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Article

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System Dynamics Approaches in Managing Real Estate Development Crises: Conceptual versus Scenario-Based

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Abstract. *Real Estate development organizations are vulnerable to crises' events due to the complexity of the external environment, internal structure, and operation systems. This paper aims to present, analyze, and compare between two proposed approaches for managing development crises based on system dynamics methodology. Twenty crises' scenarios are identified in order to be utilized in the analysis process of two approaches. These approaches are the conceptual approach and the scenario-based approach. The conceptual approach provides a framework to manage crises in a broad manner using Mitroff's model. The scenario-based approach uses crisis event characteristics to specify its containment policy. The crises' characteristics are identified by analyzing courses with time, classifying attributes, and specifying archetypes. The outcome of the analysis process for both approaches should guide developers and upgrade the quality of their decision in selecting adequate containment policies.*

Keywords: *crisis management; system dynamics; real estate development; What-if scenario; system archetypes.*

Introduction

Broadly speaking, continual changes in the contemporary business environment exert a significant influence upon organizations. Thus, it is imperative for organizations to adapt either directly or indirectly to the changes that pose threats to them so that they may survive (Shahrabi, 2012). However, the changes must be managed appropriately by

following the basics of the change management process which are the forms and ways to design, implement, control, evaluate, and assimilate changes (Vlados, 2019).

Change management means defining and adopting corporate strategies, structures, procedures, and technologies to deal with change stemming from internal and external conditions (Benedict, 2007). In fact, change management plays a vital role in the organization's development because it gives stability to the organization by studying the internal and external changes (Hashim, 2013).

Another important concept in organizational science that is closely associated with organizational change is Organizational agility. Agility is the ability of an organization to make changes so that it may utilize the opportunities induced by the changes. An agile organization is one that can change and adapt to peripheral changes as a winning strategy. However, when the management fails to tackle the changes effectively, the changes may turn out to be crises, which may even lead to organizational failure (Shahrabi, 2012). Accordingly, it could be concluded that successful change management can help to avoid crises. Therefore, Crisis management is needed if change management efforts fail (Alas & Gao, 2012).

Regarding real estate organizations in particular, they confront the same internal and external conditions as other types of organizations. First of all, real estate is important storage of wealth in the national economy; they are tightly linked that almost all countries with twin booms in real estate and credit markets ended up with a financial crisis or a severe drop in GDP growth rate (Crowe, Dell-Ariccia, Igan, & Rabanal, 2011, 2014). Real estate development process holds too much of complexity, mainly because it consists of many aspects; land development, design, entitlement, financing, construction, and sales (Gehner, 2008). Consequently, this complexity besides the fact that all organizational systems are imperfect will make development organizations more prone to crisis events (Carmeli & Schaubroeck, 2008). Therefore, effective managing of real estate development crises is vital to the organization and the national economy as well. Crisis management could be considered as an organizational core competence in the currently fierce competitive environment that keeps on escalating.

However, this specific competence could not be built unless a significant change in culture emerges and crisis management policies are totally integrated within the organization's strategic planning. Additionally, there must be a full commitment from the management board and employees as well in order to build this competence. Further, crisis management approaches should maintain a vision of the changeable and complex nature of crises and look for ways to operate within a real-world environment of confusion, unforeseen events, and missing information (Qian, Zubieta, Lango, & Gonzalez, 2014). Hence, the management strategies for crises should be holding much flexibility as well as resiliency.

About crisis management practices, there are emerging trends that differ from the traditional ones. For instance, crisis management plans were inbound notebooks, but instead, they are posted on the organization website. Further, crisis management planning process is becoming a part of the strategic planning process of the organization. Also, Crisis management team was one team per organizational unit, but it evolved to be hastily formed network. Moreover, emphasis stages of crisis

management were crisis detection and prevention (before the crisis) and managing the actual crisis (during the crisis), but it changed to be organizational learning (after the crisis). In addition, the focus of crisis management turned from media relations to stakeholder relations. Besides, crisis planning became much flexible. Lastly, there is more involvement of the management board in developing the crisis management plan instead of using an outside consultant (Crandall & Spillan, 2010). Surely, there is more than one crisis management model, but the adopted one in this research is Mitroff, Pauchant, and Shrivastava (1988) crisis management model. The reason behind that lays in the fact that its constructed phases are practical in nature and very useful in dealing with crises events which will be explained in the literature review section.

About system dynamics, it is a method to describe, model, simulate and analyze dynamically complex issues and/or systems in terms of the processes, information, organizational boundaries and strategies (Pruyt, 2013). Basically, in system dynamics a problem or a system is first represented as a causal loop diagram (hereafter CLD) which is a simple map contains the system's components and their relations (Sterman, 2001). CLDs are the basic building blocks of this paper. Generally speaking, in both approaches, the instrument utilized in the analysis will be the outcomes of exploring the CLDs and capturing the benefits of adopting the feedback loop approach. These specific outcomes revolve around identifying the root cause for crises, providing a detailed system description for the organization at the time of crisis, and clarifying system's behavior (reference model). In addition, these outcomes will facilitate determining priorities of management during crisis time, revealing policies consequences (stand-alone policy analysis), and identifying of key system drivers.

The research main question is to determine whether it is better for organizations to be fully prepared for crises, all kinds of crises, by well plans and resources or on the other hand to deal with each crisis event individually. Therefore, this paper explores crises' scenarios in real estate development and investigates the two proposed approaches in order to find a reasonable answer.

Literature review

When reviewing the relevant studies that discussed deploying Mitroff, Pauchant, and Shrivastava (1988) model in the organizational crisis, it was clear that the main focus was on comparing between management activities and Mitroff, Pauchant, and Shrivastava (1988) phases. Wang and Belardo (2005, 2009) found a similarity in them researches which conducted to investigate the relationship between knowledge strategies and crisis management by studying two crises of two energy companies in Taiwan and the third one is a telecommunication company in the USA. Elsubbaugh, Fildes, and Rose (2004) did this comparison as well, but in more depth, in their study of crisis management perceptions amongst managers in the Egyptian cotton textile industry.

In general, the majority of the related studies regarding crisis management planning and implementing included what-if scenario within. Accordingly, a set of real estate development crises' scenarios are presented in the paper to deploy them in both approaches. First of all, a scenario is defined as a coherent, internally consistent and

plausible description of a possible future state of the analyzed system (Castillo, Hiltz, & Turoff, 2012). In this regard, Crandall, Parnell, and Spillan (2009) asserted that one of the tasks of the crisis management team is to periodically assess potential crises that may happen to the organization. Also, Tidwell (2016) stated that building hypothetical crisis scenarios is an opportunity to test an organization's ability to use core values to confront these events.

Within the same context and following the same line of exploring the previous related work concerning crisis management, but with focusing on the ones which combine it with system dynamics approach. Notably, most of which was revolving around understanding and unfolding the complexity within the first. For example, Pruyt (2010) explored plausible developments of crises and their impacts by studying the case of a Dutch bank which collapsed in 2009 for liquidity problems. Following the same line, Mukerji and Saeed (2011) used the system dynamics methodology to examine the major causes of the US housing market crisis. In addition, within the system dynamics domain and in order to define the analysis tool utilized in the scenario-based approach, that is system archetypes.

Archetypes describe common system dynamics that produce patterns of behavior in a variety of contexts. The archetypes provide a structural template for analyzing a situation that can help focus attention on the heart of the problem (Ricigliano & Chigas, 2011). For instance, Ebrahimi (2015) employed archetypes to identify the problems that hinder fulfilling orders in the wind and solar energy companies. Also, Setianto, Cameron, and Gaughan (2014) utilized archetypes to explore the problematic situation within government initiatives concerning farming in Indonesia. Finally, it is clearly observed how system dynamics modeling technique has the ability to unfold the complexity within crises situations in organizations and help in managing it as well. Accordingly, this research adopts it and its applications in this specific management process.

