On the role of trust types and levels on inventory replenishment decision

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Abstract: *Using a participatory simulation platform, this paper investigates the inventory replenishment decisions made under different trust categories. Depending on the type of trust (trust in supplier versus trust in customer) and level of trust (high versus low), each decision is categorized and analyzed. We investigate how the inventory manager`s ordering behavior varies regarding their type and level of trust. This study provides evidence for the role of trust in inventory replenishment decision. The findings on the influence of trust on inventory decision indicators provide a new perspective in respect to the supply chain management literature, which generally postulates a positive influence of trust on supply chain stability and uncertainty reduction.*

Keywords: *Supply chain, Operations Management, Continuous inventory replenishment, Trust*

1 Introduction

The purpose of supply chain management is to produce and distribute products in the right quantities, to the right locations, and at the right time, with the aim of minimizing the costs while satisfying the customers to the fullest (Simchi-Levi et al., 2003). In a single product multi-echelon supply chain, a product passes through multiple stages/echelons before it is finally delivered to the end customer. In a linear decentralized supply chain, several inventory management agents, at each echelon, are responsible for inventory replenishment decisions. A linear supply chain acquires raw materials and/or components, converts them into finished goods, and finally distributes these products to customers. Therefore, adequate inventory management constitutes a key issue for supply chain efficiency. Availability of products on the one hand and reduction of inventory costs on the other hand contradict. Successful supply chain management requires therefore making a balance between these two conflicting issues.

Replenishment decisions are vital for efficient inventory management. Unavailability of the products or any delay in delivering them can cause severe damages to the business; losing market share, eroding companies reputation and in some cases huge back order costs. Therefore, inventory replenishment decision or determining how much and when to order is one of the core issues of supply chain management.

To answer these two fundamental questions, rules and procedures in inventory system, commonly known as replenishment policies, have been set. Still, many companies rely substantially on human decision-making; people use heuristics, rules of thumb and simplifications; they rely on traditions, organizational routines and formal hierarchies (Größler, 2004). Studies on inventory replenishment decision have typically assumed rational agent making decisions on the basis of normative models. However, human decision makers are prone to errors and biases. Not only an individual’s cognitive limits in terms of both knowledge and reasoning skills affect the decision making process (Simon, 1982) but also s/he can be biased by his/her emotion in processing the information (Harding et al., 2004). Hence, human decision makers are “bounded” when dealing with complex decision problems. Specific decision biases, cognitive limitations, bounded rationality, social preferences, motivational issues, or other behavioral factors, degrade the quality of human decisions and thus, deviations from optimal inventory policies often happen in practice.

The impact of behavioral issues on industrial activity is studied extensively in many fields, including economics, accounting, marketing, and management. However, its study in operations management is relatively scarce (Bendoly et al., 2006), but there is a growing interest in incorporating human behavior in inventory management studies. Behavioral decision theory (BDT) was developed to identify the cognitive limitations in the perception and processing of information (Sterman, 1987). The research methodology used in this stream of literature is behavioral experiments. By elucidating the decision rules and the behavioral factors, the behavioral experiments try to create a link between decisions and behavioral factors.

An important behavioral factor in any decision making process is "trust", which, despite its importance in supply chain, has rarely been studied. The imperfect information on intentions, competence, commitment and reputation of the other echelons in the supply chain, makes the decision makers highly dependent on the past behavior of their partners. Based on the past performances of its immediate upstream and downstream echelon, each decision maker builds a level of trust and performs based on this trust perception.

The main objective of the present research is to study how trust is linked to the inventory replenishment decision indicators. While previous experimental studies have examined the effects of factors such as information sharing, learning, lead-time reduction, etc. in alleviating bullwhip effect, this research regards bullwhip, as well as excess inventory, huge backlogs and other inefficiencies of supply chain as the results of poor inventory replenishment decision making. To solve these issues, there is the need to realize how people decide in the first place. The decisions on how much to order and at what time intervals depend on various factors such as the level of on hand inventory, the supply line of the placed orders, the size and time interval of the orders received from downstream customers, the rate of order fulfillment by the suppliers, etc. Aiming to understand how people make inventory replenishment decisions under different trust conditions; this study uses a participatory simulation platform called "XBeer Game" (Montreuil et al. 2008) along with a survey on trust.

