

On some aspects of contagion effect in organization – models and diagnostic tools

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Abstract

One of the aspects of the volatile, uncertain, complex and ambiguous environment is the contagion effect that impacts the organization. In order to understand what the contagion does and what contagion effect means for organization, the author conducted an in-depth literature review, and defined these ambiguous concepts emerging in various research fields. The paper also discusses models of mechanisms that facilitate the spread of contagion including the 4C model, contagion model of sales peak. What is more, the author proposed the diagnostic tool to map a contagion effect induced by external factors. The theoretical consideration on the contagion and contagion effect is supported by examples coming from the business practice.

Paper type: conceptual article

Keywords: complexity, contagion effect, crisis, organization, positive influence, risk

Introduction

Contagion and contagion effect are phenomenon that emerge in various research fields, contexts, and involves different entities. Fragmentation of knowledge on contagion and contagion effect results from the unstructured problems that are hard in covering and resolving. Initially, the concept of contagion was probably used in immunology, and then was adapted into various fields of research including psychology, marketing or finance.

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The primary goals of the article are to synthesize knowledge on contagion and contagion effect and present the models of contagion in organization. The author will also suggest a diagnostic tool for mapping contagion effect in the organization.

The research problem raised in the paper is of descriptive, explaining, defining, and diagnostic character. In terms of thinking, the author applies synthesis, combining elements of induction and deduction, analysis. Although, the paper sourced from the literature review it is supported by examples coming from the business practice.

1. Contagion – definition and types

The review of literature allows to distinguish two basic approaches to the understanding of the term “contagion.” They involve the spread of financial crises and imitation of behaviour. The latter includes the emotional contagion, defined as “tendency to automatically mimic and synchronize facial expressions, vocalizations, postures and movements with those of another person and, consequently, to converge emotionally” (Hatfield, Cacioppo, & Rapson, 1994, p. 5). As part of the interpretative framework of such phenomena, viral marketing (Trusov, Bucklin, & Pauwels, 2009), purchasing decisions (Argo, Dahl, & Morales, 2008) or behaviour within the supply chain (McFarland, Bloodgood, & Payan, 2008) are the concepts of contagion used in the context of imitating behaviour. The approach to financial markets focuses on the spreading of crises, negative shocks or disturbances (Edwards, 2000; Kaminsky, Reinhart, & Végh, 2003; Goldstein, 1998; Rose & Spiegel, 2009; Forbes, 2012, Pericoli & Sbracia, 2003).

Both cognitive perspectives are sometimes complementary, and e.g. the analyses describing the spread of financial crises take into consideration the imitation of behaviour typical of the “herd behaviour.” An essential strand of analyses undertaken within the framework of contagion is that it intensifies the existing interdependence (Kaminsky et al., 2003; Markwat, Kole, & van Dijk, 2009). It is assumed that contagion is subject to escalation, which is why local disturbances may transform into regional or even global crises (Markwat et al., 2009). Contagion is also defined as the co-movement in excess of that implied by the factor model, i.e. above and beyond what can be explained by fundamentals taking into account their natural evolution over time (Bekaert, Ehrmann, Fratzscher, & Mehl, 2011).

The phenomenon of contagion is also characterized by the fact that the classical mechanism of spreading crises involves investors in a number of countries owning the same assets or applying the same cognitive mechanisms. The latter results in, for example, the panic effect and herd behaviour, which, in turn, facilitate the spread of contagion (Roubini & Mihm, 2011).

In this paper, the author defines contagion as a phenomenon of rapid, immediate, high frequently, self-replicating influence on the affected entities.

Immediacy consists in the fact that as soon as the mechanism of influence starts to operate, contagion occurs. Rapidity is tantamount to the intensity of the phenomenon. Its scope may include such attributes of contagion as its high frequency, which refers to the escalation of connections as result of contagion, as well as its capacity to multiply by replication in numerous situations.

In the light of the above considerations, contagion can be defined as the process of accelerated spread of repeatedly replicating information, which is possible owing to its capacity to impose the mechanism of action on the affected entity (e.g. a company). With respect to the way contagion occurs, two kinds of the process can be isolated:

- direct exposure contagion – occurs when one entity influences another, e.g. liquidity problems affecting a company may cause similar problems in other companies;
- emerging contagion – when entities affected by contagion appear independently of one another owing to their exposure to the same kind of assets, e.g. bonds of Eurozone states at risk of bankruptcy (Greece, Spain, Portugal), but such assets may also include currencies and derivative instruments.