Methodology

The research construction process starts first by identification of twenty crises' scenarios. These scenarios represent the whole potential crises' situations which real estate development organizations could confront. The scenarios were collected from the related literature and they are holding too much diversity within it. However, not all the twenty scenarios will be analyzed, only four selected for the process. The characteristics of these four scenarios are explored by investigating their sources, variables, symptoms, key indicators, escalation patterns, and negative impacts. Second, the conceptual approach is considered for an analysis operation. During this operation, each phase of Mitroff, Pauchant, and Shrivastava (1988) model along with the adopted strategies are illustrated by means of CLDs forms to provide clear visualization to these specific processes. Further, all the management phases are analyzed to have a deep insight into the usefulness of the containment strategies suggested. Third, the scenario-based approach is discussed in detail, starting by conducting an analysis process for the scenarios' courses. This analysis process demonstrated with figures the changes in the economic impact of the crisis with time. Fourth, an assessment matrix is built to evaluate the scenarios according to several measures. The measures adopted are threat level, time pressure, degree of control, and response options. Fifth, system archetype is

used as an analysis technique in order to fully comprehend the scenarios' characteristics. The system archetype as an analysis instrument for the crisis event revealed root causes, consequences, and containment policy. Sixth, proposed containment strategies for the crises are presented in a CLD form. Finally, a comparison operation is performed between the two proposed approaches to show the advantages and disadvantages of each.

Crises' scenarios

Real estate development crises scenarios are various and differ in its nature due to industry inherent risks. Hence, twenty scenarios are presented which were extracted from scholars' previous studies. The scenarios are categorized according to their sources as listed in Table 1.

Table 1. Crises' scenarios

Source	Scenario Title	References	Sc. ID
National Economy	Sales Operation Failure in New Development Areas	Alex Bank Economic Research (2012)	1
	Building Materials and Fuel Prices Rising	Alex Bank Economic Research (2012); Ocal, Oral, and Erdis (2006); Robbins and Pearce (1992)	2
	National Economic Problems	Alex Bank Economic Research (2012); Burnett (1998); Kovoor-Misra, Clair, and Bettenhausen (2001)	3
	Laws Tighten Footprint Area and Height Limits	Alex Bank Economic Research (2012)	4
Market	Too Much Supply	Alex Bank Economic Research (2012); Ocal, Oral, and Erdis (2006)	5
	Aggressive Competition	Robbins and Pearce (1992)	6
Loan Agreement	Unjustified Bank Loan	Erol, Apak, Atmaca, and Ozturk (2011); Robbins and Pearce (1992)	7
Internal Structure	Wrong Design	Ocal, Oral, and Erdis, (2006)	9
	Inefficient Management Board	Harwati (2013); Ocal, Oral, and Erdis (2006); Robbins and Pearce (1992)	10
	Construction Problems	Harwati (2013); Mitroff, Pauchant, and Shrivastava (1988)	11
	Fatal Events	Harwati (2013); Ocal, Oral, and Erdis (2006)	12
	Bad Customer Management	Burnett (1998); Erol, Apak, Atmaca, and Ozturk (2011);	13

		Mitroff, Pauchant, and Shrivastava (1988)	
	No Loyalty among Employees	Mitroff, Pauchant, and Shrivastava (1988); Ocal, Oral, and Erdis (2006)	14
	Losing Organization Founders	Burnett (1998); Ocal, Oral, and Erdis (2006); Robbins and Pearce (1992)	15
	No Development or Innovation	Ocal, Oral, and Erdis (2006)	16
	Wrong Marketing Strategy	Kovoor-Misra, Clair, and Bettenhausen (2001); Mitroff, Pauchant, and Shrivastava (1988); Robbins and Pearce (1992)	17
	Deteriorating Assets	Erol, Apak, Atmaca, and Ozturk (2011); Kovoor-Misra, Clair, and Bettenhausen (2001)	18
	No Risk Management or Crisis Management	Mitroff, Pauchant, and Shrivastava (1988); Ocal, Oral, and Erdis (2006)	19
	Wrong Stakeholder Management	Erol, Apak, Atmaca, and Ozturk (2011); Harwati (2013)	20

Within the same context, four selected scenarios from each source are analyzed in Table 2 in order to hold a comprehensive knowledge about their characteristics. These characteristics include source, variables, symptoms, key indicators, escalation pattern, and negative impact.

Table 2. Scenarios' characteristics

Sc.	**National Economic Problems**	**Aggressive Competition**	**Unjustified Bank Loan**	**Wrong Stakeholder Management**
Source	National Economy	Market	Loan Agreement	Internal Structure
Variables	Economy condition Sales Contingency reserve Strategy alternatives	No. of competitors Competitor strength Organizational core competence Pricing strategy	Loan principal Interest rate Repayment period Revenue Business model rigidity	No. of stakeholders Power of stakeholders Organizational management of stakeholder
Symptoms	Decreasing sales	Decreasing sales Degrading of Organizational reputation	Debt service timing delay Budget overburden	Increasing the rate of conflicts with stakeholders

Indicators	GDP Customer buying affordability	Sales Customer feedback Brand name index	Debt /equity ratio Debt service affordability	Stakeholder satisfaction Brand name index
Escalation Pattern	Decreasing the rate of sales keeps on accelerating	Shrinkage of sales and reputation is frequently amplifying	Aggregation of unfulfilling financial obligations	Fluctuation of the organizational image is regularly increasing
Impact	Huge financial loss	Loss of market share	Financial instability	Loss of reputation

Conceptual approach

The main idea in this approach is to establish a management process to handle crises based on Mitroff, Pauchant, and Shrivastava (1988) model and with the aid of system dynamics methodology. This approach is representing the organization policy in confronting crises and it is governed by the earlier mentioned crises' scenarios as a context. The main assumption in this approach asserts that the organization is the system which confronts the crises by all its elements. Further, all these elements are linked together and each one has its own special role in the management process. Moreover, the approach is taking into account the case when the crisis event spreads across the organization and causes a serious infection.

Management phases

The management process is adopting Mitroff, Pauchant, and Shrivastava (1988) management model which consists of five phases; signal detection, prepare/prevent, containment and damage control, business recovery, and learning (Wang & Belardo, 2005). Regarding the first phase which is signal detection, it is the most crucial one, because if it accomplished accurately and with no or few mistakes there will be no need for most of the next phases. For the three successor phases, the measures adopted to manage the different scenarios were collected from various scientific research papers as reported in Table 3.

Table 3. Management phases measures

Management Phases	**Proposed Measures**	**References**
Prepare / Prevent	Minimizing debt / equity ratio. Building strong relations with customers. Efficient stakeholder management. Effective environmental scanning for the market. Hiring competent staff.	Elsubbaugh, Fildes, and Rose (2004); Erol, Apak, Atmaca, and Ozturk (2011); Light (2008); Mitroff,

	Efficient reward system. Existence of corporate social responsibility. Strong communication & IT systems. Strengthen the R & D division. Periodic replacement of physical assets. Insurance policies for assets.	Pauchant, and Shrivastava (1988).
Containment & Damage Control	Assets liquidation. Utilizing the contingency reserve. Cost-cutting. Restructuring of debt. Increasing empowerment. Under invest. Downsizing. Partnering. Waste reduction.	Barker and Duhaime (1997); Hallgren and Wilson (2008); Tikici, Omay, Derin, NurSeckin, and Cureoglu (2011)
Business Recovery	Enhancing culture. Integrating crisis management in strategy. Aggressive advertising. Effective pricing strategy. Upgrading staff skills. Prospector strategy. Developing a competitive advantage. Differentiation strategy.	Loosemore (1998); McConnell and Drennan (2006); Penrose (2000).

In terms of analysis, the instrument used is CLD that consists of several feedback loops. A feedback loop consists of two or more causal links between elements that are connected in such a way that if one follows the causality starting at any element in the loop, one eventually returns to the first element (Pruyt, 2013). In CLDs a link between two variables A and B is considered positive if an increase in A causes B to rise above what it would have been. On the other hand, a link between two variables A and B is considered negative if an increase in A causes B to fall below the value would have had. In order to determine the polarity of a loop, the negative signs should be counted, if the number is uneven, then the loop is balancing, and if the number is even, then the loop is reinforcing (Pruyt, 2013).

