Critical decisions for crisis management: An introduction

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Abstract. In the presence of crisis, such as global COVID-19 pandemic crisis, governments have more and more take critical decisions to cope with consequential environmental threats in the presence of highly restricted time. This chapter provides a simple description of techniques of decision making in different environments/conditions of crisis management and how that process is influenced by manifold social, economic and/or technical factors; ultimately it is presented how the approach of improvisation can support the process of decision making to cope with unforeseen and new events, rapid changes, turbulent environment and/or specific situations of emergency.

Keywords. Critical decision, Decision making, Decision support, Uncertainty, COVID-19, Crisis management, Problem solving, Bounded rationality, Improvisation.

JEL. F21, F68, O53, K23.

1. Introduction

The markets and environment have, more and more, a growing dynamism that generates uncertainty and turbulence (Johnson & Scholes, 1988; Emery & Trist, 1965). In uncertain and unstable environment, organizations/nations are open systems having activities in interaction with external factors (McDermott & Taylor, 1982; Gioia & Chittipeddi, 1991). Organizations/nations and leaders can confront crises and problematic situations that they do not face on a daily basis—for example, in the presence of hurricane, earthquake, political instability, pandemic, terrorist attacks, financial crisis, etc. (cf., Farazmand, 2001, 2007). Critical decisions are hard calls, which involve tough value trade-offs and also major changes, such as stop the production, lockdown, quarantine of population, social restrictions, staff cuts and/or move the location of firms in other geoeconomic regions, etc. In short, organization/nation and management in emergency situations have to take critical decisions to cope with consequential environmental threats in the presence of highly restricted time, endeavoring to minimize possible losses for a worst case scenario. A critical and effective decision requires interagency and inter-organizational coordination. Moreover, the effective implementation of critical decisions requires that personnel of different departments work

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together. In this context, public organizations are originally designed to conduct routine business in accordance with values of fairness, lawfulness, and efficiency. However, critical decisions in the presence of a crisis require flexibility, improvisation, and the breaking of rules in a very short time.  

2. Type of crisis and risks for applying critical decisions

A critical decision occurs in the presence of a crisis given by an unexpected complex problem that threatens organizations, countries or societies at risk (Farazmand, 2001). A general definition of risk for organizations/nations is a performance variance or environmental threat that negatively impacts the organization/nation/society (cf., Bouchet et al., 2003, p.10). The sources of crises can either originate internally or externally to organizations/nations. If organizations/nations do not decide timely a solution, and sources of risk are left unaddressed, they can permanently damage the business, public service, organization, population and society with consequent socioeconomic problems. The identification of a crisis needs the evaluation of vital elements, such as: a) the problem must pose an imminent threat to the organization/nation; b) the situation must involve an element of surprise or shock; c) unexpected and uncertain nature of a complex problem will place pressure on organizations to make timely and effective critical decisions. Crisis can be due to manifold factors: rapid evolution of technology (Coccia, 2005a, 2006, 2014, 2017, 2017a, 2019; Coccia & Watts, 2020); natural disasters, such as earthquake, hurricane, flood, etc., as well as pandemic diseases that generate socioeconomic shock and severe health damages (cf., Coccia, 2017d); economic crisis generated by hyperinflation, high public debt, energy shortages etc. (cf., Coccia, 2005, 2007, 2016; Coccia, 2017b); political risk and revolutions (cf., Coccia, 2017c, 2019, 2019a, 2019b, 2019c; Farazmand, 2001; Miller, 1992); terrorism of some group organized that has technical skills to carry out a terrorist action directed to challenge a nation’s authority and induce fear and anxiety into civilian population (cf., Crenshaw, 1981, Coccia, 2018, 2018a, 2018b, 2018c; Krueger, 2007; Newman, 2006). The effect of crises can be worsened by weak infrastructure and inefficiencies of local and national institutions; social crisis that increases violence in society.

