Further points of critique are the lack of predictability of bonus payments and the parallel existence of a variety of bonus schemes in a company.

4. Interim Resume

Three of the four above described possibilities to address the challenges of risk evaluations being run by specialist departments are practically more relevant. The fourth one is a theoretical one and shows up to date primarily in analytical characteristics. The first three approaches do not exclude each other but can be applied simultaneously. Depending on the implementation phase of risk management, the level of maturity of the company as well as the acceptance and experience with risk management issues in planning and decision finding the specialist department should have a more or less prominent and outstanding role within the risk management evaluation process.

Do the four explained approaches meet the challenge? We do not think so, as it can't be solved totally. The transparency, the ability to deal with uncertainties and the frankness to show chances is also a cultural issue and not primarily a methodological one. Nevertheless, the three above explained issues do play an important role in bringing more accurateness into corporate risk evaluation. They can all be recovered in the process and method design that underlies the following integrated risk management design.

High quality risk evaluation and management requires an integrated enterprise risk management. While this approach has often been described in literature, the following paragraphs focus on the alignment of the basic idea of risk management, thread management and crisis management. It will be explained how this idea enhances the objectification of risk evaluations and finally the quality of risk assessments and risk management.

5. Integration of Financial Risk Management, Threat Management and Crisis Management into an Integrated Enterprise Risk Management Approach

We first have to start with definitions.

5.1 Definitions

Financial risk management covers the identification, monetary evaluation, aggregation and management of chances and risks in a company. The objective is to generate a chances-and-risk profile in an evaluated form for all relevant activities and, by doing that, also in the aggregation for the whole company. A next step is to reconcile the risk bearing capacity with the actual risk and to manage the overall risk profile by using risk-reducing instruments or mitigating measures. Therefore it is necessary to cover all risks with their potential economic impact in risk management. Typically, all risks are included in risk management. This contains risks in sales and expenses as well as financial risks (such as interest and currency risks). Risk management aims at the systematic identification and financial evaluation of chances and risks. To reach this, all relevant chances and risks are described in form of a probability distribution of potential outcomes for the corresponding value. All probability distributions are then aggregated to the risk position for the whole company. Consequently, all financial planning are therefore supplemented by an analysis of potential results in the form of probability distributions. The deterministic planning is expanded and enriched by a "systematic and quantified view to the left and to the right."

Threat management deals with the description of cause and effect chains as well as indicators that might lead to an unfavorable effect on the corporate reputation, customer satisfaction and finally on the financial success. This can be due to organizational, process and/or external events and developments.

Threat management's target is to recognize patterns that cause the occurrence of a risk and to identify the description of observable indicators, which point at a higher likelihood for a risk. If the individual elements of a cause and effect relationship exceed determined values or show a certain specification, this can be interpreted as an increased risk. For this reason, the elements of the cause and effect chain can be interpreted as interdependent early warning indicators. In the following both concepts will be used alternatively.

Threat management focuses primarily on process related, operational risks. It is often based on scenario analyses to early identify unfavorable elements in business processes, which in their interaction lead to negative effects for the company. These threats also include fraud and personal failure by mistake or out of intention. Based on these analyses, measures can be deducted, e.g., in terms of process related measures, which lead to a reduction of the entrance probability of the risk. Compliance issues can be assigned towards threat management.

The objective of crisis management is to allow a systematic acting instead of an aimless activism, when a crisis situation happens. As a part of it, action plans and processes are being fixed, which have to be followed when a crisis is occurring. Those plans aim at the minimization of the damages as well as a quick retrieval of the strategic capacity to act if risks cannot be avoided and a negative event entered. Those plans can best be fixed when a crisis situation is analyzed beforehand. Crisis plans are typically defined for event risks (elementary risks, catastrophes, pandemics, insurable risks and others) and describe the roles and responsibilities of relevant persons as well as what measures have to take place to minimize damage. The thinking ahead for measures and actions should guarantee the optimal process when a crisis is occurring.

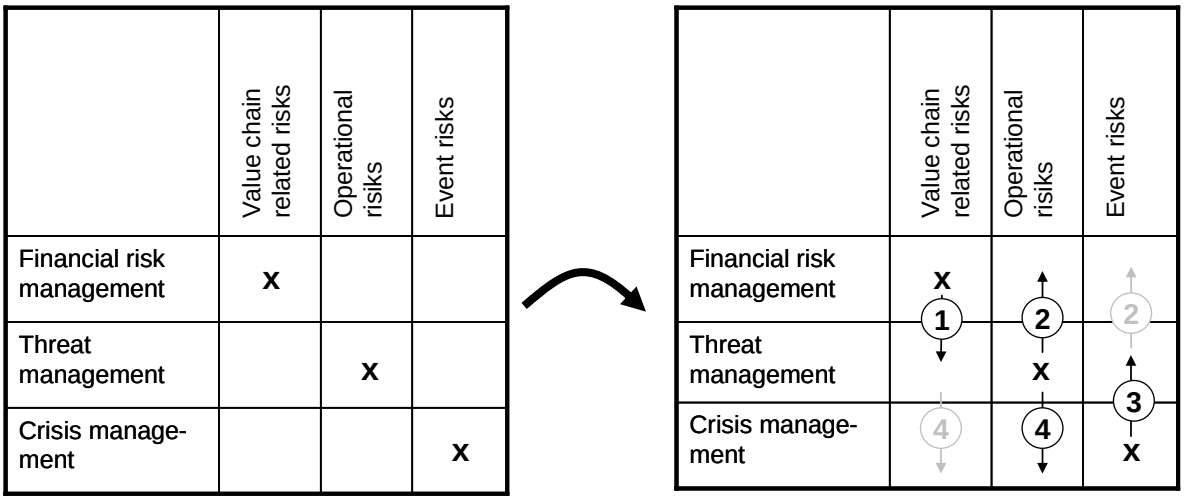
5.2 Combination into Integrated Enterprise Risk Management