The rest of the paper is organized as follows: Section 2 provides the literature review. Section 3 gives an overview on the experimental set-up and procedure. Section 4 deals with the experimental results and discussions and finally section 5 presents the conclusions.

2 Literature review

2.1 Trust in supply chain context

Recent studies on trust between organizations focus on the benefits that trust can provide to improve competitive advantage (Barney & Hansen, 1994; Jarillo, 1988; Mohr & Spekman, 1994). These studies note that trust is an antecedent for cooperation and also among the most common, and one of the most critical success factors of long term relationship between the firms. Rousseau et al. (1998) believe that trust is neither a behavior nor a choice, but an underlying psychological condition that can lead to a behavior or a choice; thus, it is important to the organizational life. In the supply chain context, the term 'company/supplier firm trust' was used by many researchers (e.g. Chow & Holden, 1997; Doney & Cannon, 1997; Zaheer, et al., 1998) to measure the sense of overriding trust the buyer has in a supplier to act in good faith and deliver competently against required outcomes. Sako (1992) defines trust an expectation held by one trading partner (trustor) about another (trustee) that the latter will behave in a particular and mutually acceptable manner. Sako & Helper (1998) study the effect of trust among suppliers on reducing transaction costs and investment. Dyer & Chu (2003) investigate the effect of trust between suppliers on reducing transaction cost in automotive industry in the United States, Japan and Korea; their findings show that trustworthiness lowers transaction costs. Handfield & Nichols (1999) discuss the importance of trust in supply chains and how the sharing of information and assets leads to success in a strategic partnership. Several researchers have paid attention to interfirm trust and its benefits from theoretical and empirical perspectives (Sako & Helper, 1998; Zaheer et al., 1998; Das, 1998; Blois, 1999; Blomqvist et al. 2002; Dyer & Chu, 2003; Krishnan et al., 2006). Interfirm trust has also been measured and evaluated widely by using several approaches (Sako & Helper, 1998; Zaheer et al., 1998; Krishnan et al., 2006).

Depending on the theoretical perspective of their work, researchers have used different trust measurement techniques. But basically, two approaches can be distinguished in the literature on trust measurement. Much of the business research relies upon survey questions to measure trust. In this approach trust is regarded as a belief or an expectation (e.g. Mayer et al., 1995; McAllister, 1995; Robinson, 1996; Zaheer et al., 1998). The other approach treats trust as a behavior and measures trust by means of game playing (McKelvey & Palfrey, 1992; Rapoport et al., 2003; Camerer & Weigelt, 1988; Rosenthal, 1981).

