Operational Risk Management in a Retail Company

Carlos Andres Pastrana-Jaramillo, Juan Carlos Osorio-Gómez

Universidad del Valle, Escuela de Ingeniería Industrial, Cali, Colombia
carlos.pastrana@correounivalle.edu.co,
juan.osorio@correounivalle.edu.co

Abstract. The risk management is one of the main activities inside modern management of supply chains. One of the main risks is operational risk, those risks are inherent to the daily activities of the company, and perhaps the effects of operational risks do not have the magnitude of the disruptive risks, but if they are not considered and managed, can to affecting significantly business results. A proposal is then presented to identify, prioritize and manage the operational risks present in the distribution process of a company in the retail sector in Colombia. Once the priority of the risks has been defined, the company must take mitigation or elimination actions on them.

Keywords: operational risk, risk management in supply chains, fuzzy QFD, risk prioritization.

1   Introduction

Nowadays companies try to mitigate different risks, addressing those in what their experience have a greater impact, however, companies can pay attention to risks that are not the priority at the time, causing the company to make decisions that have some impact but don't have the results over the most significant risks; this is where it is required to have arguments and the correct information that allows analyzing and identifying the defined processes, evaluate it and finally generate action plans for the mitigation and continuous monitoring of the evidenced risks.

The management of these risks accomplished an improvement in the process, where good practices become necessary and additionally they become daily, common and frequent in the operation, which requires constant monitoring that generates a continuous cycle where processes are guaranteed with minimum impact risks. In this way, this document highlights the importance that there is in controlling them and maintaining all the necessary conditions, on the actors of the supply chain to prevent negative impacts on the profits of the company.

In their work Sangwan and Liangro [7], risks are defined as an uncertain situation where an event can negatively affect the functioning of the organization, and has the probability to happen and may affect the performance of the company or process in the short or long term. Operational risks have an impact or relationship with the processes, equipment or environment. This is how different authors have addressed this issue of

risk management, and which involves different actors along the supply chain and has become a frequent topic of study that is increasing as say Fahimnia et al. [2].

In the handbook, Manotas, Osorio Gomez, & Rivera [5] define risk management in four stages: Risk identification, risk assessment and prioritization, risk management and risk monitoring. These phases are consider in this paper.

The authors Wee et al. [9] explain that the first step of risk management is to identify the sources or actors of the risk, in this way is also mentions in the article Giannakis and Louis [3] whom are agree that this is a fundamental step in the risk management process. To have an appreciation of the existing risks, one can first list the faults that can cause adverse results and then for each failure define the sources that can affect or influence the organization in Tummala and Schoenherr [8]. In addition, Manotas et al. [5] summarizes the most common tools among which are distinguished interviews, questionnaires, panels of experts or Delphi method and checklists mainly. Once the risks have been identified, it is necessary to rate this risk in order to generate strategies that mitigate their impact or even eliminate them. Lavastre et al. [4] proposed, this stage of risk management seeks to determine the severity of the risks, measuring the effect through the processes with the probability that the risks become for real and the potential scope of the impact.

The importance of the risk prioritization is that it show to the company which risks should be accepted and which one can be ignored due to their level of impact; the authors Giannakis and Louis [3] also emphasize that risks consider a wide range of criteria such as the probability of occurrence of the event, the level of risk and especially its impact. In this sense, the prioritization of risks must be based on the objectives set by the company, defined in a strategic way, seeking to be the first to be addressed and mitigate the negative impacts on the core of the company.

Understanding that this aspect of prioritization and evaluation provides the basis for establishing actions that seek to eliminate, reduce or simply ignore the impacts of previously identified risks. This criteria of impact definition when obtained from the experts uses scales such as (No impact, minimum impact, medium impact, high impact) as well as for the probability of occurrence is used (Improbable, moderate, probable, very likely) in the article of Giannakis and Louis [3], these qualitative data lead to look for tools that allow to analyze them. Some of the most commonly used tools according to Manotas et al. [5] are multi-criteria tools such as AHP and ANP and simulation. Additionally, Osorio-Gomez et al. [6] propose to prioritize risks using diffuse QFD, a tool that will be considered in this article.