An integrated enterprise risk management is based upon the principle that contents and philosophies of all three described areas are used for all types of risk. Value chain related chances and risks, which typically are dealt with in risk management, are linked with their cause and effect chains and their indicators. By doing this, an operationalization and concretion of the estimated monetary bandwidths (probability distributions) can be achieved (step 1). The operative risks, typically dealt with in threat management, are quantified and monetarily evaluated (step 2) in order to be able to allocate sufficient risk capital.

In addition, action plans are being defined for all risks of this risk type (step 3; this is in analogy also true for all value chain related risks, for which chains of cause and effect have been defined in step 1).

For event risks, which are typically only covered in crisis management, cause and effect relationships are also being defined; this should allow the early recognition of possibly occurring risks (step 4). The content-wise connection to risk management happens in analogy to step 2, in which the necessary risk capital requirement is being evaluated.

Explained graphically, the assignment of the different methods to risk management categories is being supplemented in a way that all fields of the matrix in the figure are covered:



5.2.1 Transition from Financial Risk Management to Threat Management (Step 1)

From the step of risk management a category of chances and risks is being evaluated monetarily.

The drivers lying behind these chances and risks are to be identified and discussed; they are then to be described with their corresponding chains of cause and effect. This can take place via answering the following questions:

- What can/must happen that the chance/risk occurs?
- Which circumstances indicate a chance/risk occurring?
- Which event indicates an increased occurrence probability for a chance/risk?

Subsequently, current and "critical" realizations (numeric or, more frequently, verbally-descriptive) of indicators and causal chain elements have to be evaluated; generally interdependencies have to be taken into consideration.

First, this contributes to a detailed and objectified description of the current chance/risk. Second, the quantification is facilitated, as the relevant drivers and influencing factors are being defined. Third, this procedure eases the monitoring of chances and risks evaluation, if, for example in the run of a business case update also, chances and risks are to be adjusted. Fourth, the update of a chances and risk estimation leads to documented, comprehensible and traceable changes. This supports the goal of an objectification of the chances and risks evaluation. Fifth, the update of the estimations can be carried out more efficiently; risks with over time increasing entrance probabilities can be identified in order to avoid surprises and in order to maintain the freedom to act strategically instead of having to react under pressure.

It is established from the area of the technical "large risks" (e.g., plane crashes) to analyze accidents and catastrophes (occurred event risks) with regard to the causes of their occurrences and to the possibilities of an early recognition and avoidance. This analytical approach can be transferred to entrepreneurial risks in order to identify the risk drivers. Events, having appeared in the past and having led to a negative impact for the company, are examined with respect to their causes; such negative impacts always include additional expenses due to image/reputation deteriorations, a negative press, loss of market shares, etc. Practical experiences reveal that often a combination of several "more unfavorable" circumstances lead the occurrence of a risk; this has to be taken into consideration. In the practical transfer of the approach it will hardly be possible to undertake a detailed analysis of the cause and effect chain for each risk in the described manner. This would lead to a high work load, while for a majority of risks there would be no reference cases available (e.g., the development of innovative products or a market entrance strategy).

It appears as a pragmatic approach to rely on experts' estimations regarding the cause and effect chains as well as early warning indicators; this can be based on scenario based approaches. Typically, these experts will also do the chances and risk evaluations and estimate the occurrence probabilities.

The determination and discussion via cause and effect chains and/or early warning indicators increase the transparency and the awareness of chances and risks. As the

evaluation of chances and risks is based on a content driven and material discussion, changes in the evaluation become more transparent and will be more comprehensibly documented. This contributes to the objectification of the chance/risk evaluation.

5.2.2 Transition from Threat Management to Financial Risk Management (Step 2)

From a financial point of view the allocation of risk capital to all kind of risks is essential. This is also true for process-related operational risks that are typically monitored in threat management. The financial evaluation of this risk type is a challenge due to its characteristics. This is acknowledged in legislation, as a standard approach for capital requirements can be used within the banking supervisory regulation for operational risks. Statistically more accurate are empirical analyses about occurring risks and resulting losses. This presumes the existence of damage databases and therefore is correspondingly cost-intensive. A long historical time series is necessary especially for risks with a low occurrence probability. In addition, the comparability between strategic risks and operative occurred risks and therefore the generated values can be questioned. As the circumstances that lead to losses are hopefully changed immediately after their occurrences, the comparability of such risks can generally be put into question.