2.2 Behavioral supply management

Sterman's (1989) seminal paper was the first to describe behavioral experiment. He uses a beer distribution game setting with no stationary demand (beginning at four units and jumping to eight units), which is unknown to chain members. Other researchers use many different settings of the beer distribution game. These settings vary on the number of echelons, number of echelons played by human agent, lead-time (fixed or stochastic), demand (known or unknown; fixed/deterministic or random/stochastic; Stationary or not), availability of information (local or system wide), supply line visibility (supply line information shared or not with other players) and finally on the version of the game used. Croson & Donohue (2006) show that even in the absence of all operational causes of bullwhip, order variation/oscillation is still observed in orders placed by human decision makers. Sterman`s (1989) observations show that underweighting the supply line and relying merely on the on-hand inventory is the cause of the bullwhip effect (both aspects: oscillation and amplification). To study how neglecting time delays affects the bullwhip effect, experiments are conducted by either reducing the lead-times, or giving players the required information for making ordering decision. Kaminsky & Simchi-Levi (1998) and Steckel et al., (2004) study the impact of order and delivery lags. Kaminsky & Simchi-Levi (1998) observe that when the order information delay and lead-time for the shipment are reduced, the total cost of supply chain decreases even though the order variability amplification still persists. Steckel et al., (2004) also show that reducing lead-times results in lower costs. Chatfield et al., (2004) analyze the impact of stochastic lead-time and information quality on bullwhip. They observe that an increase in the variance of the stochastic lead-time results in higher bullwhip, while information sharing dampens it. Croson & Donohue (2003) observe that sharing the point of sale (POS) data can significantly reduce order oscillation and the overall supply chain cost. Croson & Donohue (2006) further find that sharing echelon inventory information with the entire supply chain dampens order oscillations. Interestingly, Croson et al., (2013) show that even in an experiment where demand is fixed and known to all players, and the game is started at the optimal inventory level, still a bullwhip effect occurs. The authors suggest that this behavior is linked to coordination risk, which means that players build inventory in order to protect themselves against the risk that others will deviate from optimal behavior. Machuca & Barajas (2004) find that implementing modern data-processing environment (e.g., EDI or electronic data interchange) across the supply chain leads to supply chain cost savings. Wu & Katok (2006) investigate the effect of learning and communication on the bullwhip effect. They find that collaboration in formulating the order strategies results in lower order variability and also when system wide experience of the game (learning) is gained, bullwhip effect is reduced significantly. Therefore, the supply chain performance is ameliorated by allowing the players to communicate and coordinate through knowledge sharing and by repeating the game (i.e. training) as players gain knowledge, experience and understanding of the system. Motivated by Tversky & Kahneman`s (1974) availability heuristic, Oliva & Gonçalves (2005) and Dogan & Sterman (2006) study overreaction to backlogs (capacity shocks since backorders cost more than on-hand inventory), Oliva & Gonçalves (2005) suggest that players treat their own on-hand inventory different from backorder. Their finding suggests that rather than overreacting to backorders and placing panicked orders, participants tend to ignore their own backorders.

2.3 Literature review gap summary

Trust as a behavioral factor plays a crucial role in decision-making. Although the above mentioned studies, among many others, have made important contributions to the literature, studies addressing the role of trust on supply chain inventory replenishment decision are limited. Trust has been measured in the literature using either surveys or game playing. Surveys can capture the perception and the games the behavior. The idea of perception leading to behavior has been recognized in the literature and the underlying assumption is that perceptual and behavioral representations are linked (Dijksterhuis & van Knippenberg, 1998). Hence, behavior and perception cannot be studied separately as these two are interrelated. This study uses a combination of game playing method and surveys to measure the perception of trust in order to study the inventory holding behavior of the players.

A number of behavioral factors have been studied using experiments and beer distribution game with main focus on the bullwhip effect reduction. Hence, the focus of the vast literature is on bullwhip effect and bullwhip reduction rather than identifying the main drivers of order quantity and order time variation.

2.4 Motivations and goals

We try to understand the ordering behavior- which leads to stability or instability of the chain- under the presence of different types and levels of trust. The aim of the study is to gain insight on how trust and inventory replenishment behavior are linked. The conclusions of this study would contribute to the lack in the literature by presenting evidence on how perception of trust and inventory replenishment decision indicators may mutually affect each other.

3 Experimental setting and procedure

A participatory simulation platform based on the beer distribution game structure, called XBeerGame and developed at Laval University (see, Montreuil et al. 2008) is used in this study. We consider the situation of a three-echelon serial supply chain of a single item with a normal random demand pattern. The demand is generated by the market which is played by a computer agent. The decision-makers need to select the timing and quantity of replenishments so as to minimize the total of holding and backlog costs. 48 students, 39% female and 61% male, 24% bachelor, 44% master, and 22% PhD, from two Swiss universities, with engineering and business background participate in this experiment

The game is played over eight rounds and there is no cancelation for backorders by either the buyer or the supplier. Before the start of each round the participants are given the trust questionnaire to find out their perception of trust for the upcoming round. This indicated trust of the participant is assumed to affect the decisions made by the participant at that round. Two types of trust are identified: (1) trust of a customer in the supplier (Ts), (2) trust of a supplier in the customer (Tc). The trust construct is based on four items: intention (My supplier (customer) will not use opportunities that arise to take advantage at my expense), competence (My supplier (customer) knows how to efficiently manage his/her company), commitment (My supplier (customer) is committed to on time delivery-stable ordering behavior), and reputation (My supplier (customer) has reputation for on time delivery-stable ordering behavior) (see Kaboli 2013, for further information). To avoid an end of the game effect, the duration of the game is not announced in advance.

