Original Research Article

How to manage relations facing accumulated supply chain disturbances: pandemic, war and ripple effects

ABSTRACT

How to develop a suitable management style to manageexternal Supply Chain network relations in the light of unprecedented external disturbances like the Covidpandemic, Ukraine warand inevitable ripple effects caused by explosions or strikes? Impacts in terms of increased lead times, uncertainty about thetime required by suppliers and buyers for decision making. But,it also should be suitable in dealing with quite different types of managerial attitudes encountered. The mixed-methodsanalysis of a 3 tier supply networkaround a small focal printing company shows that *(1)* total *lead time* for raw materials, production and delivery went up from 9 days to 60 days or more.It not only meant increased uncertainty for the focal company but also for its B2B buyers;*(2)* the *decision time* of buyers responding to requests to accommodate changes enforced by scarcity or increased lead time of raw materials varied between 3 and 41 days, depending of the size of the buying firm where four size categories were used. Small SMEs were fast deciders but being mostly negative in attitude; multinationals were slow but more flexible and cooperative*. (3):* zooming in on the managerial or *human attitudes*encountered in 100 contacts with buyersrevealed 9 different human attitudes that could be clustered into a scale with two extremes:*Total denial* (selfish, exploitative, demanding, brutal, ignorant, helpless) versus *Total flexibility*(cooperative, tolerant, inspiring).*(4)* To deal with these different attitudes *employee training* is recommended, using the DiSC portfolio model invented by William Moulton Marston, standing for Dominance, Influence, Steadiness and Compliance (sometimes referred to as Conscientiousness).

Keywords: Pandemic, Supply Chain disruptions, DiSC, decision time, relation management

1. BACKGROUND

The COVID pandemic, climate change effects, the Ukrainian war together with network ripple effects [1] such as fires, explosions and strikes increased the uncertainty for companies about getting the right inputs at the right time. Increased lead times and unavailability of certain inputs played havoc on many supply chain networks [2]. Managers had to develop new ways of dealing with these new and unprecedented uncertainties in their struggle for resilience[3]. In their contacts with buyers and suppliers, significant differences between human attitudes occurred [4].The question being if these attitudes encountered were incidental or systematic? Furthermore,the case study showed that *some* companies took a very long time to respond to a request about changes in the specifications or delivery date. How come? Maybe, related to firm size, negotiation power or the complexity of the firm concerned? How to deal with them? What did it mean for the way the company operates and employees should be trained?

To answer these questions, first of all a review of relevant literature will shed some light on this issue. Thereafter, a case studyof a Hungarian label printing company will be presented to get an empirically founded better insight. Upstream lead times and total three-tier lead time were measured and compared with pre-pandemic times to check on the various lead time effects. Downstream contacts were analysed on decision time. A mini-Delphi study [5] with key informants of similar companies resulted in a list of human attitudes encountered in contacts. This list was used when analysing encountered attitudes in 100 contacts with buyers, given four sizes of buying companies to tell if there were any size related differences.

After discussing these results, an appropriate management approach will be presented to deal with this situation. It includes the type of training that would be required to deal adequately with the different attitudes encountered.

2. LITERATURE

2.1 Risk versus uncertainty

Decision making under uncertainty has been covered quite well by literature[6].Platt and Huetel[6] defined uncertainty (p. 398) as "… the psychological state in which a decision maker lacks knowledge about what outcome will follow from what choice". Busemeyer[6] describes three classes of situations: "decisions made under conditions of certainty, risk, or uncertainty" (p. 538, quoting Luce and Raiffa, [7]). "Under risk, each action produces a set of possible outcomes, and the probability of each outcome is known.Under conditions of uncertainty, each action again produces a set of possible outcomes, but the probability of each outcome is unknown" (ibid., p. 538). Ari Riabacke[6] has very much the same classification, while Lipshitz and Strauss [6] describe on page 149 three types – or causes - of uncertainty: *(1)* inadequate understanding; *(2)* incomplete information and *(3)* undifferentiated alternatives. Finally, the perceived uncertainty may be increasing day by day, resulting in disorientation described by Pugh [6] on page 161: "confusion, a sense of being lost or overwhelmed by the scale of the task at hand and a desire for outside help. The Corona pandemic is a good example of a disorientation creating event.