The core element in the CLDs representing the management process is organizational resilience. The definition of organizational resilience states that it is an outcome influenced by a dynamic complex combination of environmental factors. Moreover, it is the ability to anticipate, prepare for, respond and adapt to events both sudden shocks and gradual change (Gibson & Tarrant, 2010). About the last phase; it is all about documenting crisis lifecycle events and extracting knowledge from it. Basically, the main target from acquiring this knowledge is to assure that the same mistakes are not repeated in the future.

Signal detection

Basically, these signals are defined as pieces of information indicating a deviation from normalcy (e.g., financial indicators exceeding a threshold, abnormal patterns of social behavior, etc.) that may escalate and lead to a crisis (Paraskevas & Altinay, 2013). These signals were obtained from several scientific research papers (i.e. Bianchi & Montemaggiore, 2008; Bontis, 2001; Frankel & Saravelos, 2012; Huang & Wang, 2005; Kaklauskas et al., 2011; Lu, Shen, & Wei, 2013; Wei & Zhang, 2013). The CLD in Figure 1 contains external signals and internal ones; external signals include national economy and market indicators. About economy signals, they are represented by loops R1, R2, and B1.

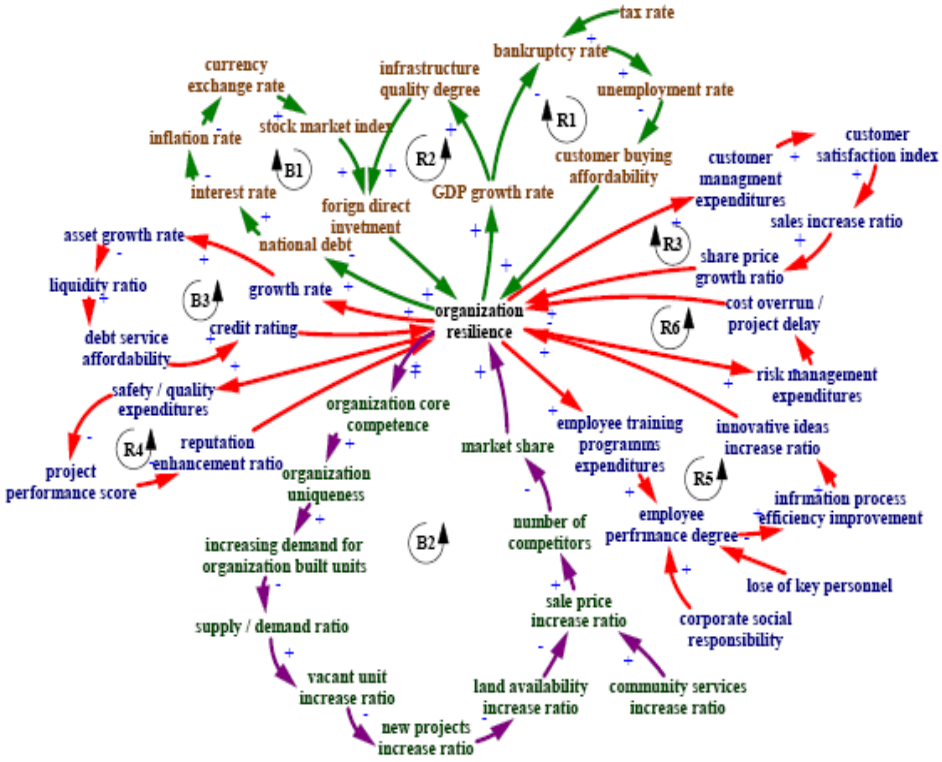


Figure 1. Crises' signals CLD

Starting by loop B1, it shows the effect of private investment on lowering national debt; which is correlated with interest rate. In addition, it demonstrates inflation's negative impact on currency value; which is tightly connected to foreign investment. Notably, this loop is a balancing type because of the inverse relationship between inflation and interest rate. For loops R1 and R2, they concentrate on GDP's role in enhancing living quality and business environment which is the reason that they are reinforcing loops. Further, as noted, key driving factors are GDP and foreign investment due to the different links which connect them to other elements.

Loop B2 performs an analysis process for the relationships between market signals. Clearly, the most important signal is the supply/demand ratio that holds a high influence on the vacancy ratio. Another critical factor is the presence of community services that will raise unit prices; leading to more attraction to other developers which will lower the organization's market share. Notably, it is obvious how market factors struggle together; some increase supply and the others increase demand, which will lead eventually to a balancing state.

When referring to internal signals, they are represented by five loops, which are: R3, R4, R5, R6, and B3. Starting by loop R3, it stands for customer management effectiveness which is measured by satisfaction index. While loops R4 and R6 are representing the process efficiency, which is assessed by the percentage of projects that are finished at a planned time and with a targeted cost. Regarding loop R5, it addresses the link between staff training and performance besides another link between information processing and innovation. Concerning loop B3, it clarifies the significance of holding an adequate liquidity ratio to support debt service. It is observed that four loops are reinforcing because high indicators of performance will increase resilience. The only balancing loop emphasizes the importance of balancing between the organization's desire to increase physical assets and its financial commitments.

Prepare / prevent

The activities in the diagram in Figure 2 represent the tasks required in order to achieve the target of this particular phase.

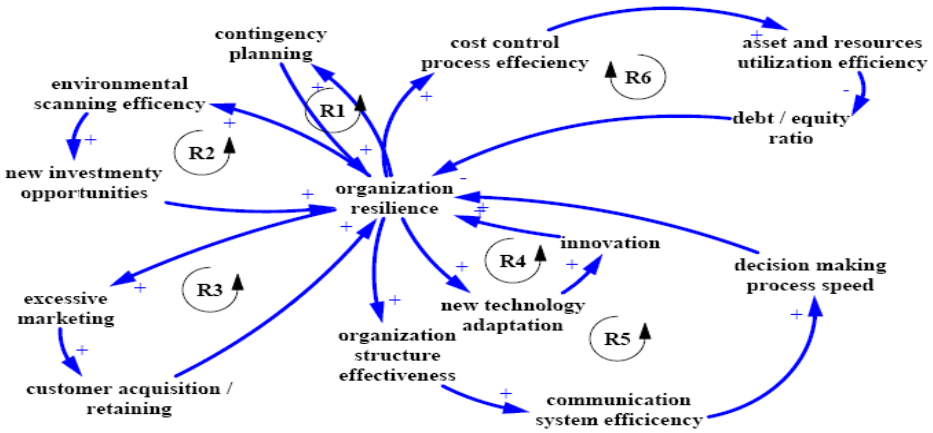


Figure 2. Prepare/prevent phase CLD

Regarding loops R1 and R6, they are concerned with the financial measures taken such as: tighten internal expenditures, maximize assets and resources utilization, and minimize debt/equity ratio. On the other hand, loops R4 and R5 are focusing on the adequacy of the organization structure beside communication system efficiency which will both lead to better and fast decisions. Moreover, the adaptation of new technology is crucial for innovation and development. About loopsR2 and R3, they illustrate how searching for new opportunities and customers must be a frequent activity. Lastly, it is

worth mentioning that CLDs in this phase and in the following ones are functioning as a strategy visualization tool.

Containment and damage control

The diagram in Figure 3 depicts the measures required to fulfill the purpose of this phase. For instance, loops B1 and B2 provide alternatives like the elimination of new investments or partnering. Likewise, loop R1 explores the role of innovation in minimizing cost which facilitates constructing an effective pricing strategy. While loop R4 focuses on reducing expenditures by downsizing and cost cuttings. Loop R2 from another perspective highlights the role of empowerment in speeding decision making.