4 Results and discussions

Experiments are designed to investigate the effect of certain variables, called focus variables. Focus variables should be systematically manipulated between treatments (Katok, 2011). Trust can be indirectly manipulated by sharing information or letting players collaborate / communicate within the chains, etc. but the nature of trust makes it hard to directly use “treatment” and “control” groups because trust is dynamic and fluctuates all the time, but a level of trust is always present. In this study, trust is measured using the Likert scale and the measured trust shows the overall trust perception of each participant at a certain time. The midpoint split procedure is used; the sample is divided into different clusters using the midpoint of the trust scale designated as "neither agree nor disagree". Those responses falling above the midpoint, in the "agree" area, are considered to have high trust and those falling below the midpoint are considered to have low level of trust and inventory replenishment behavior of players is studied within each cluster.

Echelons	4: Retailer, Wholesaler, Distributor, Factory
Human role	3: Retailer, Wholesaler, Distributor
Lead time	Shipping delays: 2 days, Ordering delay: 1 day, Production delays: 2 days
Demand function	Normal random variable (3000, 500)
Known/ known demand	Unknown
Information availability	Local
Supply line visibility	None
Game version	XBeerGame
Initial on-hand inventory	9000 units
Initial transit-in	Zero
Initial transit-out	Zero

Table 1: Experimental settings

In the following subsections, the relation between customer behavior and trust in customer is firstly analyzed, then the trust levels among the supply chain echelons are studied and finally the possible links between trust categories and replenishment indicators are discussed.

4.1 Customer behavior and trust in customer

The midpoint split procedure is used and the whole data is divided into two categories of high versus low trust in customer. The customer behavior is characterized by the mean and standard deviation of the received order quantity (ROQ) and received order time (ROT) of the previous round to see how the performance of the customer in this round (ROQ_i and ROT_i) is related to the trust in customer of next round (TC_{i+1}). As depicted in Table 2, high trust in customer is associated with small and frequent received orders and a high stability of the customer behavior (low SD and CV). On the contrary, low trust in customer corresponds to large and less frequent received orders and to a high variability of the customer behavior (high SD and CV).

The required data (such as the shipments of the orders) to analyze the performance of the supplier was not available on the version of the software used for this study, therefore, the link between trust in supplier and the supplier`s performance could not be verified. However, the latest version of the XBeer game provides all sorts of information and further research can be done on investigating this relationship.

		Trust in customer (Tc_{i+1})	
Received Order quantity (ROQ)		***High***	***Low***
Mean	μ_{ROQi}	2937,93	5092,54
Standard deviation	SD_{ROQi}	2220,17	6638,13
Coefficient of variation	CV_{ROQi}	**0,76**	**1,30**
Received Order time (ROT)			
Mean	μ_{ROTi}	23,34	25,06
Standard deviation	SD_{ROTi}	18,45	29,39
Coefficient of variation	CV_{ROTi}	**0,79**	**1,172**
Number of observations	***N***	***149***	***103***

Table 2: Trust in customer and variability of received orders.

4.2 Trust levels among supply chain echelons

Results of a role based analysis of high versus low trust are provided in Table 3. They reveal that moving upstream along the supply chain, the ratio of players having high trust in their customer decreases from 43% for the retailers to 27% for the distributors. Benefiting from the smooth supply and demand from the factory and market roles played by computer agents, most of the retailers have high trust in their customers (market) whereas the distributors have high trust in their suppliers (factory). The highest ratio of low trust in customer (41%) is found for the distributors whereas highest ratio of high trust in customer (43%) is observed for the retailers.

