Extending the Conceptagon as an Analytic Framework: A Case Study of Public Preparedness in Israel

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Abstract

As a body of knowledge, systems thinking is useful across a wide range of disciplines and research domains. To facilitate the application of systems thinking, (Boardman and Sauser 2008) introduced a conceptual framework known as the Conceptagon. The Conceptagon provides a common systems-based methodology across distinct domains by establishing shared understandings and reference points, and by facilitating the accumulation of systems-oriented knowledge and application. Despite its usefulness as a methodological tool, a review of the literature shows that the Conceptagon remains largely underdeveloped and underutilized amongst students of systems thinking.

Building on the insights of (Boardman and Sauser 2008), this paper aims to extend the practical understanding of the Conceptagon and illustrate its potential as a rigorous analytic tool. We consider a case study of Israeli public preparedness as a complex system within the broader Israeli homeland security system and demonstrate the utility of the Conceptagon in assessing the nature and operation of this complex social system.

Introduction

Systems thinking is a body of knowledge that informs analysis, synthesis and inquiry of various systems of interest in a wide range of scientific and social domains. Yet as an analytic school of thought, its application is largely ad hoc and is often devoid of a principled analytic framework that could otherwise serve to merge research and findings into a common knowledge of systems across different scientific communities. To this end, (Boardman and Sauser 2008) introduced the Conceptagon, a conceptual framework, to utilize when systems professionals, irrespective of their domains, seek to gain a better understanding of the design and operation of their systems. This conceptual tool is particularly appropriate for socio-technical systems, which have both a strong technology and a human activity component.

The Conceptagon is a powerful conceptual tool that allows an ordered and coherent review of the system of interest by providing a comprehensive scheme to assess its unique features. It also promises to be a rigorous analytic tool if utilized as part of a robust critical thinking process. To date, however, application of the Conceptagon to systems-related analyses remains limited. One way of providing a more practical knowledge of the Conceptagon and demonstrating its analytic utility in assessing a system is to illustrate its application through a practical case.

In this paper, we seek to operationalize the Conceptagon through application to the Israeli public preparedness system. Israeli resilience is widely acknowledged amongst
the students of counterterrorism as a success story of engaging and leveraging an informed and properly educated public as a deliberate counterterrorism tool (Tucker 2003, Conroy 2008). This resilience is a result of the comprehensive and multifaceted preparedness programs that the Israeli authorities pursue to educate and train the public about its role in countering terrorism. As such, Israeli public resilience is an interesting case study that offers many insights and lessons learned to other countries struggling with the threat of terrorism. This paper approaches Israeli public resilience from a systems thinking perspective and considers public preparedness as a system that is embedded within the broader Israeli counterterrorism efforts. Since Israeli public preparedness is tightly linked to other aspects of the homeland security and emergency management efforts in Israel, its composition and operation is particularly complex and elaborate. As such, application of the Conceptagon is especially helpful and necessary for a comprehensive yet coherent assessment of this system.

To re-introduce systems practitioners to the Conceptagon, this paper will begin with a methodology section where the 21 attributes of the Conceptagon and its potential as a rigorous analytic framework will be discussed. After a brief introduction to the case study of the Israeli public resilience, we will assess the public preparedness system in Israel through a practical application of the Conceptagon. This exercise will illustrate not only how approaching the issue through a systems thinking perspective brings to the fore additional insights, but also demonstrates the Conceptagon’s ability to frame our inquiry, analysis and synthesis in a more structured and organized scheme to ensure no significant aspect of this system is left unaddressed.

Methodology

To analyze and characterize the public resilience in Israel we use several systems thinking and analysis concepts, tools and techniques to include context diagrams and causal loop diagrams. However, the most critical tool utilized in this paper is the Conceptagon adapted from (Boardman and Saucer 2008; Edson 2008; Boardman, Saucer, John and Edson 2009).

The Conceptagon. The Conceptagon (Figure 1) is a framework that allows “both the assessment of the problem situation as a system (synthesis and analysis) and the problem solving method as a systemic process of inquiry” (Edson, 2008, p., 31). By providing an analytic tool for “ordered thinking” about the problem and the system, the Conceptagon serves to define both the system and its solution space.