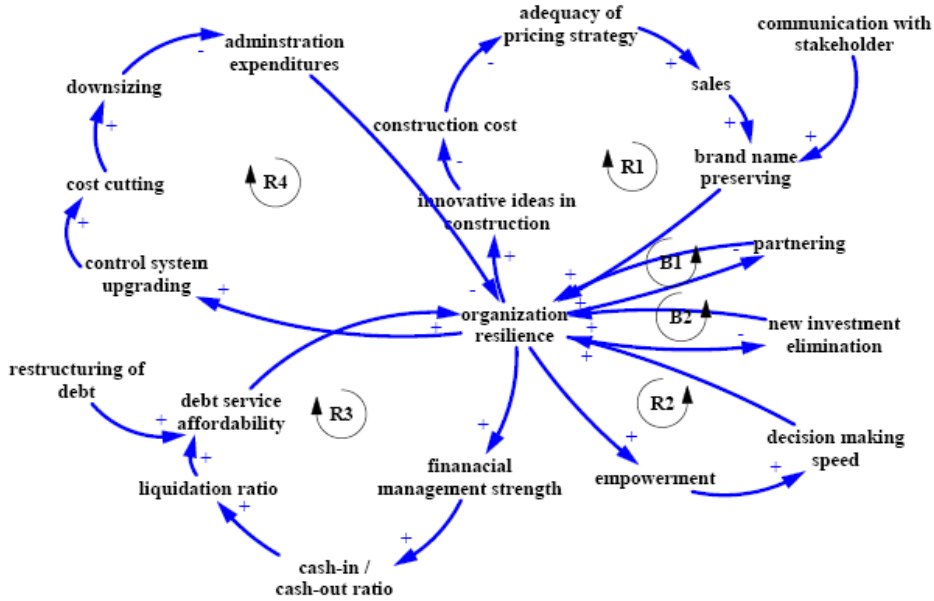


Figure 3. Containment and damage control phase CLD

Regarding loop R3, it studies the measures taken to reduce the pressure from debt service. As witnessed, the reinforcing loops contain measures that accelerate each other leading to an exponential growth because they are recognized as core solutions. While the balancing ones include measures that provide stabilization because they are considered as temporarily solutions.

Business recovery

The CLD in Figure 4 describes this phase in detail. Starting by loop R1, it looks after protecting the brand name by means of controlling the processes.

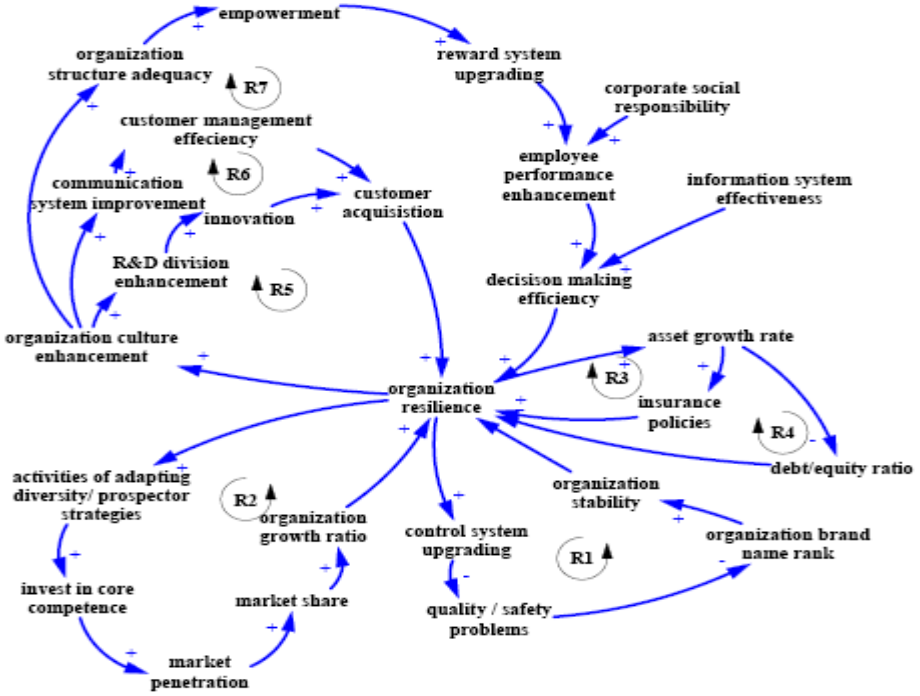


Figure 4. Business recovery phase CLD

Regarding loops R3 and R4, they are concentrating on lowering the debt /equity ratio by increasing assets and shielding them by insurance. On the other hand, loops R5, R6, and R7 are holding the new strategies adapted in order to reshape the organization's culture and structure. Some of these strategies are: changing the culture into learning, building research and development division, constructing a new information system, and designing a new incentive system. Ending by loop R2, it focuses on the importance of building a unique core competence. As observed, key system drivers are the organization's culture and asset growth rate; the first is presented in three nested loops, while the second is presented in two nested ones.

Learning

The causality diagram in Figure 5 includes only two loops. For loop R1, it shows how studying crisis historical cases can hinder the organization from exposing to such events. Loop R2 focuses on knowledge management, starting by acquisition then followed by sharing and ending by utilizing this knowledge in preventing any crises' event from happening in the future. Notably, the diagram clarifies how knowledge building blocks are working as an engine to strengthen the organization.

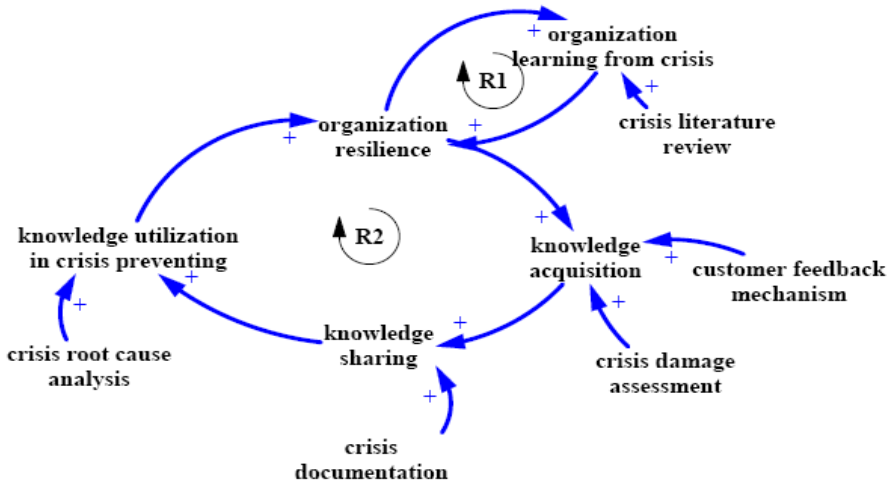


Figure 5. Learning phase CLD

Scenario-based approach

The basic idea asserts that each crisis event has its own particular attributes (i.e. causes, symptoms, and consequences) which should define its specific containment policy. Therefore, in order to identify the crisis event characteristics, an analysis process is performed. The process consists of three operations; determining crisis course with time, classifying crisis event, and identifying crisis event archetype. Consequently, each one of these operations has its own role in the proposed containment policy.

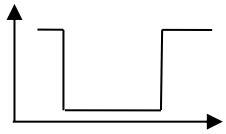
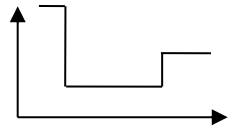
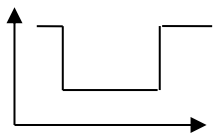
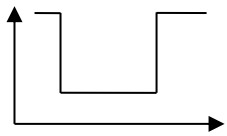
Course of crisis

There are different courses for crises with time; it could be in a shape of V, with the abrupt drop followed by a rapid and steep recovery. Moreover, it could be in U-shape with a longer period between the decline and the upturn. The V and U forms imply that there will be a return to the former levels, but far more serious would be an L-shaped with a permanent or at least long-lasting backslide. Finally, there is hysteresis pattern in which the recovery is partial rather than complete (Simon, 2010).

Scenarios' courses

Determining the course of each scenario for real estate development crises is vital for the management process because early identification of it will facilitate choosing the right corrective measures. From the earlier identified scenarios, the previously selected four are analyzed as presented in Table 4. Lastly, it must be clarified that the horizontal axis represents time and the vertical axis represents the economic level.