Since many years,there are numerous publications about various types of *risks*[8]. When zooming in on more specific sources ofwhat is labelled as 'risk', the term 'uncertainty'would be more applicable, because of the uncertain outcome, making it more 'upsetting'. Examples are disasters, market price increases, the pandemic, climate change effects or the Ukraine war.

When taking more of a helicopter view of the supply system, networkor value system, we should realise that supply uncertainty for one company is the result of the problems a supplier of that company has because of demand issues, a fire, strikes or environmental impacts or even process issues; problems where the effect spreads across the supply network: the ripple effect [1]. Also, volatile customer demand may lead to supply problems when suppliers are unable – or unwilling - to follow or absorb that volatility. In our case study, we do find these situations. Hence, to single out unique single *risk* sources may result in nice lists of risk sources, but overlooks the interrelationships and multiple interdependences between all those risk sources creating uncertainty because the probability of each possible outcome is unknown.

At this day of writing, the environmentaluncertainties like the pandemic, climate change and the Ukraine war actually are predominant in *causing*most of the risks, described in literature. Similar to terminology in factor analysis, risk sources as mentioned in literature could be termed the '*manifest observable'* variables, while the underlying causes – pandemic and Ukraine war for instance - causing overall uncertainty could be termed the *'latent constructs'*or phenomena. They can only be measured through the manifest symptoms or consequences.

2.2 Behavioral aspects

Given uncertainties and knowing their origins is one thing, what it does to people having to deal with them is another thing. First of all, do they perceive it as just a 'deviation from normal', a 'disruption' or a 'disaster'[9]? Do they think the uncertainty and the risk for disturbance originates from internal or external sources [10? Also important, do they think or perceive it is 'controllable' or 'uncontrollable' [11].Finally, do they think it can be classified as something that could have been prevented if and only if proper monitoring indices had been put in place: a 'catastrophe' versus a 'calamity' being something that came out of the blue (like an explosion, strike, war or pandemic) [12].

We should not ignore the psychological aspect, for a*n "incident becomes a critical incident because of its perceived seriousness in its consequences"*[12](p. 1).In other words, when people *think* it can be dealt with within the boundaries or scope of 'normal' corrections, routines or feedback loops, it is not *perceived* as critical but is viewed as a routine deviation. This may lead to situations where one manager classifies a situation as critical while another manager does not, based on – maybe mistaken – experience and risk-taking attitude. Or that one network actor perceives something as a problem while network partners do no 'see' the problem and therefore are unwilling to help.

Hence, given the network dependence or systems dependence of any actor, critical situations and their possible solutions are influenced by the behaviour of other actors. Are other actorscooperative, selfish, exploitative, demanding, tolerant, inspiring, brutal, ignorant, helpless or other human characteristics that play a role? This especially is important in finding solutions that deviate from the standard routine. How well willing are the network partners to support solutions? One particular aspect that might play a role is the market power or bargaining power of the network partners. Are differences expected? Are large Multinationals more cooperative or less, compared to SMEs? Are SMEs more cooperative because they lack the power to be more selfish or even brutal? At this stage, it only is a *hypothesis that there is a difference in behaviour between network partners, related to market power and bargaining power; the actual* case study will give the answer. It also gives the answer, how environmental uncertainty can change the way the company operates.

2.3 The role of trust and sharing information

Sharing information vice-versa was found to be very important.Sometimes the information was "we do not know". In spite of this, it is a main point to build up the mutually trusting relationships between the supplier – manufacturer – buyer [13]. "Trust is perceived reliability and integrity of an exchange partner and can be viewed in terms of competence, consistency, and benevolence"[14]. This also relates to uncertainty in the perceived

capabilities of the supplier, and uncertainty in the expected benefits. Which is in line with the business marketing literature with for instance Ford's [15] model on pre-transactional and transactional bilateral uncertainties.