2   Methodology

In Figure 1 the methodological proposal is presented. For the identification it is necessary to define the situations that can be considered risks in the operation and once this has been defined, a questionnaire is designed to effectively validate that they correspond to the risks of the process. Additionally, it is important to select a team that has all knowledge of the process to be evaluated, since they are who must define the pertinence of considering or not the identified risks.

From a linguistic scale defined in Table 1, to apply the designed questionnaire and decide if the failures evidenced in the distribution process within the organization correspond to operational risks or not; if it is considered a risk, both its probability of occurrence and its magnitude of impact must be defined, using the scale in Table 1.

Fig. 1. Methodology for the management of operational risk in a retail company.

Table 1. Linguistic scale for the risk identification and fuzzy equivalence for FQFD.

Linguistic Scale	Very low (VL)	Low (L)	Medium (M)	High (H)	Very high (VH)
Numerical equivalence	1	2	3	4	5
Triangular fuzzy number	(0,1,2)	(2,3,4)	(4,5,6)	(6,7,8)	(8,9,10)

Data should be consolidated so that it can be translated in proportion and quantitative questionnaire data, which will be the basis for related matrix Impact – Probability. These are obtained from define the percentage of the increased risk applicability by the corresponding values in the quantitative scale of the weighted averages of the scores made in both probability of occurrence and in impact according to Equation 1 (weighted average of the magnitude of risk i) and Equation 2 (weighted average probability of risk i):

$$\overline{X}_i = \frac{\sum_{j=1}^{n}(B_{i,j} \times M_{i,j})}{n} \quad ; \quad \forall \, i, \tag{1}$$

$$\overline{Y}_i = \frac{\sum_{j=1}^{n}(B_{i,j} \times P_{i,j})}{n} \quad ; \quad \forall \, i, \tag{2}$$

where $\overline{X}_i$ is weighted average of the magnitude of risk i,

$\overline{Y}_i$ is weighted average probability of risk i,

$B_{i,j}$ is expert's criterion j if i is applicable as risk (1,0),

$M_{i,j}$ is expert's qualification j on the impact of risk i,

$P_{i,j}$ is expert's qualification j on the probability of risk i.

Based on the impact matrix, it can be defined by a range of colors, those risks ranging from its lower impact and lower probability to a critical case of risk with a high impact

on the operation and in turn with high possibilities occurrence. With this result, we proceed to apply the FQFD for the risks located in the critical zone.

For prioritization through FQFD, the steps presented in Osorio-Gomez et al. [6] must be followed as they show. These steps will be developed in the following section.

Finally, from the previous ranking the company can define the strategies to be able to mitigate or eliminate the risks and in this way improve the analyzed process. It is important to highlight that the implementation of actions may include strategies associated with transferring risk, eliminating it, reducing it or applying strategies focused over the person or associated machine as showed Lavastre et al. in their article [4].

3   Results

Company operates in the retail sector in Colombia, where it has achieved a leading position in the home constructions. It seeks to satisfy the customer through multiple points of contact and sales channels that ensure the Omni-channel business model (Stores, Internet and Telephone). Its activity is focused on developing and providing solutions to the customer's remodeling and construction projects, in addition to satisfying their projects, offering good service.

The company currently has the distribution process through a third party, belonging to the corporate group of the owner organization. This company is responsible for managing deliveries to customers through contracted vehicles that meet the company's security and policy requirements.

According to the needs of the organization, a questionnaire was designed, which was applied in different stores of the region. This allows establish the initial risks that were considered in each one of the warehouses or stores, to finally elaborate the questionnaire that was applied to the defined experts.

According to the article of Avelar-Sosa et al. [1]; in a questionnaire, at least 7 of the respondents must agree with the points to be evaluated. For this reason, eleven people are selected representing the 4 branches of the Valle del Cauca region, experts in the logistics field. From the questionnaire, these people are asked to make the pertinent qualifications in order to consolidate the answers, and determine the viability of the previously selected risks, according to the observation of the process, and then obtain the weighted on the probability and the impact of the risk. These will allow building the probability and impact matrix of the preliminary risks as shown in Figure 2 based on Equation 1 and Equation 2.