Trust in supplier follows rather a different pattern. The highest ratio of high trust in supplier (38%) is not surprisingly found for the distributors as a computer agent played the factory role. But the highest ratio of low trust in supplier (42%) is observed among the wholesalers and not the retailers who show an equal ratio of high and low trust in supplier.

Role	High Tc	Low Tc	High Ts	Low Ts
Retailer	**43%**	22%	33%	33%
Wholesaler	30%	37%	29%	**42%**
Distributor	27%	**41%**	**38%**	25%
N	***162***	***126***	***187***	***101***

Table 3: Frequency of each role per trust categories

The study of the frequencies of the rounds in each trust category shows no specific link between the round and the level of trust. Thus, high trust in customer or supplier can happen at any round of the game and no clear pattern could be identified.

4.3 Inventory replenishment indicators

Using the same midpoint split procedure, the sample is divided this time into four categories of high trust in customer (Tc) - high trust in supplier (Ts), Low Tc- High Ts, High Tc- Low Ts and Low Tc- Low Ts. The characteristics of the replenishment decision are then reported in each trust category.

Three decision indicators are considered:

- On-hand inventory (OI): amount of products immediately available for shipping
- Supply line (SL): amount of products ordered to supplier but not yet delivered
- Net inventory (NI): OI+SL– amount to be shipped

Table 4 reports the mean of these three indicators in each trust category. The results indicate that the decision indicators vary significantly between trust categories. Comparing the categories Low/Low trust versus High/High trust, a marked difference in all three indicators is noticed. SL and OI are much higher in the L/L category, while the reverse is true for NI.

Considering the Low/High and High/Low categories, it can be seen that:

- SL is closer to the Low/Low category for both
- OI of Low/High category is close to Low/low
- OI of High/low category is close to High/High
- NI of Low/High category is close to Low/low
- NI of High/low category is close to High/High

At first glance, it appears that SL is reduced only if both trust types are high and that OI and NI are mostly dependent on Tc.

Category		H/H	L/H	H/L	L/L
	Tc	High	Low	High	Low
	Ts	High	High	Low	Low
SL	μ	8802	10460	10068	10668
OI	μ	3558	6941	4097	6297
NI	μ	8895	11617	10451	12116

Table 4: Descriptive statistics for supply line, on hand inventory and net inventory in trust categories

To understand the difference of decision making process in each category of trust, regression analysis is used and decisions are decomposed into their underlying decision weights. Following the literature (Sterman, 1989 and Croson & Donohue, 2003) each model expresses a player's ordering decision as a function of several random variables so that each regression compares heuristics for orders placed in round *t* by individual *i*, against the participant's on-hand inventory level; orders received, and supply line level for order quantity; for order time the regression model includes average time between received orders and on hand inventory (standard deviation of received orders and supply line were also included in the model, but using the stepwise method of analysis in SPSS, both were excluded in all settings, meaning that both parameters are not considered into decision heuristics of the decision makers). Two models have been studied; one for order quantity and the other for the time between orders. Table 5 (order quantity) and Table 6 (order time) show a summary of the results of linear regression. The stepwise method of regression is used in order to find out which independent variables have influence on these two dependent variables. In this sense, the models indicate which parameter stays in the final model and which ones are excluded.

Model I: $OQ_{it} = B_0 + B_r\ ROQ_{it} + B_{sL}\ SL_{it} + B_{OI} OI_{it}$ *(1)*

With:

OQ_{it} = mean order quantity of individual *i* in round *t*
ROQ_{it} = mean received order quantity by individual *i* in round *t*
SL_{it} = mean supply line of individual *i* in round *t*
OI_{it} = mean on-hand inventory of individual *i* in round *t*

The values of the obtained coefficients for Model I are given in Table 5.