As Gao et al. [16] remark on page 398, it could be said that buyers' trust in suppliers is established "when buyers believe in the suppliers' willingness to keep their promises and their ability to deliver competent and need-satisfying performance".Therefore, the decision maker must undergo a slow and time-consuming process of retrieving, comparing, and integrating the comparisons over time. "No action is taken until the preference for one action becomes strong enough to goad the decision maker into action." [17] (p.444). Obviously, the decision maker has to recognize the various relevant aspects that may play a role in making that decision. Shall we share the negative information with the customer or shall we just say the positive things and pretend that everything is fine? Shall we just ask; are you satisfied if we deliver only the partial products and the rest of it, we do not know yet but we do not talk about it?Making decision means the process of deliberation, weighting, waiting, recalling, searching, digesting all kinds of relevant and seemingly-not-so relevant external stimuli, internal experiences and memories and events that lead to a final step: the actual decision taken. Riabacke remarks that "*The context affects the form of decision analysis and the way decision are made*" [6] (p. 12). As such, it closely relates to the process of *sensemaking*described by Karl Weick [18].

2.4 Broad theoretical framework

As broad theoretical framework consisting of a combination of theories is used to try to explain what is observed. Given the discussion above, the well-accepted definitions and descriptions are used of 'uncertainty' and 'risk' [6][7]. To describe and understand the process of decision making and the attitudes encountered, these definitions are combined with a number of behavioral approaches that each has some specifics to contribute: Lewin's *field theory*[19][17], *cultural materialism*[20], *sensemaking* [18], some 'naturalistic decision-making' as described by Lipshitz and Strauss [6],*isomorphic institutionalism*[21], concepts from *business marketing*[15], *procurement concepts*[22] and combinations and applications of these theories [23]. Together, these theories should explain the different types of behaviour and attitudes encountered.

3. METHODOLOGY AND CASE DESCRIPTION

3.1 Methodology: mixed methods

A mixed method methodology was applied. The lead times of inputs from the four major suppliers of raw material and total throughput time came from the SAP system of the company, as did the real decision times required by 100 selected buyers, representing 80 percent of the turnover. A Mini-Delphi method [5] was applied in developing a scale of human attitudes. Four general managers of similar companies as the focal one were interviewed to discuss the attitudes they met. Results were discussed again and were used to analyse the 100 contacts selected. All correspondence and discussions between the sales managers and the customers were analysed and discussed with managers if required. As such, this can be viewed as a type of action research, since results were immediately implemented and used in the company.

The 100 Buyers were divided into four size categories in terms of employees and annual turnover: SME1 (<10 employees; <2m Euro turnover); SME2(<50 employees; <10m Euro turnover), SME3 (<250 employees; <50m Euro turnover). The MULTI typically hasone global head office and maintains facilities and assets in numerous countries other than its home country. It typically is a well-known company with large operation bases and a largerevenue.

3.2 Case description

3.2.1 The Company

The focal company is a Hungarian company in the adhesive label and bar code technology market. It's most important supplies of high quality inputs are for 25 percent from one Hungarian and 75 percent from three large European multinational suppliers. Labels contribute to 79 percent of the turnover, reason to zoom in on this product for the analysis. The group of more than 400 customers comes from warehouse logistics, transportation, automotive, electronics component manufactures, construction manufacturers, plastic industry and food manufactures.

3.2.2The disturbances it faced

Ripple effects:(1) one of the major suppliers announced a force majeure due to the explosion and subsequent fire occurred at the plant of one of their main chemical suppliers, subsequently followed by increased prices and lower volumes. *(2)* Further cost upcharges followed such as for pallets, hard woods, energy and oil, with "exploding" prices.*(3)* Another major supplier changed the delivery methods so the company had to divert volume in a shift towards another supplier. *(4)* A major strike in Finland affected another major supplier for 5 months. It caused an enormous gap in the paper industries all over Europe.
Unprecedented external disturbances: The Covid pandemic and the Ukraine war can be considered as two major external disturbances having a stagnating impact on global business. It led to lack of resources, logistical problems, rocketing energy prices and increased anxiety about the future. The visible effects of the climate crisis only added to this feeling and meant an intensified search for the appropriate answer.

On the *buyer's side*: because of some bankruptcies and customers switching to other suppliers, the number of customers went only less that 3 percent down, from 441 in 2019 to 429 in 2022. The company did not have the chance to find new customers to replace the ones gone. Its aim was most of all to serve those customers who are in a business relationship for a long time, not to get short term contracts.