When it comes to the presence or absence of intention, contagion can be divided into:

- intentional – when it is spread purposefully; it may occur e.g. when an enterprise intentionally abuses the terms and conditions of cooperation;
- non-intentional – when contagion occurs as a result of lack of awareness, e.g. when a participant in the value chain initiates certain attitudes which are then inadvertently adopted by other participants.

As regards to the distribution of its sources, contagion can be characterised as:

- single-epicentre (e.g. the US in August 2007);
- multiple-epicentre (e.g. Greece and Italy in 2011).

With respect to its types, contagion is usually characterised as:

- financial – e.g. the interbank market (Müller, 2006), exposure to foreign assets (Rose & Spiegel, 2009), liquidity problems (Hernández & Valdes, 2001), direct financial connections (Hernández & Valdes, 2001), CDSs (Credit Default Swaps) (Hernández & Valdes, 2001);
- financial-real economy – contagion spreads in the sphere of the real economy through the actions of the financial markets, e.g. abrupt cessation of commercial bank lending due to insufficient liquidity on the interbank market;
- real – contagion within the sphere of the real economy, e.g. exposure of trading connections to *country zero*, that is, the one where the crisis has started, or a sudden decrease in the volume of orders.

However, there are also other kinds of contagion that, from the vantage point of a company, do not necessarily have a negative impact on its operation. Accordingly, the following types of contagion have been identified:

- virtual – those that occur in the virtual space, e.g. a film that shows poor recruitment practices or certain aspects of organisational culture, which, on the other hand, offer an opportunity for buzz marketing based on the unique contents of a film, game, virtual postcards;
- virtual-real – the transmission of phenomena that occur in virtual space into the real world, e.g. contagion in the virtual sphere drives the actual purchasing decisions made by consumers.

The distinctions fundamentally correspond with the channels of contagion. Admittedly, in literature the relationships between the notion of contagion and channels of contagion are ambiguous. According to the principles of causal reasoning, contagion should occur via such channels. However, the literature does not always support this distinction.

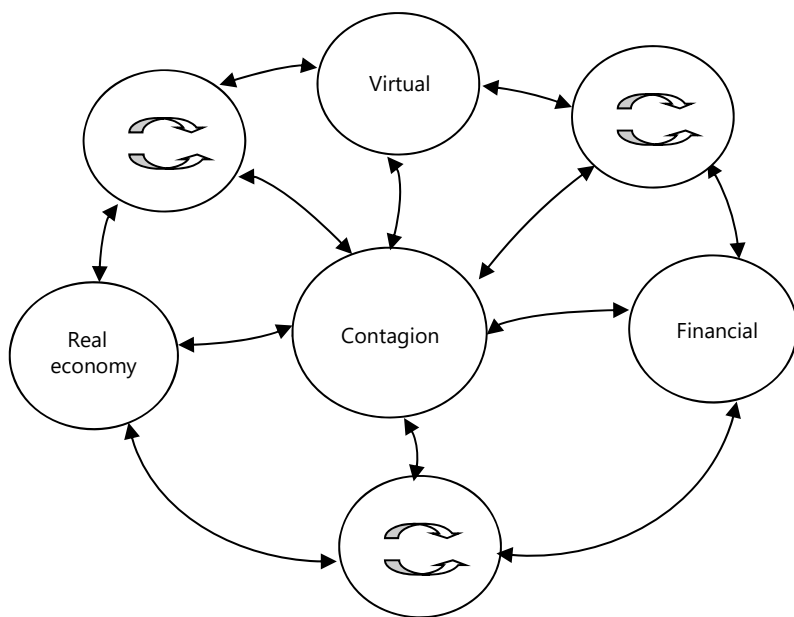


Figure 1. *Types of contagion.*

The considerations reviewed so far warrant the definition of contagion as a spatiotemporally determined set of unidirectional influences that arises when factors causing contagion impose its mechanisms of action on the affected object

(e.g. an organisation such as a business enterprise). In the sphere of corporate activity, one may identify three types of behaviours in the face of the contagion effect. They include situations where the enterprise is subject to contagion, itself causes contagion or when contagion occurs within it. These three situations may occur simultaneously.