Fair according to the effort involved and fitting in a corporate management system is the utilization of cause and effect chains defined in the threat management category. In the first step, it has to be defined under what circumstances a specific loss occurs. The second step is to operationalize these circumstances by a limited number of factors. In the third step, each element of this chain is being evaluated regarding the probability distribution of the possible values. This does not lead to a mathematical modeling, in which an algorithm leads to the appropriate risk estimation. Much more, this procedure boosts a structured and objectified discussion about probabilities of occurrence—in the sense the "what can happen"—about the damage height; this replaces the querying of a stomach feeling or at least amends to it.

5.2.3 Transition from Crisis Management to Threat Management (Step 3)

Characteristically, crisis management covers event and insurable risks in an integrated enterprise risk management. These should also be provided with chains of cause and effect and/or early warning indicators in order to estimate the probabilities of occurrences. The definition of these chains leads furthermore to a better understanding, under which circumstances such a risk occurs. A systematic detection and analysis result in an identification of risk reducing and preventive measures.

These measures and their evaluation finally are also the content related link to risk management, in which adequate risk capital requirements can be deducted from a systematic estimation of occurrence probabilities and damage heights or the factors indicating a high probability for a crisis.

In addition, this combination and the resulting operative risk reducing measures deliver an argumentation basis for negotiations with insurers. It therefore produces also a direct financial advantage by reduced damages and decreased insurance premiums paid.

5.2.4 Transition from Financial Risk Management and Threat Management to Crisis Management (Step 4)

All risks dealt with in threat and in risk management should be evaluated and described more in detail by cause and effect chains and made operatively observable. Within the crisis management category action plans and process are being defined, which have to be followed in the case of a risk occurring. This should also be done for value chain related risks and for operational risks. These action plans do not necessarily consist of detailed operative activities, but can also include summoning the meeting of a decision circle. The fixing of action plans (in the sense of crisis plans) can be subdivided into two parts. In the first part, critical values are being determined for all chances and risk and their defined indicators, which point out an increased occurrence probability. If these values are exceeded, the first level of steering measures has to be considered to avoid the full occurrence of a risk and its negative consequences. As a second step, action plans are fixed, if the risk occurs. Those plans aim at minimizing the damage.

The application of the basic idea of crisis management for all risk type leads to action plans, which are defined in a qualitative higher way due to the identification of the reasons and consequences of risks. Negative impacts from risks occurring can be reduced, as the best processes and actions have been thought through well in advance. In addition, there is a high probability that all relevant risks are backed with action plans for a risk.

Also financial risks such as currency risks can be integrated into this approach. A value at risk measuring of the FX exposure (within “risk management”) is supplemented by a system of indicators that points out to a rising risk (e.g., internal: higher revenue forecast which increases FX exposure; external: trade balance deficit of the corresponding currency area, increase of the implicit volatility of the exchange rate, change of currency forward rates, increase of the country spreads for bonds issued by the corresponding country, etc., as a part of the "threat management"). As a part of the crisis management, action plans are to be defined that describe what has to be done, if certain indicators exceed fixed values and defined risk limits are used. The crisis plan can contain transactions in financial contracts (hedging of risk position to reduce open FX exposure) as well as summoning a meeting of the relevant decision circle.

6. Summary and Resume

Implementing an integrated enterprise risk management approach in industrial companies is more than taking over methods and processes used in the financial services sector. The identification and evaluation of chances and risks, especially, require a significantly different approach. Risk drivers and reasons for potential losses can be identified much more easily when they are due to value changes in capital market prices. Additionally, their volatility can be measured by analyzing historical time series. Both are not true for chances and risks from the industrial value chain. They even cannot be verified ex-post due to the fact that only one occurrence can be observed and due to the limited comparability of chances and risks.

We have shown four options how to address the topic of asymmetric information between the risk management and the specialist departments giving their evaluation. With the exception of the option based on the signalling approach, all three can come into effect simultaneously.

Practical experience shows that the implementation of an integrated enterprise risk management and its use as an enterprise wide management tool with efficient processes is the best way to address the topic. Risk management requires a cultural change in an enterprise. A management circuit, where risk is included in decision making, where associates are confronted with their evaluations and where concealing risks leading to significant losses is negatively sanctioned and where revealing chances does not directly lead to an increased target setting, is the basis for a successful implementation.

This paper describes how the different levels of risk management, threat management and crisis management can be linked together. This is one dimension of integrating risk management into the entrepreneurial management. By defining cause and effect relationships and discussing them and the potential action plans in the case of occurring risks, this also contributes to an objectivized evaluation of risks and chances in a company. While not able to define a mathematical algorithm that ensures a “correct” evaluation, the design of processes and methods should at least avoid a well directed tactically driven influencing of the statements by specialist departments. If this is done in a regular and effective way, the three options are elements of the partially described integrated risk management. Enterprise risk management is not primarily a financial-statistical set of methods but an enterprise wide approach impacting the whole company from culture to governance to decision rules.