According to the matrix and the managerial decision by the case study company, the risks found in the critical areas demarcated with red, listed in Table 2, are considered for the analysis, based on the FQFD methodology. The decision-making group; made up of the logistics coordinator, the manager, the dispatch coordinator, the product logistics coordinator and the operations manager; from red risk have to rate it's based on fuzzy logic.

	VL	L	M	H	VH
VH		r9,r21	r7 r5 r12 r10 r31 r24 r23 r17 r22 r26 r27	r8 r13 r33 r32 r19 r20	r18,r2,r9
H		r11, r25	r6 r2 r3 r15 r16 r28 r30	r1	
M		r14			
L		r4			
VL					

PROBABILITY OF OCURRENCE (Y) — RISK IMPACT (X)

Fig. 2. Matrix of probability and impact of preliminary risks case study.

Table 2. Risks defined in the matrix to apply the FQFD.

RISK DESCRIPTION	ID	RISK DESCRIPTION	ID
Do not perform the sweep of enlistments in the defined times.	r1	Difference between physical and virtual inventory (Sale without existence)	r20
Do not have the necessary and obligatory courses.	r5	Failure to comply with agreed delivery.	r22
Pick a wrong SKU.	r7	Deliver an NP to the customer's home.	r23
Picking with color or size difference (batch).	r8	Do not place complete delivery seal on the bill.	r24
Enlisting wrong amounts of a SKU	r10	Generate delivery record before validating based on the Enrollment Sheet.	r26
Do not record the NP once enlisted and left in the distribution area.	r12	Do not check the quantities listed at the time of boarding.	r27
Failures in Saps at the time of generating enlistment sheets.	r13	Without space for storage of the enlistments.	r29
Do not label the orders with the talker.	r17	Mechanical failures of the vehicles while they	r31

RISK DESCRIPTION	ID	RISK DESCRIPTION	ID
		are in function of delivering NP.	
Orders stored in warehouse with more than 5 days of enlistment	r18	Do not count on the number of vehicles sufficient to deliver the NPs.	r32
No availability of forklift or Macalister for the preparation of the merchandise.	r19	Technological failures in Saps at the moment of generating delivery records.	r33

3.1 Phase 1 and 2. Identify the Internal Variables "What's" and Determine Their Weight

This phase is determined by the wishes of the decision-making group regarding the process that is being evaluated, which were recorded in Table 3, together with the relative importance assigned by the decision-making group.

Table 3. Internal Variables and their relative importance.

		Weight of WHAT'S		
W1	Deliver timely	7,2	8,2	9,2
W2	Deliver reliably	6,8	7,8	8,8
W3	Planned operation in times and effectiveness	7,6	8,6	9,6
W4	Efficiency in operational costs	5,2	6,2	7,2
W5	Have the correct layout	5,2	6,2	7,2
W6	Focused attention to the customer.	6,8	7,8	8,8

3.2 Phase 3. Identify the Strategic Objectives or "How's"

To determine how, the indicators that manage the analyzed process were established, since they were defined and focused on the fulfillment of the company's objectives or strategic guidelines. Therefore, they are listed in Table 4.

Table 4. Strategic objectives of the analyzed process. HOW.

	Strategic objectives or "How's
H1	Delivery on time
H2	Complaints and claims
H3	Impact NPS

	Strategic objectives or "How's
H4	Reprogramming of shipments
H5	Deliveries of transferred sales
H6	PIS Withdrawal in Store
H7	% Non-existent sales

3.3 Phase 4 and 5. Determine the Correlation Between the "What's and How's" and Define the Weight of the How's

In this phase the decision-making team qualifies the relationship that each of the WHAT has with respect to the HOW, for example for member E1 the relationship between timely delivery and timely deliveries has a HIGH (H) relationship, on the other hand for the same expert the relation that has the efficiency in operational costs with respect to deliveries on time is LOW (L). This sequence is followed for the rest of the experts and correlations and the weight of the HOW's is calculated as shown in Table 5.

Table 5. Weight of the How's for the case study.