2. Mechanisms that facilitate the spread of contagion

There are two models of mechanisms that facilitate the spread of contagion. The first one involves the negative aspects of contagion, while the other can be linked both to the negative and positive interpretations of contagion.

In the first case, the spread of contagion is interpreted as a process in which the lack of documented security measures leads to a drop in confidence and escalation of contagion. For example, buyers of CDOs (Collateralised Debt Obligations) assumed the risk of mortgage repayment defaults in the United States. Once the default rates for subprime loans started to increase, CDO owners were infected with problems occurring in the subprime loan market.

The spread of contagion was intensified by repurchase agreements. Mortgage-backed instruments were supposed to act as collateral for the repurchase of agreements made by banks. When its value dropped, repo lenders required that the collateral be topped up long before the loan was due to be repaid. Worse still, other partners required larger collaterals for other transactions, since they were concerned about the solvency of the borrowers. Demands for increased collateral led to a massive sale of assets.

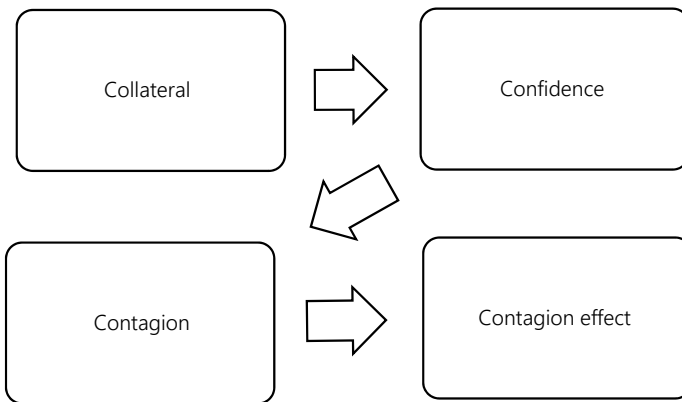


Figure 2. *Model 4C.*

Source: based on Wyciślak, 2013, p. 51.

Naturally, it is possible that the spread of alarming information results in a drop in confidence, and, consequently, in contagion. All business contracts are founded on a certain degree of trust. The greater the trust, the lower the costs of contracts. The level of trust as well as social capital can be considered to be the basic determinants of contagion in terms of relationships amongst enterprises.

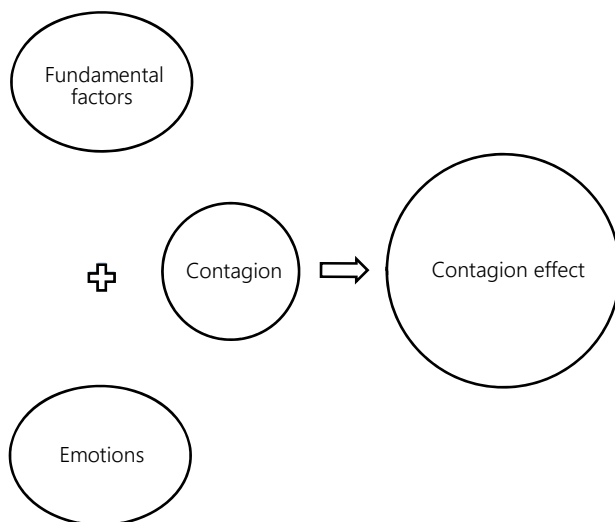


Figure 3. *A model of origin and spread of contagion.*

The fundamental factors include e.g. increased interest on bonds above the planned limit, whereas emotions comprise anxiety, fear and panic. Yet fundamental factors may also involve advantages offered by the product such as a new taste or new functional packaging. And these in conjunction with emotions such as rapture, admiration and recognition result in a positive contagion effect.