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1 In this context, for studies about the interaction in different environments/conditions between decision systems, science, technology and innovation, their sources, evolution, diffusion and impact on socioeconomic systems, see: Cavallo et al., 2014; Coccia, 1999, 2001, 2004, 2005, 2005a, b, c, 2006, 2007, 2008, 2009, 2009a,b,c; 2010, 2010a,b; 2012, 2012a,b; 2013, 2014, 2014a, b, c,d; 2015, 2015a, b; 2016, 2016a; 2017, 2017a, b, c, d, e, f, g, 2018, 2018a, b, c, d, e, f, g, h, i; 2019, 2019a, b, c, d, e, f, g, h, i, l, m; Coccia, 2020a, b, c, d, e, f, g, h, i, l, m, n, o, p, q: Coccia and Bellitto, 2018, Coccia and Cadario, 2018; Coccia et al., 2015; Coccia and Finardi, 2012, 2013; Coccia et al., 2012; Coccia and Rolfo, 2008, 2009, 2010, 2013, Coccia and Watts, 2020.
3. Crisis management and types of critical decisions

Organization can design a crisis management team for managing strenuous situations and complex problems and making critical decisions to resolve, as far as possible, them. Crisis management team should deal with threats before, during, and after they have occurred (cf., Groh, 2014). Successful crisis management teams understand the different types of crisis and are thoroughly prepared for all situations. Moreover, in a crisis, leaders are expected to reduce uncertainty and provide an authoritative account of problems, solutions and difficulties. When leaders have to formulate a strategy and critical decision for complex problems, they also must get others to accept the proposed solution. In fact, the critical decisions of leaders can coincide and compete with those of other parties, who hold other positions and interests and who are likely to suggest various alternative solutions and actions (Venette, 2003). Vital factors for a critical decision in aversive environment are:

(a) a threat to the organization
(b) the element of surprise
(c) a short decision time

Different types of critical decisions are (cf., Seeger et al., 1998; Shrivastava et al., 1988; Bundy et al., 2017):

Responsive critical decision

When a problem hits organizations/nations, it is important to have a plan of action ready that matches the situation at hand. Crisis management executes the plan of critical decision and handles any unexpected roadblocks that may pop up.

Proactive critical decision

Proactive critical decision anticipates a potential problem and works to prevent it, or prepare for it. For example, building an earthquake-resistant factory and sharing an evacuation plan with employees/population are methods to prepare for natural disasters. While not all crises can be prevented or planned for, actively monitoring for threats to organizations/nations can reduce the impact of problematic situations in society.

Recovery critical decision

Sometimes, it is not possible to see the complex problem coming (e.g., earthquake, pandemic diffusion, etc.), or it is too late to prevent the damage it caused. In these cases, organizations/nations may not be able to lessen the impact, but it can begin to salvage what is left of the situation.

4. Structure of decision making and strategies for critical decisions

The process of critical decisions is based on strategic operations and steps, such as (Linstone, 1999):

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the definition of a complex problem $Pr$ from volatile environment, and the implicit assumption that the problem can be solved. After that, it is important to gather information for possible solutions of the problem $Pr$

- Reductionism, the study of complex problems in terms of a very limited number of variables and the critical interaction among them
- Identification of the purpose of critical decision about the complex problem $Pr$ under study
- Suggestion and evaluation of different alternative solutions to complex problem $Pr$ under study
- Ignoring or avoiding the individual interests
- Selection of the optimal solution, or the search whenever possible, for a best solution in a short time
- Implementation of the critical decision and evaluation of results

In short, the starting point of critical decision is a complex problem that we assume a possible solution exists. A complex problem has several solution concepts ($Sl_i$), each of which leads to several consequential problems ($Pr_j$) and solutions ($Sl_l$). A critical decision can be schematically summarized by a tree structure of decision making with consequential levels of $Pr$ and $Sl$ (Fig. 1).

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**Note:** The increasing number from left to right indicates the sequence of decisions to cope with consequential problems.

Different strategies for critical decisions in the presence of turbulent scenario are schematically summarized in Figure 2.

**Figure 1.** The problem-solution tree for critical decisions.

**Note:** $Pr$ = problem; $Sl$ = solution.

**Figure 2.** Strategies for critical decisions
A simple example can clarify these different strategies for critical decisions (cf., Lloyd & Dicken, 1977).

First of all, we create a matrix of outcome associated with strategies and environmental situations (or payoffs) as in Table 1.

### Table 1. Matrix of payoffs for a critical decision process

| Environmental Situation | I    | II   | III  |
|--------------------------|------|------|------|
| Strategy 1               | 200  | 155  | 145  |
| Strategy 2               | 130  | 220  | 130  |
| Strategy 3               | 118  | 118  | 225  |

Critical decision depends on manifold endogenous and exogenous factors, also considering the behavior of management towards risk and uncertainty. Results of critical decision listed in Figure 1 are as follows.