4. RESULTS

4.1 Lead times

A detailed analysis showed first of all the impact on the *upstream* lead time of its four main first tier suppliers of raw material – expressed in working days spent for *(1)* procurement, *(2)* confirmation of orders and *(3)* arrival at the focal production plant. This total sourcing process took 6 working days in the past but went up to at least 30 days and a large share of 'unknown' for the second and third part. Analysis of the total *downstream* process of *(1)* order confirmation to buyer, *(2)* producing the required labels, *(3)* delivery time reveals that

this used to be 5 days, but also went up to at least 30 working days with all three aspects entering the 'unknown'.

4.2 Decision time

The time buyers took to decide on requests for adjustments required to accommodate changes induced by upstream issues and problems was measured for 100 contacts: 15 SME1, 24 SME2, 14 SME3 and 47 Multinationals. Figure 1 gives the percentage frequency distribution of the time required for each of the three SME size categories and the Multinationals.It shows a rapid decision making by the smallest SME1 category (4 days), a bi-modal distribution for the next size SME2 (either 4 days of 16 days), SME3 with 13 days and the Multinationals ranging from 7 to 40 days, with a peak at 15. One of the assumed causes for the large range of scores by the multinationals is the complexity in decision procedures, intensified when decisions are following multi-national routes. Another assumption explaining the short decision time of the small SMEs versus the long decision time used by multinationals is the difference between entrepreneur led small SMEs and manager led multinationals [24]. Differences in time required for consultation, deliberation, consideration and counsel translate in total longer decision time.

Figure 1: Percentage distribution of decision time of buyers for 4 size categories

4.3 Attitudes encountered

The result of the Mini Delphi exercise was the following initial list of attitudes encountered:*(1)* being positive motivated, *(2)* being helpful, *(3)* risk minimisation, *(4)* revenue optimisation, *(5)* group decisions, *(6)* teamwork, *(7)* support each other and information sharing. In addition, all the conversations between the sales department of the focal company and the customers of the company were read. After discussing these, the following list of nine attitudinal characteristics was applied when analysing the 100 contacts for the four size categories used:*(1)* cooperative, *(2)* selfish, *(3)* exploitative, *(4)* demanding, *(5)* tolerant, *(6)* inspiring, *(7)* brutal, *(8)* ignorant and *(9)* helpless. These nine attitudes were

clustered along a polar scale with on the two poles 'total denial' and 'total flexibility', as shown in figure 2.

Figure 2: Total denial versus Total flexibility in human attitudes encountered from buyers

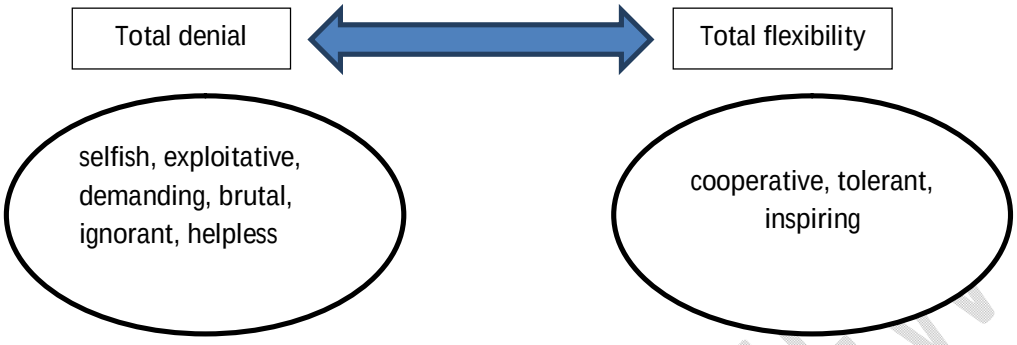
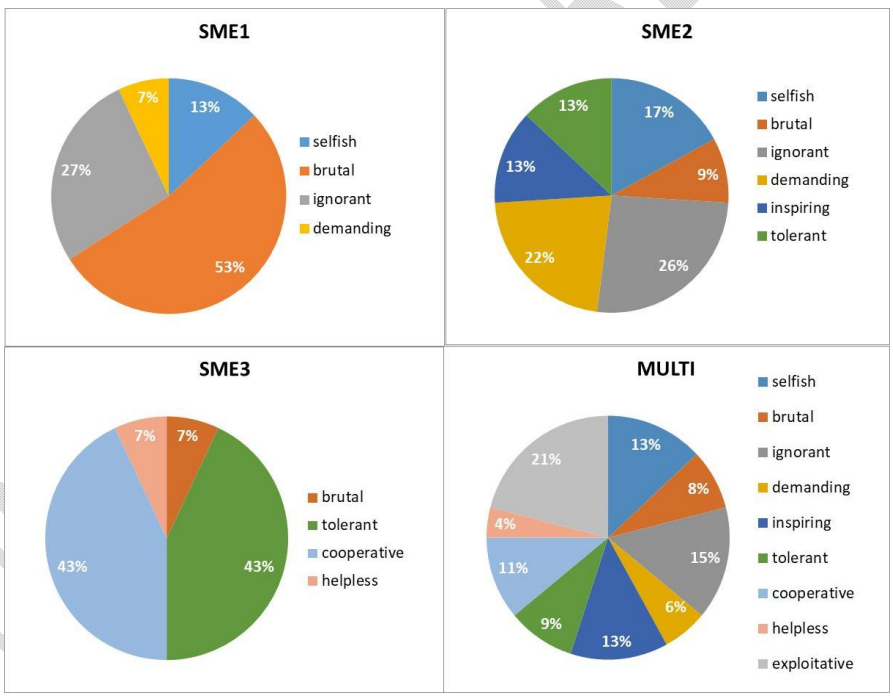