The process that showed most, if not all, attributes of contagion was one of the factors that led to the bankruptcy of General Motors. On June 1, 2009, the 101-year-old automotive giant applied for protection from creditors. The bankruptcy of General Motors was the fourth largest in US history (in terms of aggregated assets). The new General Motors is called General Motors Company LLC, a different entity from its predecessor. The US giant was bailed out thanks to state help (both in Europe and in the US). GMAC, the (former) financial arm of General Motors, in the period directly preceding the global financial crisis, committed itself heavily to investment in the subprime credit market. For some time, GMAC in a way subsidised the proper mission of General Motors, which was car manufacturing. Once the subprime speculative bubble in the US exploded, General Motors was destroyed. Losses incurred by GMAC cancelled out the profit from the principal ac-

tivity of the company (Talbot, 2009). Thus, in the case of General Motors, we are dealing with financial-to-real contagion and with the deterioration of fundamental conditions related to the speculative bubble on the subprime loan market in the US.

In the case of MF Global Holdings, the source of contagion were the bonds of heavily indebted Eurozone states. In 2010, MF Global Holdings started buying the bonds issued by such countries as Italy, Spain, Portugal, Ireland, and Belgium on the assumption that the prices of those bonds would continue to increase as interest rates fell. The reality turned out to be exactly the opposite – prices of the bonds in question fell, while the interest rates steadily increased. The exposure of MF Global Holdings to bonds of those European countries totalled \$6.3 billion, which was five times more than its equity capital (as at September 30, 2011). Finally, on October 31, 2011 MF Global Holdings filed for bankruptcy in the US Bankruptcy Court in Manhattan (Evans, 2011). This was the eighth largest bankruptcy in US history.

In Poland, the phenomenon of contagion can be analysed in terms of problems related to currency options. Losses due to these derivative financial instruments were incurred by such companies as Apator, Ciech, Duda, Fota and Krosno, Sanwil, Ropczyce, Alchemia, Forte, MIT, Paged and PKM Duda. As result of losses due to currency options, banks financing the meat producer Duda filed a motion for its bankruptcy. In July 2009, the company came to an agreement with the banks and converted its payable dues of 300 million PLN into company shares (Dowgielski, 2011).

Naturally, an infected company may become a source of problems for other companies. It may occur intentionally, when the enterprise in question purposefully refrains from cooperation. At this moment it makes sense to ask, under what conditions companies tend to share risks and when do they tend to infect others? In this respect, the level of trust appears to be the decisive factor, however, we cannot forget about the propensity to exploit a dominant position in the network as well as how easy it is to break the relationship. In the face of contagion, one should simply break the relationship. Thus, risk-sharing appears to be advantageous when the general economic situation is favourable. In the context of instability, it is better to remain isolated. Contagion may also occur inadvertently, when within the value chain certain disadvantageous behaviours tend to be more and more widely imitated (e.g. overstocking).

One of the models stemmed from a business practice that illustrates contagion in supply chain is illustrated in the Figure 4.

The contagion effect manifests itself in supply chain by sales peaks. Contagion effect is a result of certain patterns in behaviour of the sales staff. The latter is determined to meet monthly targets. Knowing that retail chains in other words customers wait for the months' endings in order to get the highest possible discounts. This means that last working week has seen even about 60% of total value monthly sales. Accumulation of customers' orders over the months' endings affects other company functions, including customer service, logistics, procurement, but also IT and HR.

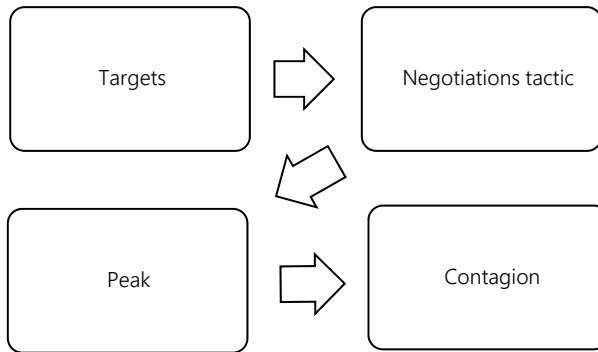


Figure 4. *Contagion model of peak in sales.*

Customer service needs to secure resources for additional work both on entry and validation of orders. Consequences are twofold: higher costs and more errors.

Logistics also need to secure additional transportation capacities from the spot market, which translates into higher costs. Transport Service Providers even run of capacities and are not able to ensure the proper service levels. What is more, the trucks are not fully loaded which means waste.