Table 4. Scenarios' courses

ID	Scenario	Course	Reasoning
3	National Economic Problems		There will be a long time until actions for fixing the problems taken by government officials and then it will get back to normal.
6	Aggressive Competition		If the competitor is fierce and the organization could not fight back, the financial stability will be badly affected.
7	Unjustified Bank Loan		It will take a while until the financial deficit will be adjusted and the loan is repaid, but it will not have a permanent effect.
20	Wrong Stakeholder Management		It will take some time until finding the right policy and the appropriate strategy to deal with stakeholders.

Crises classification matrix

Crises can be classified in a sixteen cell-matrix based on the threat level, response options, time pressure, and degree of control. While the most challenging situations are found in the lone "level four" cell, events that classified as crises can also be found in level two and level three cells (Burnett, 1998).

Scenarios classification

The classification matrix presented in Figure 6 categorizes each scenario according to the previously mentioned criteria. This classification has many advantages; it works as an analysis process to crises events, reveals hidden symptoms, clarifies options' availability for respond**,** defines priorities**,** enforce speeding decision making**,** and finally has the ability to predict consequences.

Threat Level	Time Pressure / Degree of Control / Response Options	Intense		Minimal	
		Low	High	Low	High
Low	Many	Level 2	Level 1	Level 1	Level 0
	Few	Sc. 9 Level 3	Level 2	Sc. 17 Level 2	Level 1
High	Many	Sc. 12,19 ,20 Level 3	Sc. 3,7,11 ,14,16 Level 2	Sc. 1 Level 2	Level 1
	Few	Sc. 4,6 Level 4	Sc. 8 Level 3	Sc. 5,10,13, 15,18 Level 3	Sc. 2 Level 2

Figure 6. Scenarios classification

Moreover, the interpretation of the conclusions registered in the classification matrix for the earlier selected four scenarios is clarified in Table 5. For each scenario of the chosen ones and under the defining criteria there is a brief explanation of the reason behind being in this specific category.

Table 5. Scenarios categorization interpretation

Scenario		**National Economic Problems**	**Aggressive Competition**	**Unjustified Bank Loan**	**Wrong Stakeholder Management**
Time Pressure	Intense	Consequences could be catastrophic and need fast decisions.	Solution must be implemented as soon as possible to hold market share.		Fast response is required for not losing their trust.
	Mini-mal			Negotiations with bank officials usually take some time until the debt is restructured.	
Degree of Control	Low	Out of organization control.	Several alternatives exist but competitor can take counter-measures.		No guarantee for solutions because their reactions are unpredictable

	High			Restructuring of debt and adjusting customer installment timing will provide balance.	
Threat Level	Low				
	High	Potential financial losses could be huge.	Potential market share losses are undetermined.	Financial stability is highly jeopardized.	Potential losses of reputation and image could be catastrophic.
Response Options	Few	Rare in this kind of events because it is an external threat.			
	Many		Many effective solutions exist but must be deeply analyzed.	Seldom if sales will not cover debt service.	It differs according to each stakeholder's expectation.

Scenarios' archetypes

The standard archetypes are: 'Balancing Process with Delay', 'Limits to Growth', 'Shifting the Burden', 'Eroding Goals', 'Escalation', 'Success to the Successful', 'Tragedy of the Commons', 'Fixes that Fail', and 'Growth and Underinvestment' (Senge, 1990). Typically, the defining properties of the archetypes encompass the root cause for the crisis event accompanied by the consequences along with the containment policy. Accordingly, these defining properties will guide selecting the adequate measures required. Therefore, according to the individual attributes for each one of the selected four scenarios, there is an associated specific standard archetype

National economic problems

This scenario is associated with 'Limits to Growth' archetype, which is defined as a process that feeds on itself to produce a period of accelerating growth. Over time, the growth begins to slow and eventually comes to a halt and may reverse itself and begin an accelerating collapse (Senge, 1990). The diagram in Figure 7 represents this scenario after it had been formulated and shaped according to the archetype standard structure. About the reinforcing loop, it is motivated by the profits that the organization earned, which leads the organization to look after more earnings. On the other hand, the balancing loop is governed by the disability of potential customers due to economic problems. Hence, any effort from the organization to attract potential customer will fail due to this disability.

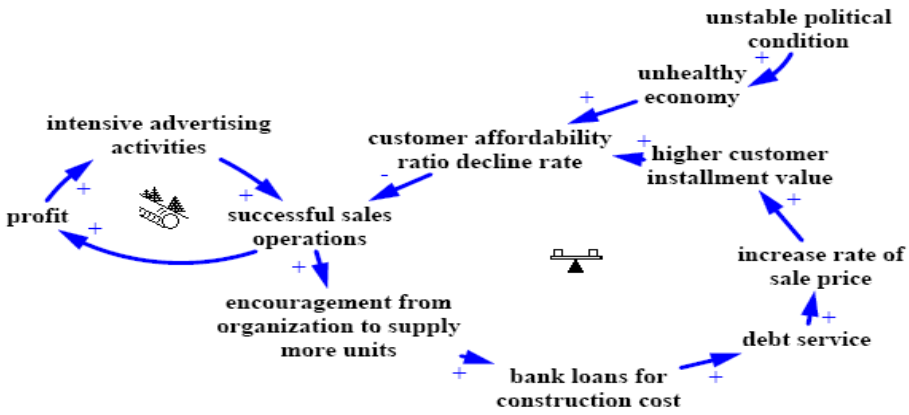


Figure 7. National economic problems

Aggressive competition

This event is categorized as an 'Escalation' archetype, in which two organizations see their welfare as depending on a relative advantage over the other. Whenever one side gets ahead, the other is more threatened, leading it to act more aggressively to re-establish its advantage, which threatens the first, increasing its aggressiveness, and so on (Senge, 1990). The archetype in Figure 8 provides a full description of this scenario. It is a comprehensive picture of price and advertising wars between real estate development organizations. Each developer is trying to increase his market share by lowering prices and adopting intensive advertising campaigns. Finally, the cost/benefit analysis will be jeopardized leading to financial losses.

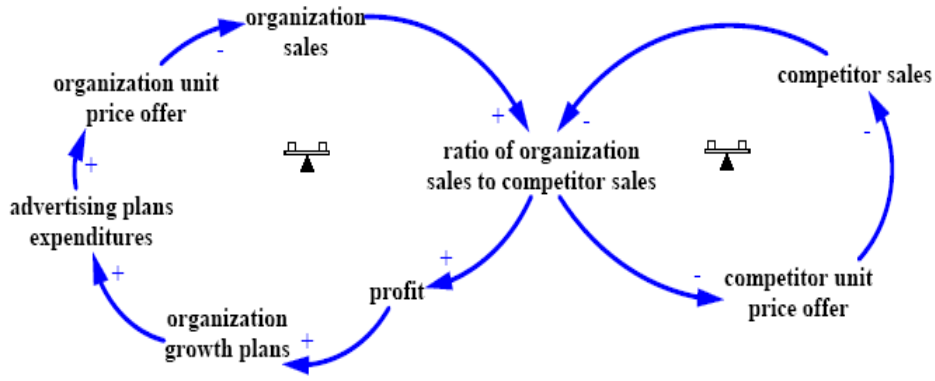


Figure 8. Aggressive competition

Unjustified bank loan

This scenario falls in 'Shifting the Burden' archetype category which is defined as a short term solution that is used to correct a problem, with seemingly positive immediate results. As this correction is used more and more, more fundamental long term corrective measures are used less and less. Over time, the capabilities for the fundamental solution may atrophy or become disabled (Senge, 1990). Although every organization needs fund for its operations, source and terms of the fund must be analyzed deeply to avoid any jeopardizing for financial stability. Borrowing from banks is the main source for fund for organizations but depending heavily on it will cause serious financial issues as demonstrated in Figure 9.