Figure 3 gives the scores on the components of the attitude scale of the 100 contacts by size category.

Figure 3: Attitude scores when asked for adjustment by size category buyers



The last diagram – for Multinationals – has a surprisingly high score of 21 percent for exploitative attitudes. Is it, because they think that they are a Multinational? So, they can do whatever they want, they have the power, they can be arrogant? Fortunately, it is not true for all the Multinational enterprises, because they can also be cooperative, inspiring and tolerant.

Compared to entrepreneurial led small companies, the multinationals with their bargaining power would be assumingly less understanding and more brutal; the opposite is

true. The smallest SMEs are the most brutal in their response. They simply deny flexibility. Hence, the assumption that market power almost automatically translates into more brutal and less cooperative behaviour is not supported. At the same time, some of these multinationals turned out to be less flexible, not because of a human attitude, but simply because of certain protocols that for instance did not allow more than a single price adjustment per year. They sometimes are caught in their complexity in decision making, created by themselves, which may be a serious handicap in times of uncertainty were rapid decision making is an advantage[4].

5. DISCUSSION

5.1 How to handle?

5.1.1. Dealing with uncertainty: does experience matter?

One of the questions in taking decisions under uncertainty is, whether experience counts. Would this suggest that experienced decision takers know better how to deal with uncertainty? Or they know better how to classify what is 'rally' uncertain, unpredictable in terms of risk probability and separate the aspects that have a risk probability? Under complete uncertainty, the decision maker knows neither the complete set of possible events which may take place, nor their exact impact, nor their probability of occurring. When does it end or will it ever end? This seems very much a personality issue, where experience only helps in similar looking cases. As such, sharing tacit knowledge about disasters in the past and what they meant may help. After all, what managers actually 'see' is coloured by their experiences: *what* they see and *how* they see it. Which of course is translated in a biased choice of what they are going to do as a result of what they see. The reason for this is that their subjective perception is driven by their frame of reference [18][25].A frame of reference that is the result of individual past experiences, individual histories. Managers have – as all human beings - been conditioned to do and see certain things as Weick states: *"they see what they believe"* [18] (p.154). So: does experience help in cases of totally unknown external uncertainties? Maybe yes; more likely no*per se*.

5.1.2. Dealing with all those different attitudes

Facing the different human attitudes and related behaviour, the question arise how to handle them. Most modern companies use some type of portfolio analysis to differentiate strategies between different types of suppliers[22], products [25]and buyers[26]. However, how to handle the human characteristics of the people 'at the other end' is – so far - not explicitly included in any of these portfolios. To find an adequate answer, as starting point is the assumption used that everything depends on *both* parties - customer <> supplier - and the main or key element is the communication; how does it work between them. After all, companies should be aware that 'We' do not choose the customer; the customer chooses us to build with us a business relationship. For this reason, any company should find and train their employees in a way they can handle well the denial customers or the flexibilities ones, even the exploitative multinational managers;it also should pay attention to how the behaviour is of their own employees. A proper model to use in this case is the DiSC model [27].