The additional warehousing capacities should be secured, which translates into more resources to commit. The latter results in a growth in need for FTE. Full-time equivalent is a unit that indicates the workload of an employed person in a way that makes work-loads or class loads comparable across various contexts. As the additional temporary resources are primarily secured by employment agency, new employees are not skilled enough, and the training is time consuming. Consequently, productivity is on the downward spiral, and costs witnessing the growth.

When it comes to inventory control, the Pareto method is a classical way for dividing items into classes. Each class is then assigned to a dedicated area of the warehouse. The fastest moving items are generally called A-items, whereas next fastest moving category of products is called B-items, both consequently and respectively next fastest one – C-items. However, the new criteria are needed to optimize storage within the Pareto method in the wake of contagion. It means that picking list from the Warehousing Management System, should be improved by further studies based on for example discrete event simulation. Depending on the homogeneity of the customers' orders, picking or handling are the most resource intensive operations and the most ones affected by contagion.

The other consequence of contagion is the growth in the number of quality claims raised by customers, orders are not delivered – in full, on-time, error free.

3. Building the diagnostics tool

Investigating contagiousness potential may be treated as an element of strategic-level analysis. It can become a component in the strategic analysis framework for company-like organizations. What should be noted is that contagion does not have to be a loosely structured problem as it may occur in the case of highly structured issues and be a result of errors in action methodology as well as epistemic-level problems.

Further in the diagnosis, the specificity of a contagiousness phenomenon needs to be addressed. In the light of this notion, the following problem areas should be explored:

- the degree of interconnectedness intensity for a given enterprise,
- the level of influence on decision-making patterns (assessing undisclosed knowledge) – behaviour imitation.

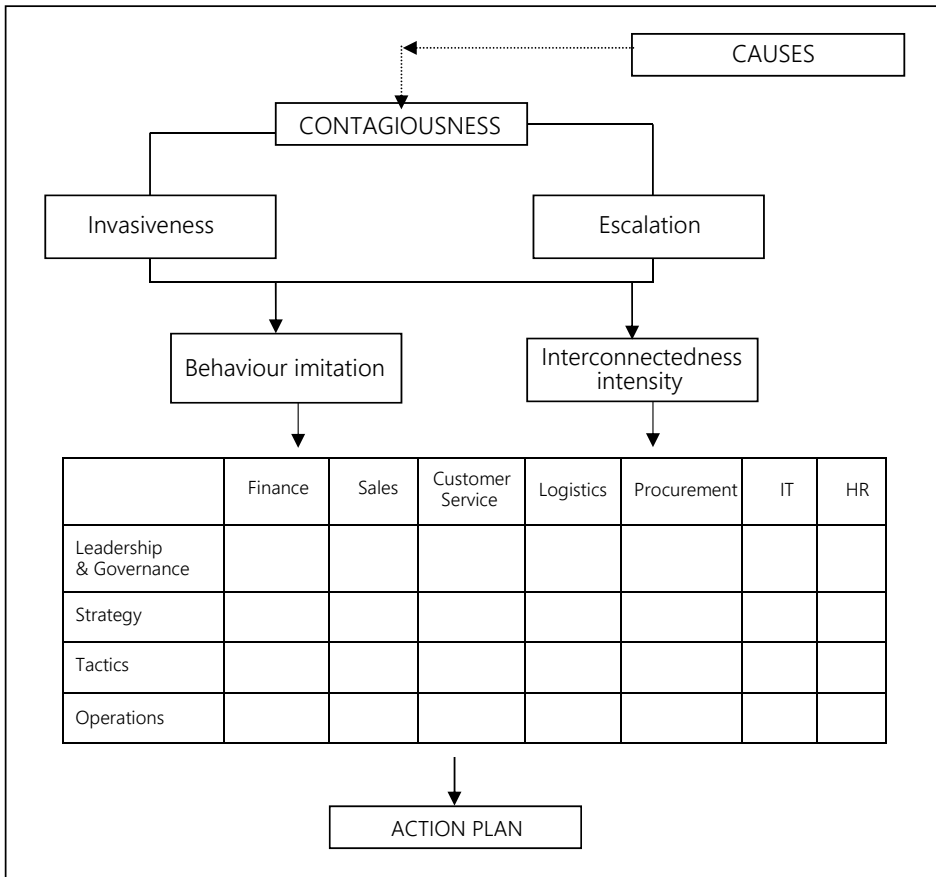


Figure 5. Schematic representation of contagion diagnosis phase.