- **Pessimistic critical decision** is based on a rule of max-min, selecting the max of the worst result in each strategy:
  - Critical decision with max-min
    - 145 for strategy 1
    - 130 for strategy 2
    - 118 for strategy 3

- **Optimistic critical decision** is based on a rule of max-max, selecting the max of the best result in each strategy:
  - Critical decision with max-max
    - 200 for strategy 1
    - 220 for strategy 2
    - 225 for strategy 3

- **Rational critical decision** considers relative probabilities of each environmental situation.

If the probability of different environmental situations in Table 1 is assumed to be:

| Probability          | Environmental Situation I | Environmental Situation II | Environmental Situation III |
|----------------------|---------------------------|----------------------------|------------------------------|
| Probability          | 0.2                       | 0.5                        | 0.3                          |
| Total (certain event in probability) | 1.0                        |                            |                              |

then, critical decision here is based on selecting the strategy with the **highest expected value**, given by:

| Strategies | Expected value |
|------------|---------------|
| strategy 1 | 0.2(200)+0.5(155)+0.3(145) =161 |
| strategy 2 | 0.2(130)+0.5(220)+0.3(130) =175 Critical decision |
| strategy 3 | 0.2(118)+0.5(118)+0.3(225) =150.1 |

- **Approximate critical decision** assumes that the probability of different environmental situations is equal. Table 1 has three environmental situations and the equal probability is 0.333 (i.e., 1/3=0.333…):

| Probability          | Environmental Situation I | Environmental Situation II | Environmental Situation III |
|----------------------|---------------------------|----------------------------|------------------------------|
| Probability          | 0.333...                  | 0.333...                   | 0.333...                     |
| Total (certain event in probability) | 1.000                      |                            |                              |

This critical decision is also based on selecting the strategy with the **highest expected value**.
Strategies | Expected value | Critical decision with Min-Max strategy
--- | --- | ---
strategy 1 | 0.33(200)+ 0.33 (155)+ 0.33 (145) =165 | If the critical decision, \textit{a priori}, is strategy 3 and the environmental situation, \textit{a posteriori}, is 1 in table 1, the best critical decision \textit{ex-post} would be strategy 1, rather than strategy 3; the regret \textit{ex-post} for the wrong choice done \textit{a priori} is 83 (i.e., 200-118). The calculation of this value for each cell is the base for \textit{Min-Max} rule of critical decision, given by minimizing the max value of strategies, i.e.,
strategy 2 | 0.33 (130)+ 0.33 (220)+ 0.33 (130) =158.4 | 80 for strategy 1
strategy 3 | 0.33 (118)+ 0.33 (118)+ 0.33 (225) =152.5 | 95 for strategy 2

5. Improvisation for critical decisions

Planning can reduce uncertainty, but even the most carefully devised plans may have to be abandoned or modified in the face of unanticipated changes or challenges. Improvisation is one of approaches that stands outside of rational models of decision making mentioned above. Improvisation is a combined behavioral and cognitive activity that requires consequential creativity under tight time constraint in order to meet performance objectives (Mendonça & Fiedrich, 2006, p. 350). Improvisation carries an immediate answer for a need in the presence of environment threats (Lee, 1995). Improvisation is also a way of take advantage of important and unexpected opportunities without formal plans or systematic procedure (Sharkansky & Zalmanovitch, 2000). While rational planning aims to control a situation by reducing the uncertainty, improvisation is a reaction to a novel situation and a way of working within uncertainty. While rational planning is directed at optimal solutions, improvisation aims at dealing with problems rather than solving them in an optimal manner. In short, improvisation may be employed to overcome the limitations of rational planning. Understanding of cognition in highly non-routine situations can lead to improvements for decision-making in these situations (Klein, 1993). A two-stage process for improvisation may be: 1) the organization recognizes either that no plan applies to the current situation or that plan cannot be executed; 2) the responding organization has to develop and deploy one or more new procedures. Mendonça & Fiedrich (2006, p. 350) argue that:

The improvisation may range from substitution (e.g., using a close substitute resource for one that is unavailable) to the construction of new procedures (e.g., developing an entirely new procedure). In the case of substitution, the responding organization ‘mixes and matches’ existing procedures and/or the materiel used in them. At the other end of the spectrum, the organization must develop new procedures and possibly find new material for use in those procedures. More radically, it may also entail changing the goals of the response (e.g., deciding in the field that the
real problem to be solved is providing shelter in place rather than evacuating).