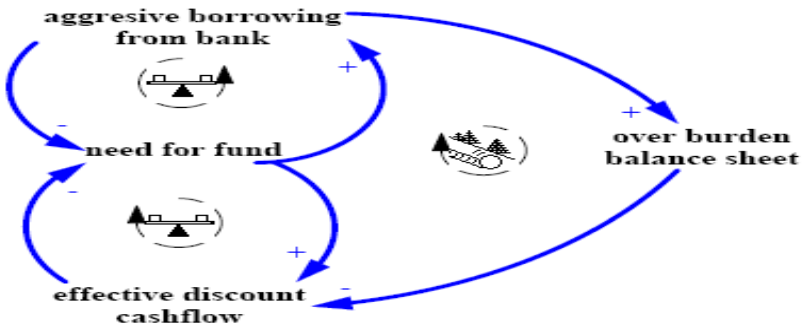


Figure 9. Unjustified bank loan

Wrong stakeholder management

This particular case belongs to 'Growth and Underinvestment' archetype, which asserts that whenever growth approaches a limit which can be eliminated or pushed into the future if the organization invests in additional capacity. This investment must be aggressive and sufficiently rapid to forestall reduced growth, or else it will never get made (Senge, 1990). In fact, organizational growth must be supported by strong relationships with stakeholder. These stakeholders could be categorized as follows: suppliers, contractors, governmental bodies, facilitators, shareholders, unions, and neighbors. Each one of them holds a key to a specific process, therefore building long term relations with them is mandatory. The relations could be manifested in many forms such as partnering, long term contracts, and even upgrading their performance by means of training programs as shown in Figure 10.

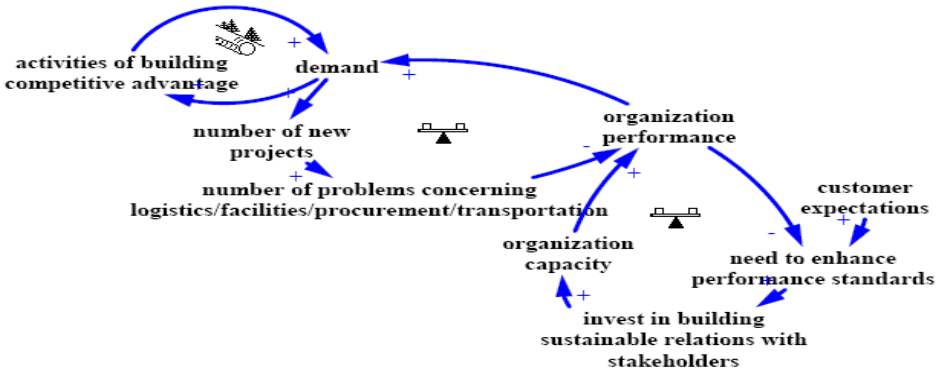


Figure 10. Wrong stakeholder management

Scenarios management

The management process is founded on the outcomes of the previous analysis processes as a basis for selecting the suitable containment strategies. For each one of the selected four scenarios, there is a specific strategy for management which is visualized by means of a CLD.

The national economic problems management process

The CLD in Figure 11 encompasses the tasks required to manage the crisis scenario efficiently by utilizing the results of the analysis process. Starting by course of the crisis, which is U- shape, in which the focus of attention is on the recovery phase. Therefore, this phase is represented through three elements; building contingency reserve, deployment of prospector strategy, and adopting differentiation strategy. In terms of assessment, this crisis is in the red zone, which is characterized with intense time pressure. Accordingly, the decision must be taken as fast as possible. Referring to archetype, its management principle is to remove the source of limitation (Senge, 1990). Surely, this target should be accomplished by adopting differentiation and prospector strategies.

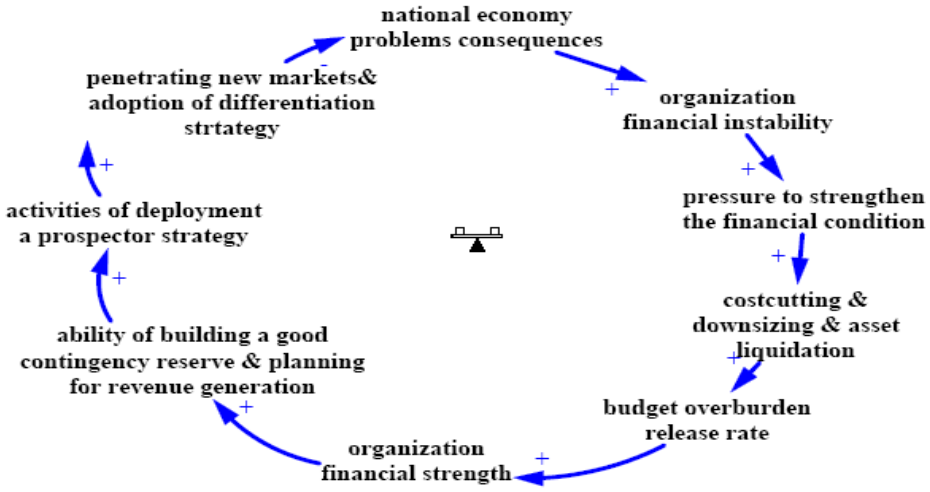


Figure 11. National economic problems management process

The aggressive competition management process

The balancing loop in Figure 12 demonstrates the management measures adopted. Typically, the analysis process is navigated, starting with a course of crisis which is hysteresis, in which the concentration will be in the damage control phase. Thus, this phase is represented by two elements; competitor analysis and searching for uniqueness in capabilities. Regarding assessment, the scenario is in the green zone which holds many alternatives but must be analyzed first and this is achieved in the SWOT operation. Last but not least, the archetype management principle is stating that each organization should find another way to achieve its objective rather than aggressive reactions (Senge, 1990). Hence, this objective is achieved when the organization looks for its own strength and builds its own competitive advantage.

Figure 12. Aggressive competition management process

Unjustified bank loan management process

The causality diagram in Figure 13 presents the chosen containment actions for managing this scenario. Within the analysis context, the course, in this case, is U- shape, in which the concentration will be on the recovery phase. This phase is represented by two elements; enhancing financial strength and utilizing pre-sale approach. About assessment, the event is in the green zone which is acknowledged with few options for response, which in this case is restructuring of debt and adopting multiple approaches for financing. Finally, regarding the archetype management principle, this is to focus on the fundamental solution, while using short term solution to gain more time (Senge, 1990). Clearly, this goal is reached by lowering the debt portion in the financial structure and depending more on other sources of funding.

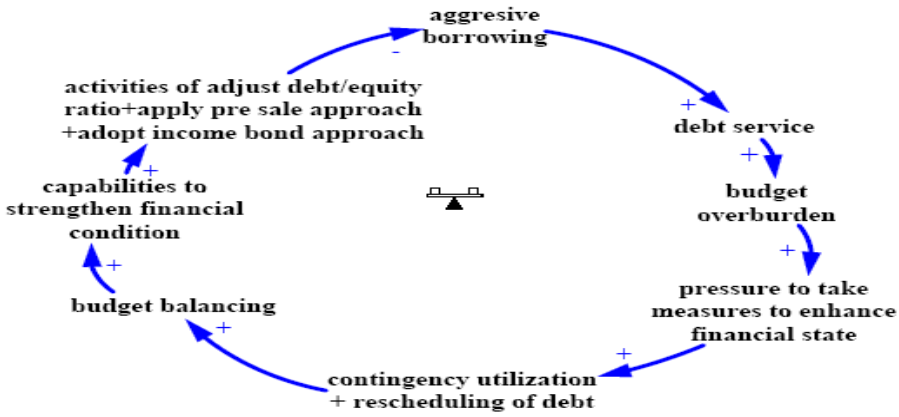


Figure 13. Unjustified bank loan management process

Wrong stakeholder management containment process

The diagram in Figure 14 shows the selected activities for containing this crisis scenario. The analysis process begins with a course of crisis which is U- shape, in which much focus will be on the recovery phase. Thus, this phase is represented by two elements; setting regular meeting with stakeholders and deploying their recommendations. Referring to the assessment, the scenario is in the blue zone which is recognized with intense time pressure. Therefore, the decisions regarding enhancing the relationships with stakeholders should be taken as quickly as it could be. Lastly, the archetype management principle asserts that the organization should build the capacity to achieve the desired growth (Senge, 1990). Arguably, this capacity is the effective management of stakeholders' needs and expectations.