Category	H/H	L/H	H/L	L/L
Tc	High	Low	High	Low
Ts	High	High	Low	Low
B_0 (constant)	-1,136	-0,491	-2,334*	0,813
B_r	0,647**	0,618***	0,949***	----
B_{SL}	0,462***	0,292***	0,486***	0,319**
B_{OI}	-------	0,102*	----	0,226**
R^2	0,185	0,753	0,610	0,435
R^2 (adjusted)	0,169	0,743	0,595	0,410
RMSE	4,776	3,476	3,658	2,663
Observations	109	78	53	48

Standard errors in parentheses: * significant at 10%; ** significant at 1%; *** significant at 0.1%.

Table 5: Regression model for order quantity

Model II: $OT_{it} = B_0 + B_{rot}\ ROT_{it} + B_{OI}\ OI_{it}$ (2)

With:

OT_{it} = mean time between orders of individual *i* in round *t*

ROT_{it} = mean time between received orders by individual *i* in round *t*

The values of the obtained coefficients for Model II are given in Table 6.

Category	H/H	L/H	H/L	L/L
Tc	High	Low	High	Low
T s	High	High	Low	Low
B_0 (constant)	13,37	40,95	21,66	27,05
B_{rot}	0,638***	------	0,703**	0,012***
B_{OI}	0,0040***	0,002**	------	------
R^2	0,233	0,075	0,350	0,473
R^2 (adjusted)	0,218	0,063	0,337	0,462
RMSE	35,82	60,26	19,55	32,21
Observations	109	78	53	48

Standard errors in parentheses: * significant at 10%; ** significant at 1%; *** significant at 0.1%.

Table 6: Regression model for order time

It must be noticed that this analysis assumed independence between the data of each two round. This is certainly not the case for adjacent rounds, but as adjacent rounds are only rarely found in the same trust category, the assumption of independence is considered as acceptable for a first analysis. More sophisticated statistical analysis is foreseen in future work.

The results presented in Tables 5 and 6 indicate some differences in the replenishment decision process:

In the H/H trust category, it appears that participants decide about the order quantity on the basis of the received order quantity and the supply line, ignoring the on-hand inventory. Their ordering time decision seems to depend mainly on the received order time.
In the L/L trust category, the decision about the order quantity does not seem to depend on the received order quantity, but on the supply line and the on-hand inventory. The ordering time decision shows a very weak (0.012) dependence on the received order time. In a first approximation, this decision can be looked at as independent of any of the considered independent variables.

In the H/L trust category, the decision about the order quantity is similar to that observed in the H/H category; it appears to depend on both the received order quantity and the supply line, ignoring again the on-hand inventory. Also the ordering time decision seems to depend mainly on the received order time, as in the H/H category. Thus categories H/H and H/L do not show any significant differences, except for the value of some coefficients.

In the L/H trust category, the decision about the order quantity depends on the received order quantity, on the supply line and the on-hand inventory (although relatively weakly). The ordering time decision shows a very weak (0.002) dependence on the on-hand inventory. Thus, in a first approximation, this decision can be considered as independent of any of the retained independent variables.

These different decision processes are summarized in Figure 1, which illustrates the weights of the independent variables considered in choosing the two replenishment parameters OQ and OT. It clearly appears that the decision process can be considered as identical in the H/H and H/L categories. The L/L category shows a very specific decision process based solely on SL and OI. The decision process in the L/H category represents an intermediary situation between the L/L and H/H ones, while being relatively close to the L/L category; main difference is the role of ROQ in the setting the order quantity.
Comparing the decision process between the two extreme cases, i.e. H/H versus L/L, the following conclusions can be drawn.

In the H/H situation, the decision variables are ROQ, SL and ROT, three variables that represent the behavior of the customer (ROQ, ROT) and partially the behavior of the supplier (SL). Thus it appears that in a high trust situation, the participant bases his/her decision essentially on the basis of his/her supply chain partner's behavior.

In the L/L situation on the contrary, the decision variables are SL, and OI only. This can be seen as decision based essentially on the local situation with little regards to the behavior of the supply chain partners.

Whether the decision process is the consequence of the trust situation or the reverse cannot be concluded here, but a link between the two elements clearly appears.

