

Solutions **Chapter 7:** Supply Chain Risk Management

Review question 7.1:

Uncertainty describes the fact that there is a lack of information on future events and developments. Uncertainty not only comprises a lack of information about what might happen in the future but also missing information on the possible consequences as well as the probabilities of occurrence.

In the business context, the concept of risk most often refers to a negative deviation. It is seen as an undesirable loss, i.e. an unwanted negative consequence. Different from uncertainty, a particular risk can be identified, analyzed – and potentially also controlled or handled in some way. Thus, there is at least some knowledge about its probability of occurrence.

Review question 7.2:

Vulnerability denotes the susceptibility of an organization or system to risk. Vulnerability, therefore, is not a characteristic of risk or a disruptive event itself, but rather of the system that is affected by these events. Vulnerability determines what is at risk for the organization in case a risk actually materializes. Resilience denotes an organization's ability to cope with the consequences of unavoidable adverse events in order to return to its original operational state or to move to a new, more desirable, state after being disturbed. Most efforts in risk management focus on reducing vulnerability and improving resilience.

Review question 7.3:

Management can work towards higher resilience by trying to strengthen the following characteristics of their organization:

- Flexibility: Flexibility describes an organization's ability and readiness to change (e.g. processes or rules) and to find compromises. If a disruption occurs, an organization will have higher chances to be "back on track", if rules and processes can be adapted according to the newly prevailing conditions.
- Velocity: Velocity focuses on speed, i.e. how fast can a system adapt or change. The faster adaptation is possible, the higher the chance that negative effects can be kept under control or losses can be minimized.
- Visibility: Visibility describes the degree to which the identity, location, and status of all system elements is known and transparent.
- Collaboration: Collaboration denotes the willingness of different players to share even sensitive risk-related information. Collaborative information sharing will reduce uncertainty and will help all parties define appropriate risk management actions

Review question 7.4:

The risk management process can generally be split into three broad sequential steps:

1. Risk identification (Identify and categorize potential damaging events)
2. Risk analysis (Quantify probability and consequences, analyse potential causes)
3. Risk response (Identify and implement possible remedial actions)

Review question 7.5:

Unlike other international standards, risk management standards do not impose any formally binding rules or

procedures on businesses. Following an internationally established standard can still be a wise decision for companies. Basing own risk management efforts on a well-established and standardized framework can provide new managerial insights for the organization and can help manage supply chain risks effectively and avoid costly mistakes

Review question 7.6

Risks can be categorized according to:

- Risk types as listed in international standards (e.g. following ISO 28000)
- Organizational entities where the risks originate (internal, supply chain, external)
- Main supply chain flows affected by the risk (physical, information, financial, organizational)
- Conceptual domain of the risk (technological, commercial)

Review question 7.7:

Reputational risk is defined as the cumulative likelihood that events resulting from exogenous or endogenous sources can occur and negatively impact the stakeholder's perception of the firm's behavior and performance. Exogenous sources might be the behavior of supply chain partners. A firm's reputation might be at risk if one of its supply chain partners shows misconduct and the general public attributes this behavior to other supply chain partners as well.

Review question 7.8:

A number of different tools have been developed in academia and business practice, such as (but not limited to):

- Checklists (forms that record how often a specific failure or damage was attributed to a specific event)
- Ishikawa diagrams (diagrams showing the causes of a specific event in a fishbone-shaped order. They can be used to identify possible root causes behind an observed or hypothesized effect and can help identify possible risks)
- Expert interviews / Delphi studies (a study asking a group of identified subject matter experts to answer a questionnaire, providing respondents the opportunity to react to consolidated responses and revise or further refine their own answers based on the opinion of other respondents, thus gradually working towards a group consensus that is expected to reflect the combined expertise of all expert respondents)

Review question 7.9:

1. the probability of occurrence of an identified risk,
2. the extent of the potential damage caused by its occurrence (with points 1 and 2 often being used for risk prioritization),
3. interrelationships with other risks that might give rise to "domino effects" and thus increase potential damage,
4. potential root causes of the risk that might give indications for proper risk handling and risk management.

Review question 7.10:

Qualitative risk assessment focuses on non-numeric (i.e. mostly textual) information to identify and quantify

risks. Possible tools are questionnaires, Delphi surveys, FMEA analyses, or an ABC analysis.

Quantitative risk assessment tries to determine specific values both for probability of occurrence (expressed as a percentage) and potential impact (expressed as a monetary amount). Quantitative assessment is mostly based on various statistical methods or data mining approaches.

Review question 7.11:

Value-at-risk is a hypothetical daily loss expected to be breached once every hundred days - in other words: the probability that tomorrow there will be a loss larger than the VaR is 1%. In statistical terms, VaR is the $(1-\alpha)$ -quantile of a profit and loss distribution. Given a normal distribution, a 1%-VaR can be calculated as $\text{VaR} = \text{standard deviation} \times 2,33$.