Figure 1. The Conceptagon (from Edson, 2008)

Comprised of 21 attributes organized into 7 triplets, the Conceptagon allows the researcher to gain a deep and comprehensive understanding of a system’s design, its components and the associated relationships, its processes, and its operation.1 The triplets of the Conceptagon include two related attributes linked by a third attribute. These attributes

1 See (Boardman and Sauser 2008), (Edson 2008), and (Boardman et al. 2009) for more detail on the definitions and meaning of each triplet term.
address significant characteristics of any given system providing a holistic understanding of the system under inquiry. During the application of the Conceptagon triplets, systems analysts can benefit from utilization of different systems thinking tools such as contextual diagrams, Systemigram maps, causal loops, and stock and flow diagrams to attain a robust and rigorous assessment of different aspects of a given system.

Operationalization of the Conceptagon tends to be an iterative process as the triplets of the Conceptagon build on each other and are best assessed in a mutually reinforcing process of learning. Hence, triplets of the Conceptagon do not require a particular sequence of application and may be based on personal preference or evolution of the research.

Data Collection. This paper draws on an earlier comparative case study conducted for the Department of Homeland Security, contrasting the state of public preparedness in Israel and the United States (McGee, Bott, Gupta, Jones and Karr 2009). Data for the case study were collected through interviews with the stakeholders as well as subject matter experts in Israel and the United States. Additionally, news articles, public opinion polls, unclassified primary and secondary sources of information and analysis, website content, and official documentation were utilized.

Public Resilience as a System

Referring to community resilience, the American Psychological Association (APA) emphasizes that “resources and skills associated with more positive adaptation to stressors can be cultivated and practiced” (APA, What Contributes to Resilience, Para. 1, N.d.). Accordingly, governments can facilitate public learning on resilience by investing in diverse programs of preparedness for various natural and man-made hazards. Israeli authorities acknowledge the significance of public resilience vis-à-vis national vulnerability to terrorism and understand that the most sophisticated emergency plans cannot ensure successful management of a crisis if the public is uneducated about possible types of emergency situations and lacks a baseline understanding of proper code of conduct.

A system of systems includes a set of elements performing a unique function together that cannot be performed alone (Rechtin & Maier, 2002). Israel presents a case where public preparedness is a system of systems that is embedded within the broader homeland security and emergency management system (Figure 2). Israeli authorities appreciate the significance of public resilience in relation to national homeland security and leverage it particularly in the context of terrorism. In Israel, the public is treated as an indispensable player in national preparedness efforts. As such, public preparedness and resilience is a critical component of the broader emergency management system. The following sections will approach the issue from a systems thinking perspective and review the

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2 See the document for more information and complete data analysis on Israeli public preparedness system.
peculiarities of the public preparedness system in Israel with help of the Conceptagon.

Public Resilience in Israel through the Conceptagon

Interior, Exterior, Boundary. Boundary definition is perhaps the most critical aspect of systems thinking analysis (Edson 2008). It impacts those issues, actors, and components that fall within the system as well as the problem behavior(s) that needs to be corrected for the wellbeing of the system. The interior includes those elements or factors that are controlled or can be changed by the system. Similarly, the system’s exterior includes those issues or factors that the system cannot control. This, however, does not indicate that a system’s exterior is irrelevant to the system. In fact, the exterior of the system has significant influence on the system. The system, in turn, can influence many things outside its boundary which it cannot directly control. Therefore understanding the exterior is critical in defining the solution space.

In the case of the Israeli preparedness system, the interior includes a wide range of actors to include government agencies, private sector and nongovernmental organizations (Figure 3). The key player in the system is the Home Front Command (HFC) of the Israeli Defense Forces (IDF). HFC is assisted by other agencies such as Ministry of Health (MoH), Ministry of Education (MoE) and the Israeli National Police (INP). The unitary state structure in Israel leads to a centralized organization of the entities involved in the preparedness system. Examples of the issues that the system can change include dissemination of preparedness information and public domain security measures.