The question of when to improvise for a critical decision may be conceptualized as a choice problem, in which the ability or likelihood of a decision-maker to categorize correctly is influenced by a number of factors, such as penalties associated with making an incorrect choice and the likelihood that the response will succeed. The question of how to improvise may be conceptualized as a search and assembly problem, which may be influenced by factors, such as time available for planning, risk in the environment and the results of prior decisions. In short, learn how to develop and deploy new procedures and critical decisions in a consequential manner under time constraint; after that, inform multiple decision-makers and make inferences about the present and likely future states of complex systems (Weick, 1993, 1998). Indeed, training has proven capable of improving human ability to recognize salient similarities and differences between current and past situations for critical decisions– even at a very fine-grained level (Klein, 1993). Hence, improvisation involves the ability to act in real time, when the need arises, and to find an action when none of the established alternatives appear to be practical. It is useful when there is uncertainty, few precedents, or few reliable facts and suitable routines; and when there is pressure to act in a short time or with resources that appear to be insufficient. Stressful environments may foster improvisation more than less fraught ones. Thus, unpredictable and rapidly changing environments are probably more likely to promote improvisation than more stable environments. Improvisation may be more likely when there is not enough time, information, knowledge, or material resources to plan, measure, weigh, consider, and document an optimal response, or when opposing demands are so intense that calculated compromise appears unproductive. Thus, critical decision with improvisation is likely to occur in emergencies, crises, and novel situations, and when the problem it comes to address is perceived to be intractable. Improvisation has inherent drawbacks. It may generate instability and consequential improvisations to cope with the effects of previous improvisations. Improvisation tends to be judged by its results that can lead to success or fail.

6. Conclusions

The decision rule and mechanism for critical decisions, of course, change according to the situation that can be affected by manifold organizational and environmental variables. In this context, it is important to consider the ecological rationality that claims how the rationality of a decision depends on circumstances in which it takes place, so as to achieve one's goals in a specific context. What is considered rational under the theory of rational choice account, it might not always be considered rational under the ecological rationality account. In particular, rational choice theory puts a premium on internal logical consistency, whereas ecological rationality also
targets external performance in the world (cf., Allais, 1953; Kahneman et al., 1982; Gigerenzer & Todd, 1999; Simon, 1955). However, within process of critical decisions, it is also important to consider bounded rationality of decision makers, i.e., rationality is limited when individuals make decisions by the tractability of the decision problem, the cognitive limitations of the mind, manifold environmental variables and the time available to make the decision. Organizations/nations, in a context of bounded rationality, aim to a behavior of satisficing rather than maximizing critical decisions to cope with consequential environmental threats in the presence of highly restricted time (Simon, 1947; 1957; Gigerenzer & Selten, 2002). In general, acritical decisions provide vital material and information for a process of learning for turbulent and problematic situations in future. In fact, critical decisions are part of collective memory within and between organizations/nations and a vital source for historical analogies useful to leaders and organizations/nations in future complex situations (cf., Seeger et al., 1998; Shrivastava et al., 1988; Bundy et al., 2017). Overall, then, critical decisions deal with problems that are choicesituations in which what is done makes a significant difference to those who make the choice (Ackoff & Rovin, 2003, p.9). These problems can be treated in different ways as follows (Ackoff & Rovin, 2003, pp.9-10):

- **Resolution** is when management employs behavior previously used in similar situations, adapted if necessary, so to obtain an outcome that is good enough. This approach for critical decisions is based on past experience, trial and error, and a common sense.
- **Solution** means to discover or create a behavior that yields the best, or approximately the best possible outcome, one that optimizes. However, change in environment and new information can cause solutions to deteriorate. In general, solutions do not exist in isolation from other problems and environment.
- **Dissolution** means to redesign either the organization that has the problems or the environment in such way as to eliminate the problem or the conditions that caused it, thus enabling the organization to do better in the future than the best it can do today. Moreover, stakeholders might seize upon the lessons of crises to advocate measures and policy and organizational reforms to improve overall efficiency of organization/nation (cf., Bundy et al., 2017).

The critical decision of consequential problems can be based on a mix of these ways in the presence of more and more, turbulent markets, uncertain and volatile environments.
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