	Strategic objectives or "How's	Weight of How´s		
H1	Delivery on time	44	58	74
H2	Complaints and claims	40	53	69
H3	Impact NPS	46	60	77
H4	Reprogramming of shipments	20	30	43
H5	Deliveries of transferred sales	38	51	67
H6	PIS Withdrawal in Store	41	55	70
H7	% Non-existent sales	24	35	48

According to Osorio-Gomez et al. [6], these diffuse triangular numbers correspond to the average of the multiplication between the weights of the "WHAT's and the assessment given for the relationship between each WHAT's and the corresponding strategic objective.

3.4 Phase 6 and 7. Determine the Impact of Risk on the Strategic Objectives "How's" and Establish the Priority of the Risks

The risks that are considered critical; selected from the red quadrants of the matrix were valued according to their relationship between each of them and the strategic objectives defined for the dispatch process, finally obtaining the order of priority shown in figure 3 where it is observed that risks r20 and r22 are the most critical for the process that was being considered. Additionally, it can be observed that of 20 risks that were evaluated, 11 were ranked higher and ranked among those with a criticality level between High and Very High, and each of these risks must be addressed and intervened in order to mitigate their risk, the impact or eliminate it.

3.5 Strategies or Actions to Mitigate Operational Risks

For the management group of the company this work was very useful since it could associate the FQFD methodology to its internal improvement processes, known as "Closed Cycle" and in this way make decisions based on the risks between the rating interval High and Very High; but additionally it was decided to group the risks by their common causes or common monitoring indicator, with this grouping the Cause-Effect tool is used, to finish with the establishment of actions and follow-up the indicators; which will show the improvement in the process of dismissals; established in table 6.

Then we proceeded to establish a defined order to intervene the risks, this order was established according to the specific needs of the organization and decided by the management of the branch. This order does not have any interference on the initial approach of establishing actions on the risks that affect the dispatch process, because in the end all the risks that after prioritizing through the FQFD have been intervened between the High and Very High levels.

RANKING	ID	RISKS	DIFFUSE RATING			DEFUSED RATING
1	VH	VH	287,3	439,9	419,7	**396,6914**
2	r20	Difference between physical and virtual inventory (Sale without existence)	282,3	432,9	413,6	**390,4122**
3	r22	Failure to comply with agreed delivery.	261,7	403,6	388,9	**364,4297**
4	r1	Do not perform the sweep of enlistments in the defined times.	255,2	395,7	382,8	**357,3352**
5	r32	Do not have the enough vehicles to deliver the NPs.	244,3	381,4	369,5	**344,1417**
6	r7	Enlist a wrong SKU.	243,5	379,2	368,8	**342,6766**
7	r23	Wrong deliver an NP to the customer's home.	241,8	378,1	365,0	**340,7562**
8	r10	Enlisting wrong amounts of a SKU	238,6	373,2	361,6	**336,6484**
9	r27	Do not check the quantities listed at the time of boarding.	231,8	364,4	353,8	**328,6145**
10	r8	Loading with lots difference.	231,5	362,8	352,5	**327,4328**
11	r26	Generate delivery record before validating based on the enlistment Sheet.	221,5	350,0	340,8	**315,5825**
12	r31	Mechanical failures of the vehicles while they are in function of delivering notes ordered.	216,9	343,5	336,7	**310,1406**
13	H	H	215,5	342,2	335,7	**308,8743**
14	r33	Technological failures in Saps at the moment of generating delivery records.	198,5	317,0	316,0	**287,1364**
15	r13	Failures in Saps at the time of generating enlistment sheets.	191,2	309,1	307,6	**279,2343**
16	r19	No availability of forklift or macalister for the preparation of the merchandise.	187,8	303,4	303,5	**274,5116**
17	r12	Do not record the NP once enlisted and left in the dispatch area.	182,1	296,9	297,9	**268,4278**
18	r29	Insufficient space for storage of the enlistments.	164,8	273,9	277,6	**247,5672**
19	r17	Do not label the orders with the talker.	154,8	259,8	265,9	**235,0701**
20	r18	Orders stored in warehouse with more than 5 days of enlistment	149,4	251,5	258,2	**227,6480**
21	M	M	143,6	244,4	251,8	**221,0571**
22	r5	Not having the approved forklift courses or heights.	139,6	238,0	247,4	**215,7333**
23	r24	Do not place complete delivery seal on bill.	110,8	199,7	212,5	**180,6690**
24	L	L	71,8	146,6	167,9	**133,2400**
25	VL	VL	0,0	48,9	83,9	**45,4229**

Fig. 3. Prioritization of risks in the case of study.