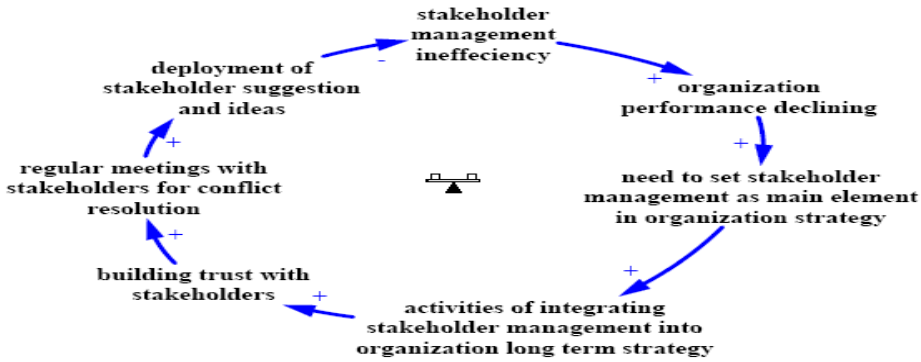


Figure 14. Wrong stakeholder management containment process

Approaches comparison

Eventually, after presenting the two approaches, the remaining task is to compare between them and to reveal the strengths and weaknesses for each as reported in Table 6.

Table 6. Approaches comparison

Approach	**Conceptual**	**Scenario-Based**
Strengths	Decision making takes a relatively small time. Ability to manage more than one crisis simultaneously. Suitable for large size organizations. Effective for crisis with different types of negative impact. Correlations between containment policies are clear. Key system drivers are easily identified. Provides detailed system description. Management phases are highly distinguished from each other.	Implementation cost is relatively low. Crisis event is deeply analyzed. Precious assessment for crises events. Suitable for small and medium-size organizations. Solutions are founded on root causes and pattern of behavior through time. Each crisis event is referred to a specific standard archetype which gives credibility for solutions. No commitment to specific management model. Enhances managers' methods of thinking which leads to improving performance. Ability to verify from the absence of contradiction between containment policies adopted in successive management phases.
Weaknesses	Implementation cost is relatively high. Crisis event characteristics are not accurately identified. Solutions are based on symptoms and consequences. Absence of ranking for crises.	Decision making takes relatively much time. Inefficient in confronting more than one crisis at the same time. Management phases are not clear. Key system drivers cannot be defined easily

Conclusions

The contribution of this paper was basically manifested in utilizing CLDs' functions in the analysis process of two proposed approaches for managing real estate development crises. Twenty crises' scenarios were identified for the purpose of deploying and analyzing the two approaches. The first approach is the conceptual approach. This approach is founded on Mitroff, Pauchant, and Shrivastava (1988) model and presented in the form of CLDs. While exploring the approach and analyzing its phases; significant findings revealed. These findings encompassed an identification of key driving factors, correlations between factors, and type of each feedback loop. Some of these key driving factors are structure, communication, decision making, innovation, control system, debt/equity ratio, brand name, and physical assets. Further, revealing factors' correlations provided a detailed description of the system (real estate development organization) as a whole. Additionally, identification of loops' types shows the pattern of behavior of the system which will lead to knowing the consequences of the adopted containment strategies. Therefore, the CLD for each phase provided a strategy visualization tool which also works as stand-alone policy analysis.

The second proposed approach is the scenario-based approach, in which the core element under consideration is the crisis event. The analysis operation started by specifying the crisis's course, which facilitated locating the resources required in the right phase. Subsequently, an assessment matrix was constructed to evaluate each crisis scenario. The matrix provided an accurate diagnosing as well as threat level ranking and finally clarified management options. The final analysis instrument was system archetypes, which demonstrated clearly for each scenario; root cause, description, symptoms, properties, structure, and management principles. Eventually, building on the outcome of the three operations, the adequate containment strategies were established. The last task performed was a comparison process between the approaches, in order to explore the strengths and weaknesses of each. One significant conclusion from this comparison asserted that the conceptual approach is much applicable to large organizations while scenario-based approach suits small and medium ones.

In terms of managerial implications, effective and practical containment strategies for crises' scenarios were presented. Concerning the conceptual approach, it provides managers with a fully integrated procedure to manage crises, which is distributed along the crisis lifecycle. Regarding the scenario-based approach, it supports them with reliable and accredited policies to manage crises based on system archetypes management principles. Lastly, presenting the management activities in the form of CLDs help managers to enhance and enrich their mental models.

Regarding the research limitations, they are concentrated on two issues. First, the variables inherent in the CLDs were selected from the literature because they were relevant, consistent, practical, and almost unanimity. However, if these variables and their relations were presented to practitioners in the form of a questionnaire to capture their comments; this will enrich the research content. Second, although the analysis tool is the CLD, it will be more influential to transform it into stock and flow diagram in order to represent the research results in numbers. Therefore, these two limitations could be the proposed area for future research.

References

Alas, R., & Gao, J. (2012). *Crisis Management in Chinese Organizations, Benefiting from the changes*. London, UK: Palgrave Macmillan. doi: 10.1057/9780230363168.

Alex Bank Economic Research (2012). Egypt's real estate industry. Retrieved from https://www.alexbank.com › ABOUTUS › Research.

Barker, V.L., & Duhaime, I.M. (1997). Strategic change in the turnaround process: theory and empirical evidence. *Strategic Management Journal*, *18*(1), 13-38. doi: 10.1002/(SICI)1097-0266(199701)18:1<13::AID-SMJ843>3.0.CO;2-X

Benedict, A. (2007). 2007 Change Management. Survey Report: A Study by the Society for Human Resource Management. Retrieved from https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/documents/2007%20change%20management%20survey%20report.pdf.

Bianchi, C., & Montemaggiore, G.B. (2008). Enhancing strategy design and planning in public utilities through dynamic balanced scorecard: insights from project in a city water company. *System Dynamics Review, 24*(2), 175-213. doi: 10.1002/sdr.395.

Bontis, N. (2001). Assessing knowledge assets: a review of the models used to measure intellectual capital. *International Journal of Management Reviews*, *3*(1), 41-60. doi: 10.1111/1468-2370.00053.

Burnett, J.J. (1998). A Strategic approach to managing crises. *Public Relations Review*, *24*(4), 475-488.

Carmeli, A., & Schaubroeck, J. (2008). Organisational crisis preparedness: the importance of learning from failures. *Long Range Planning*, *41*, 177-196. doi: 10.1016/j.lrp.2008.01.001.

Castillo, J.M., Hiltz, S.R., & Turoff, M. (2012). Monte Carlo and decision making support in crisis management. In Rothkrantz, L.J.M., Ristvej, J., & Franco, Z. (Eds.), *Proceedings of the 9th International Conference on Information Systems for Crisis Response and Management ISCRAM* (pp.90-121). Vancouver, Canada: Simon Fraser University.

Crandall, W., Parnell, J.A., & Spillan, J.E. (2009). *Crisis management in the new strategy landscape.* Los Angeles, CA: Sage.

Crandall, W., & Spillan, J.E. (2010). A look to the future: emerging trends in crisis management. *International Journal of Sustainable Strategic Management*, *2*(1), 17-28. doi: 10.1504/IJSSM.2010.032161.

Crowe, C., Dell-Ariccia, G., Igan, D., & Rabanal, P. (2011). Policies for macrofinancial stability: options to deal with real estate booms. Retrieved from https://www.imf.org/external/pubs/ft/sdn/2011/sdn1102.pdf.

Crowe, C., Dell-Ariccia, G., Igan, D., & Rabanal, P. (2014). Policies for macro financial stability: managing real estate booms and busts. In Claessens, S. (Ed.), *Financial crises: causes, consequences, and policy responses* (pp.365-395). Washington, DC: International Monetary Fund.

Ebrahimi, M. (2015). Model building of manufacturing SMEs of new energy technologies by focusing on system archetypes. In *Proceedings of the 33rd International Conference of the System Dynamics Society* (vol. 1, pp.845-867). Albany, NY: System Dynamics Society.

Elsubbaugh, S., Fildes, R., & Rose, M.B. (2004). Preparation for crisis management: a proposed model and empirical evidence. *Journal of Contingencies and Crisis Management, 12*(3), 112-127. doi:10.1111/j.0966-0879.2004.00441.x.