5.2 The DiSC model

5.2.1. The model

The present day DiSC model has its origins more than a century ago in the work of Harvard psychologist William Moulton Marston in the 1920's. His theory assumes that people tend to develop a self-concept based on one of four factors — Dominance, Inducement, Steadiness, or Compliance/Cautiousness. There are since numerous assessment and measurement tools based on this DISC model:
(https://www.discprofiles.com/blog/2017/03/disc -personality-types/#.Y9EC-nbMLIU).

One way to describe the DISC model is to visualise it as a circle, representing the full range of normal human behaviour, divided into four quadrants. As withall models, there are differentinterpretations of the model. For instance, when splitting up the circle, the upper half would represent more outgoing or fast-paced people. The lower half would represent reserved or slower-paced people. Outgoing people are supposed to move fast, talk fast, and decide fast. Reserved people tend to speak more slowly and softer than outgoing people, and they generally prefer to consider things thoroughly before making a decision. Many web sites on internet deal with slightly different interpretations.

'D-personalities' would tend to be confident and place an emphasis on accomplishing bottom-line results; they are task-oriented and tend to be dominant and decisive.

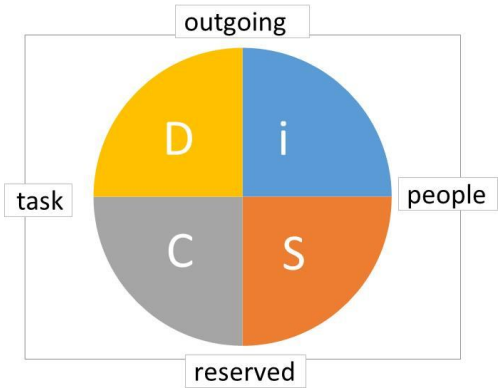
'i-personalities' would tend to be more open and would place an emphasis on relationships, influencing or persuading others; theyassumingly are rather inspiring and influencingwith a focus on talking and having fun.

'S-personalities' would tend to be dependable and place the emphasis on cooperation and sincerity.They are more reserved and people-oriented, are assumed to be supportive and steady, focus on peace and harmony.

'C-personalities' would tend to place the emphasis on quality, accuracy, expertise, and competency. They also are assumed to be more reserved and task-oriented, while usually with a focus on facts and rules being more cautious and conscientious.

Figure 4 shows an example of the DiSCmodel where the words around the circle are supposed to reflect the priorities of people.

Figure 4: The DiSC model



5.2.2. The implementation

Large companies can afford a team with all the different personalities described by the DiSC model on board. Each team member dealing with external relations suitable with its personality. This is similar to the distribution of personalities across team members in typical procurement situations [28]. However, the smaller the company, the more individuals have to be able to switch between attitudes to deal effectively with the external relation. Assumingly, individuals with a higher score on Emotional Intelligence and Adoptive Intelligence would score higher in being able to empathize with attitudes that are not theirs than individuals with a low score.This seems an issue of relevance to the HRM department of large and small companies. At least, if the company is looking for a way to successfully handle the different attitudes encountered in external relations, it has to train people.

5.3 Limitations

In line with Kumar's [29] recommendation, we also point at the limitations of this study. The authors are aware that only one company was used as a focal case. Still, discussions with three similar companies revealed they were all in the same situation and position in terms of lead time problems, decision time issues and facing some negative behaviour by companies. As such, we think that companies will recognize the situation which means that the recommendation to train employees using the DiSC model seems to make sense.

6 CONCLUSIONS

Unprecedented events led to sharp increases in lead time and unpredictable shortcomings in volumes contracted and delivery times. These shortcomings were transferred downstream. Buyers responded on requests to adjust volumes and deliveries in quite different ways. Small companies showed negative attitudes; for 80 percent of small buyers described as brutal and ignorant. While multinationals took a long time to decide, assumingly caused by more complex decision procedures, their attitudes were more diverse and included many supportive attitudes, albeit that 'exploitative' was the largest category of attitudes with 21 percent of the analysed interactions with multinationals. Related to this is the observation that managers respond in a different way from entrepreneurs/owners.

Faced with the variety of attitudes, ranging from total denial to total flexibility, employee training was proposed, using the DiSC model. Employees would and should be trained to be at least aware of the nature of people's attitude they deal with in external communication. Well trained employees may be more effective and lead to less conflicts with partners within the supply network.

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