Table 1 *Analytical formula for contagion assessment*

Analytical formula for contagion assessment	
Characteristics	Description
Evaluation	It is intended to transform the data obtained and to turn them into evaluative and/or quantitative categories. The above is achieved through the following: choosing evaluation criteria, determining the weights of evaluation criteria, factor ranking, aggregation and dissection, synthesis, evaluative ordering, and others. Appropriate diligence needs to be observed when choosing evaluation criteria. To that end, it is indispensable to strive to objectivize the selection of evaluation criteria and to discard arbitrary or contingent benchmarks. One methodologically correct and practically useful solution to specify evaluation criteria is the successive approximation procedure.
Categorization	The procedure aims to determine the qualitative class of factors that cause contagion; with regard to evaluation, categorization is secondary and complementary.
Selection	Investigation the importance of factors that cause contagion. Their importance may be determined on the basis of the following criteria: <ul style="list-style-type: none"> – significance (how strongly a given factor that causes contagion influences the effective functioning of the company), – necessary resources to act in order to block, compensate for, minimize, eliminate the contagion and its effects, – interconnectedness of factors that cause contagion: whether taking action is a premise (a condition) of actions against other such factors or the countermeasures are independent; the existence of applicability limits guarantees any future changes in value(s) of the factor(s) that result(s) in contagion shall be noticed and re-evaluated.

Basically, the purpose of assessing factors that result in contagion is to turn them into measurable quantities. General methodological requirements concerning factor assessment process are:

- preparing assessment ground rules,
- selecting assessment methods and techniques,
- formulating assessment standards.

Correctly established, the factors that cause contagion demand interpretation. What becomes necessary then is relevant expertise and an objective, impartial way of thinking. One should remember that in some complicated cases when implementation of advanced research techniques had failed, the problem was recognized after subsequent meticulous consideration of contagion causes that were presented by employees. Naturally, the course of failings is marked for its divergence. Their course varies depending on the type of organization. Behaviour imitation or the degree to which managers' strategic-level decision-making patterns have been influenced. Studying changes in managers' decision-making patterns may be performed by considering such factors as: preferences in strategic choices, acquiescence towards external entities' behaviour, susceptibility to external influences.

Interconnectedness intensity may, in turn, be examined in relation to financial realm and logistics. In this area, what can be distinguished are for instance sale of assets, negotiations with creditors, renegotiating delivery terms.

The essential issues with regard to addressing a contagion situation are the possibilities, scope, time of cooperation with external entities. This happens due to the fact that affected organizations are unable, because of the extent of contagion effects, to single-handedly manage the actions that lead to compensation, minimization, and elimination of various failings.

Discussion and conclusion

The contagion induced in the company should be further discussed. In the case of contagion within a company, the decisive role is played by its organisational culture and leadership. Rumours tend to spread in the context of nepotism (division of goods and services at variance with the social, legal and ethical order). However, a positive contagion effect can be achieved thanks to the existence of genuine leadership.

In terms of negative contagion, the reasons are tensions between the reality and expectations. The ambitious employees are tasked with ambitious tasks and have high expectations. But, the difference between reality and expectation/ambitions leverages frustrations. This, in turn, translates into rumours fuelling the organization. Frustrated people leave the company and infect others. As a result, the company suffers from the waves of employees leaving.

On the other side, the contagion could be applied by positively impacting others. Achieving positive contagion is about leveraging resources in the way that will allow us to exploit fully their potential. Finding out the leverages is a key to awake the contagion and benefiting from contagion effect. Enthusiasm and passion are amongst the positive contagion leverages. Having passion and enthusiasm in place we could then stimulate for example creativity in organization. About 30 minutes session would be an appropriate and sufficient tool to achieve the contagion effect for creativity. The agenda of such session would consist of: presentation of creativity role in solving problems, practical tips, methods of stimulating creativity; fun/work in subgroups, going to a social event. The bottom line for inducing positive contagion effect for creativity is however to build a creative mood by exploit leverages including passion and enthusiasm.

The further research should also focus on spontaneous knowledge wide spreading within the organization. For investigating an impact of external factors on organization the appropriate mathematical tools should be developed.

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