Erol, M., Apak, S., Atmaca, M., & Ozturk, S. (2011). Management measures to be taken for the enterprises in difficulty during times of global crisis: an empirical study. *Procedia-Social and Behavioural Science*, *24*, 16-32. doi: 10.1016/j.sbspro.2011.09.086.

Frankel, J., & Saravelos, G. (2012). Can leading indicators assess country vulnerability? evidence from the 2008–09 global financial crisis. *Journal of International Economics*, *87*, 216-231. doi: 10.1016/j.jinteco.2011.12.009.

Gehner, E. (2008). *Knowingly taking risk-investment decision making in real estate development*. Delft, The Netherlands: Eburon Academic Publishers.

Gibson, C.A., & Tarrant, M. (2010). A Conceptual models approach to organisational resilience. *The Australian Journal of Emergency Management*, *25*(2), 6-12.

Hallgren, M., & Wilson, T.L. (2008). The nature and management of crises in construction projects: Projects-as-practice observations. *International Journal of Project Management, 26*, 830-838. doi: 10.1016/j.ijproman.2007.10.005.

Harwati, L.N. (2013). Crisis management: determining specific strategies and leadership style for effective outcomes. *Asian Journal of Management Sciences and Education, 2*(2), 170-181.

Hashim, M. (2013). Change management. *International Journal of Academic Research in Business and Social Sciences*, *3*(7), 685-694. doi: 10.6007/IJARBSS/v3-i7/92.

Huang, F., & Wang, F. (2005). A System for early warning and forecasting of real estate development. *Automation in Construction*, *14*, 333–342.

Kaklauskas, A., Kelpsiene, L., Zavadskas, E.K., Bardauskiene, D., Kaklauskas, G., Urbonas, M., & Sorakas, V. (2011). Crisis management in construction and real estate: Conceptual modelling at the micro-, meso- and macro-levels. *Land Use Policy, 28*, 280–293. doi: 10.1016/j.landusepol.2010.06.008.

Kovoor-Misra, S., Clair, J.A., & Bettenhausen, K.L. (2001). Clarifying the attributes of organisational crises. *Technological Forecasting and Social Change*, *67*(1), 77-91. doi: 10.1016/S0040-1625(99)00081-5

Light, P.C. (2008). *Predicting organisational crisis readiness: perspectives and practices toward a pathway to preparedness*. New York, NY: Centre for Catastrophe Preparedness and Response.

Loosemors, M. (1998). The three ironies of crisis management in construction projects. *International Journal of Project Management*, *16*(3), 139-144. doi: 10.1016/S0263-7863(97)00041-0.

Lu, Y.C., Shen, C.H., & Wei, Y.C. (2013). Revisiting early warning signals of corporate credit default using linguistic analysis. *Pacific Basin Finance Journal*, *24*, 1–21. doi: 10.1016/j.pacfin.2013.02.002.

McConnell, A., & Drennan, L. (2006). Mission impossible? planning and preparing for crisis. *Journal of Contingencies and Crisis Management*, *14*(2), 59-70. doi: 10.1111/j.1468-5973.2006.00482.x.

Mitroff, I., Pauchant, T.C., & Shrivastava, P. (1988). The Structure of man-made organisational crises: conceptual and empirical issues in the development of a general theory of crisis management. *Technological Forecasting and Social Change, 33*(2), 83-107. doi:10.1016/0040-1625(88)90075-3.

Mukerji, P., & Saeed, K. (2011). Likely causes of the US housing market crisis: a system dynamics investigation. In Lyneis, J.M., & Richardson, G.P. (Eds.),

Proceedings of the 29th International Conference of the System Dynamics Society (vol. 4, pp.2546-2569). Albany, NY: System Dynamics Society.

Ocal, E., Oral, E.L., & Erdis, E. (2006). Crisis management in Turkish construction industry. *Building and Environment*, *41*(11), 1498-1503. doi: 10.1016/j.buildenv.2005.05.042.

Paraskevas, A., & Altinay, L. (2013). Signal detection as the first line of defence in tourism crisis management. *Tourism Management*, *34*, 158-171. doi: 10.1016/j.tourman.2012.04.007.

Penrose, J.M. (2000). The Role of perception in crisis planning. *Public Relations Review*, *26*(2), 155-171. doi: 10.1016/S0363-8111(00)00038-2.

Pruyt, E. (2010). Using small models for big issues: exploratory system dynamics modelling and analysis for insightful crisis management. In *Proceedings of the 28th International Conference of the System Dynamics Society* (vol. 3, pp.2291-2315). Albany, NY: System Dynamics Society.

Pruyt, E. (2013). *Small system dynamics models for big issues-triple jump towards real world dynamic complexity*. Delft, The Netherlands: TU Delft Library.

Qian, Y., Zubieta, L.L., Lango, P., & Gonzalez, J.J. (2014). Modeling the 2005 Hatlestad slide. In Davidsen, P., & Rouwette, E.A.J.A. (Eds.), *Proceedings of the 32nd International Conference of the System Dynamics Society* (vol. 3, pp.2476-2505). Albany, NY: System Dynamics Society.

Ricigliano, R., & Chigas, D. (2011). Systems thinking in conflict assessment: concepts and application. Retrieved from https://pdfs.semanticscholar.org/34d8/a001d2afae2bb22ed52f5b94eefff8db44fb.pdf.

Robbins, K., & Pearce, J.A. (1992). Turnaround: retrenchment and recovery. *Strategic Management Journal*, *13*(4), 287-309. doi: 10.1002/smj.4250130404.

Setianto, N.A., Cameron, D., & Gaughan, J.B. (2014). Identifying archetypes of an enhanced system dynamic causal loop diagram in pursuit of strategies to improve smallholder beef farming in Java, Indonesia. *Systems Research and Behavioural Science, 31*(5), 642-654. doi: 10.1002/sres.2312.

Senge, P.M. (1990). *The Fifth Discipline: The art and practice of the learning organization.* New York, NY: Bantam Doubleday Dell Publishing Group.

Shahrabi, B. (2012). The Role of organizational learning and agility in change management in state enterprises: a customer-oriented approach. *International Research Journal of Applied and Basic Sciences*, *3*(12), 2540-2547.

Simon, H. (2010). *Beat the crisis: 33 quick solutions for your company*. New York, NY: Springer.

Sterman, J.D. (2001). System dynamics modelling: tools for learning in a complex world. *California Management Review*, *43*(4), 8-25. doi: 10.2307/41166098.

Tidwell, M. (2016). Preparing for the coming storm: exploring interactions between corporate values and crisis management. *Journal of Professional Communication*, *4*(2), 135-158. doi: 10.15173/jpc.v4i2.2631.

Tikici, M., Omay, E., Derin, N., NurSeckin, S., & Cureoglu, M. (2011). Operating turnaround strategies during crisis periods: a research on manufacturing firms. *Procedia Social and Behavioural Sciences*, *24*, 49–60. doi: 10.1016/j.sbspro.2011.09.046.

Vlados, C. (2019). Change management and innovation in the "Living Organization": The Stra.Tech.Man approach. *Management Dynamics in the Knowledge Economy*, *7*(2), 229-256. doi: 10.25019/MDKE/7.2.06.

Wang, W.T., & Belardo, S. (2005). Strategic integration: a knowledge management approach to crisis management. In Nunamaker, J.F., & Briggs, R.O. (Eds.), *Proceedings of the 38th Hawaii International Conference on System Sciences* (pp.252a). Big Island, Hawaii: IEEE.

Wang, W.T., & Belardo, S. (2009). The Role of knowledge management in achieving effective crisis management: a case study. *Journal of Information Science*, *35*(6), 635-659. doi: 10.1177/0165551509104234.

Wei, L., & Zhang, W. (2013). Research of corporate ERP performance evaluation model based on system dynamics. In *Proceedings of the International Conference on Advanced Computer Science and Electronics Information (ICACSEI)* (pp.300-303). Paris, France: Atlantis Press.

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