4   Conclusions

The identification of risks is very important, but this has no relevance if it is not included in your personal selection expert on the process, which validate and approve that such risks effectively impact the performance of the company.

It can be specified that prioritization is one of the most important steps since it is the crucial point where actions are directed or more focused strategies can be generated; about those risks that generate the greatest impact and are likely to affect the strategic objectives set by the company and finally be able to control, eliminate or mitigate them.

Table 6. Grouping of risks between High and Very High.

Rank-ing	Classification by group	Risk	KPI associate
7		Enlisting wrong amounts of a SKU	Mistakes in en-listing the prod-ucts, 36 new fea-tures that represent 4% of sales made by deliveries.
9	2	Loading with lots differ-ence.	
5		Enlist a wrong SKU.	
8		Do not check the quanti-ties listed at the time of boarding.	
11		Do not have the enough vehicles to deliver the NPs.	Availability of vehicles in 97% to deliver orders
4	4	Mechanical failures of the vehicles while they are in function of delivering notes ordered.	
1		Difference between phys-ical and virtual inventory (Sale without existence)	Noncompliance in the promise of delivery to the cli-ent. The indicator of delivery on time is 93.61%
6	1	Wrong deliver an NP to the customer's home.	
2		Failure to comply with agreed delivery.	
10		Do not perform the sweep of enlistments in the defined times.	Indicator notes lists vs. generated notes is 92% for the delivery of the merchandise to the customer
3	3	Generate delivery record before validating based on the enlistment Sheet.	

Through the implementation of the diffuse quality function deployment methodology or FQFD, it was possible to establish the priority of the risks in terms of their impacts on the strategic objectives of the company, this methodological scheme can be

applied throughout any process business. In this way the organization manages to have a clear picture of what are the critical risks associated with its processes.

Finally, the quantification of the impact of each risk on the financial scheme of an organization, that is, translating the occurrence of each risk and its impact to economic or financial terms, remains a study opportunity.

References

1. Avelar-Sosa, L., García-Alcaraz, J.L., Castrellón-Torres, J.P.: The Effects of Some Risk Factors in the Supply Chains Performance: A Case of Study. J Appl Res Technol 12:958–968. doi: 10.1016/S1665-6423(14)70602-9 (2014)
2. Fahimnia, B., Tang, C.S., Davarzani, H., Sarkis, J.: Quantitative Models for Managing Supply Chain Risks: A Review. Eur J Oper Res 247:1–15. doi: 10.1016/j.ejor.2015.04.034 (2015)
3. Giannakis, M., Louis, M.: A multi-agent based framework for supply chain risk management. J Purch Supply Manag 17:23–31. doi: 10.1016/j.pursup.2010.05.001 (2011)
4. Lavastre, O., Gunasekaran, A., Spalanzani, A.: Supply chain risk management in French companies. Decis Support Syst 52:828–838. doi: 10.1016/j.dss.2011.11.017 (2012)
5. Manotas, D.F., Osorio, J.C., Rivera, L.: Operational Risk Management in Third Party Logistics (3PL). In: Alor-Hernández G, Sánchez-Ramírez C, García-Alcaraz JL (eds) Handbook of Research on Managerial Strategies for Achieving Optimal Performance in Industrial Processes (2016)
6. Osorio-Gomez, J.C., Manotas-Duque, D.F., Rivera, .L, Canales, I. Operational risk prioritization in supply chain with 3PL using Fuzzy-QFD. In: New perspectives on applied industrial tools and techniques, management an industrial engineering. pp 91–109 (2018)
7. Sangwan, T., Liangro, J.: Risk Identification for Outbound Road Freight Transportation Service (2015)
8. Tummala, R., Schoenherr, T.: Assessing and managing risks using the Supply Chain Risk Management Process (SCRMP). Supply Chain Manag An Int J 16:474–483. doi: 10.1108/13598541111171165 (2011)
9. Wee, H.M., Blos, M.F., Yang, W.: Risk Management in Logistics. In: Handbook on Decision Making. Springer Berlin Heidelberg, pp 285–305 (2012)