Review question 7.12:

Risks are often interconnected. Firstly, some risks may trigger domino effects by increasing the probability that other risks materialize as a direct consequence. Secondly, and in contrast, some risks may offset each other, thus limiting the potential damage. Finally, some risks may be independent of each other, but they may – if by accident appearing at the same time – amplify each other and their subsequent damage. It is therefore important to consider a business as a portfolio of risks and not just to look at each risk in separation. This is even more important when considering an entire supply chain, since through the interconnectedness of risks in a network, the probability of risk occurrence typically increases when moving from the single firm to the entire supply chain.

Review question 7.13:

When accepting a risk, the firm is prepared to bear all negative consequences if the risk actually materializes and no effort or resources are spent on mitigating or avoiding the risk. Risk acceptance, however, is the result of a risk identification and analysis process. The risk, therefore, has not been ignored (i.e. not identified and not further analyzed). Ignoring a risk does not constitute a proper risk management strategy, since neither the probability nor the damage potential of a risk has been identified.

Review question 7.14:

Taking out insurance is a typical approach of risk transfer. An insurance company can spread the risk across a potentially large number of customers and thus benefits from a portfolio effect: although some insurance contracts will actually lead to a damage and consequently to a (potentially large) payout, these negative consequences are balanced by many other insurance customers that pay their fee, but do not cause any damage. The insurance company, therefore, can handle risk more efficiently and more effectively than the single firm would ever be able to. Risk transfer through insurance is typically more appropriate for disruptive risks with a small probability and high impact rather than for operational risks with a high probability and low impact.

Review question 7.15:

Risks should be transferred to other partners in the supply chain, if two conditions hold: First, the supply chain partner must be willing to accept the risk – either because it receives a compensation or because its negotiating power is too low to fight it off. Second, the supply chain partner must be in a better position to deal with it (lower probability of occurrence, lower damage expected).

Review question 7.16:

Appropriate supply chain design decisions can help reduce the probability and the damaging effects of existing

risks. One alternative of adapting the supply chain design is to establish parallel structures that make the network more robust and flexible (for instance through the implementation of multiple sourcing, which is a diversification strategy). Other supply chain design decisions with risk effects are the spatial distribution of supply chain partners (offshoring or nearshoring) and the distribution of responsibilities among supply chain partners.

Review question 7.17:

Redundancy denotes a situation where certain resources or means are available multiple times. Redundancy can be a risk handling strategy, because it increases the capacity of a supply chain beyond the normally required level. Redundant resources reduce the risk of a mismatch between demand and supply and provide a safety net for the supply chain in case of unforeseen interruptions or slowdowns in operating processes. Redundancy, however, also increase costs, since more capital is tied up, the higher inventory levels need to be managed, or more equipment must be maintained and depreciated. In addition, redundancy often leads to inefficiency, since the negative operational effects of wrong planning, increased waste, or delayed task completion do not surface, but are compensated by buffer supplies and other redundant resources.

Review question 7.18:

Collaborative risk management denotes a setting, where previously independent firms give up some of their discretionary freedom and agree to act in alignment with each other in order to implement risk management strategies that would be unachievable when being pursued separately. Collaborative risk management often involves sharing of risk-related information between supply chain partners, the explicit implementation of risk sharing mechanisms in contractual arrangements, or the implementation of modern IT systems across supply chain partners.

Exercise 7.1:

When jointly working on the resiliency of their business partnership, Jummy Fruits and Pacific Dream aim at improving the ability of their business to cope with the consequences of adverse events in order to return to quickly return to regular operations. Standard strategies could be the following:

- Increase flexibility by defining a routine or a decision-making board that can handle unforeseen situations and emergencies that require a deviation from contractually agreed terms and conditions (e.g. a change in defined shipping routes or agreed countries of origin for certain fruits).
- Increase velocity by jointly defining emergency handling procedures or fallback options that can quickly be activated when needed.
- Improve visibility by introducing tracking and tracing devices and processes that allow real-time monitoring of shipments and allow both partners to continuously monitor business and detect possible new sources of risk as early as possible.
- Intensify collaboration through trust-building initiatives, mutual information exchange, or even a reciprocal equity participation in the partner firm.

Exercise 7.2:

Changing purchase conditions is always a matter of negotiating power between the involved parties. Jummy Fruits will consider the change only, if a potential treat of Pacific Dream terminating the business relationship is not detrimental and alternative suppliers could be found.

Given a certain negotiation power, Jummy Fruits will initiate the change in purchase currency only, if the supplier Pacific Dream is in a better position to deal with the exchange rate risk. This could be the case, for instance, if Pacific Dream is already doing business in Euro currency with other customers and is already engaging in currency hedging. Adding the Jummy Fruits contract to its Euro business would not constitute a

major change for Pacific Dream and its hedging costs would most likely not increase significantly. In such a situation, supplier Pacific Dreams might agree to the change in contract currency without requesting high compensation for that move.

Jummy Fruits, however, will in any case have to offer some compensation for the increase business risk which its supplier now has to bear. This might be an increase in purchase prices (financial compensation) or alternatively an extension of the purchase contract for a longer period and maybe also some right of exclusivity for Pacific Dream – the latter reducing commercial risks for the supplier and thus compensating a risk increase in one risk dimension (exchange rates) with a decrease in another risk dimension (future volatility of business volume).