It is also interesting to note that in the L/H situation, which corresponds to a loss of trust in the customer, ROT is not considered in the decision process, as in the L/L situation, but that OI is then considered. This is the indication of a decision process with a weaker link to customer behavior than in a high trust in customer situation (H/H and H/L).

On the contrary, in the H/L situation, both ROQ and ROT are again considered, indicating a strong link of the decision process with the customer behavior.

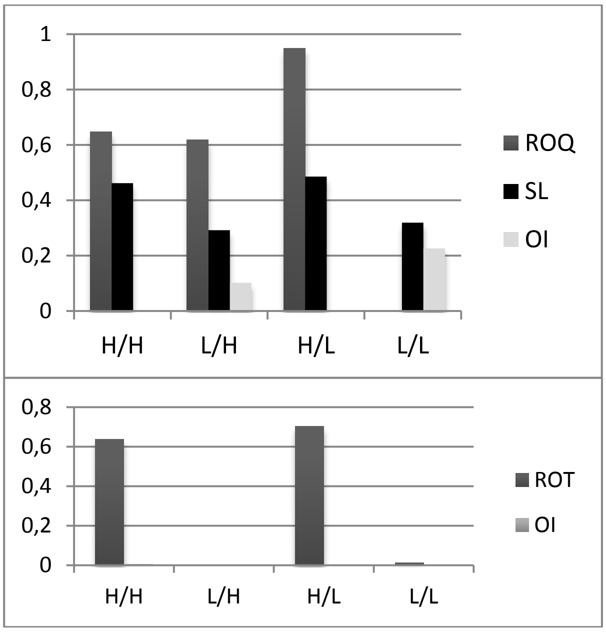

Figure 1: Summary of the influencing factors in decision making in each trust category.

5 Conclusions

The work reported here is the result of an experimental study, under controlled conditions, of the role of trust in supply chain and more specifically on the inventory replenishment process. It shows evidence of the link between trust and supply chain partner performances. In particular, it is shown that the level of trust in customer depends on the volatility of the ordering process of the customer; the less volatile the ordering behavior, the higher the level of trust.

Role based analysis of trust reveals that, due to the non-volatile demand of the market, the retailer shows the highest ratio of high trust in customer in the supply chain, while distributor (having the most reliable supplier) exhibits the highest ratio of high trust in supplier.

The analysis of the obtained experimental results leads to interesting findings concerning the inventory replenishment decision process. It is in particular found that the integration of the supply chain partner behavior in the decision process is linked to the corresponding trust level. In case of a high trust level, the replenishment decision takes the characteristics of the partner's ordering behavior into account, while in case of low trust in the partner the replenishment decision is taken essentially on the basis of local parameters.

The findings of this study add to the existing knowledge on behavioral supply chain management and provide insights into the replenishment decision process. The study has however some limitations. The first limitation is due to the procedure adopted for the investigation of the role of trust on inventory replenishment, which is based on a multi-criteria trust measurement through questionnaires and does not use any treatment. This experimental procedure has however the advantage of providing quantitative, while approximate, description of the trust level that can then be easily used for analysis. Another limitation acknowledged in this study is the fact that the multiple regressions used in data analysis assume independence of the data for each round. Although this is statistically not proven, the fact that adjacent rounds are not often found in identical categories makes this approximation acceptable for a first analysis. The low adjusted R^2 of the model under some trust conditions along with their high RMSE makes the model poor in prediction (specially for order time). How high the coefficient of determination (R^2) should be to show that the model fits the data well enough is a question that does not have a clear-cut answer. It depends on the intended use of the regression model. If the model is intended to be used for prediction, the higher the R^2, the more accurate will the predictions be (Aczel, 2008). The regression models used in this study are however not to be used as predictors of order time and order quantity, but in order to find out which independent variables have influence on the two dependent variables. In other words, the purpose of the model is limited to finding out which variable stays in the final model and which one is excluded. In this sense, it fulfills the research goal, which is to gain insights into the replenishment decision process. However the R^2 might get improved in further studies, by 1) incorporating other predictors such as shipment data, or 2)increasing the power of predictors by using quadric or cubic models.

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