![Figure 3. Exterior of the Israeli Preparedness System: Actors and Issues.](image-url)

There are many actors and factors that influence the nature and quality of the system functioning and transformation that cannot be directly controlled or changed by the preparedness system itself. Therefore, such elements lie beyond the system boundary and are depicted in Figure 3. The most noted of exterior issues are the high threat level, presence of conflict, compulsory military service and public trust in government. The preparedness system cannot change the level of terrorist threat or the fact that Israel is involved with some of the surrounding countries in direct hostilities. Both the public and the government agree on the extent of
public responsibility for knowing the threats and being prepared for personal safety. Israeli law that requires compulsory military service from every healthy Jewish adult (with some minor exceptions) also contributes to the public familiarity with emergency management procedures and, hence, the willingness to participate in related activities. Furthermore, public trust in government and perception of government’s ability to handle any emergency is very high in Israel, which is likely to increase public cooperation with authorities on preparedness-related issues.

The system is bounded by legislation, availability of resources, and the budget for preparedness and first responder capabilities.

**Inputs, Outputs, Transformation.** This triplet addresses the high level description of the system behavior and purpose. If inputs are defined as those elements that enter the system and are essential to produce the system output, then the most important input to the Israeli preparedness system is the Israeli public itself. The HFC website states that the goal of the Israeli HFC is to ensure the resilience of the Israeli people during armed conflict, disasters and emergencies. Israel treats its citizens as the “true first responders” and provides education, training and information to equip them with the necessary skill set to act as such. As a result, ordinary members of the Israeli public are a key participant in preparedness and readiness activities. These programs target not only individuals, families, communities and special needs populations, but also children. Indeed, Israel follows a generational approach to building a resilient public. Children begin learning about and practicing preparedness in various environments to include kindergartens and schools to ensure effective internalization of the significance of emergency preparedness. Israeli authorities (mostly HFC Soldiers) visit schools to lecture students about various threats and how to cope and respond to those threats.

![Figure 4. Transformation in the Israeli Preparedness System](image)

The preparedness system, then, takes ordinary members of the public in and, through extensive and comprehensive programs of preparedness, produces a resilient public as the final output (Figure 4).
Wholes, Parts, Relationships. This triplet addresses the high-level conceptual description of the overall system. Review of the system components and their relationships give a holistic view of the nature and functioning of the overall system.

There are different ways of looking at the public preparedness system to get an understanding of its parts and relationships. One way of doing so is breaking preparedness strategy into smaller activities that are designed to improve different areas of preparedness. When combined, these different fields of activities (which can be assessed as complex systems themselves) and the confluence of their impact constitute the broader strategy of public preparedness. Different preparedness programs are required not only to be part of a broader and nationally designed scheme of preparedness, but also serve in substance to complement each other, fostering different qualities that make up a resilient public.

Israeli government pursues a fourfold strategy to foster public preparedness and resilience (Figure 5). Four fields of activity build on each other as pieces of a coherent national system of preparedness. These components are: general public education and awareness, suspicious activity reporting (SAR) programs, participation in readiness trainings and drills, and direct government communications with the public or risk communications (Figure 6).

General education can only ensure public awareness of some possible emergency situations and prepare citizens in theory to face extreme situations of danger. Hands on training and drills can build on an abstract knowledge basis to allow the public to participate in a realistic rehearsal of an emergency situation. SAR programs are concerned with terrorism related emergencies and promote an effective partnership between members of the public and law enforcement community. Risk communications are important for developing a working relationship between emergency management authorities and credibility of the government in the eyes of the public. Together these four fields of emergency preparedness ensure that the public has a complete understanding not only of the emergency, its implications and consequences, but also of the response skills and practical ways of coping with different emergencies.

Command, Control, Communication. This triplet assesses the governance architecture of the system. Given its unitary state structure, the Israeli preparedness
The Israeli preparedness system is characterized by a functional architecture that relies on a clear and well-planned division of labor between different participating organizations. As such, the Israeli public is exposed to a coherent and nationally consistent preparedness message that is informed by a broader overarching national preparedness program that is predominantly designed and controlled by a single agency.

**Structure, Function, Process.** This triplet is concerned with the functional architecture of the system. While structure refers to the system components and their relationships, process is defined as the sequence of activities to produce the system-wide outcome; process relates structure to function. The Israeli preparedness system is characterized by a functional architecture that relies on a clear and well-planned division of labor between different participating organizations.

As the leading agency, HFC is responsible for three main preparedness activities: public education and awareness; national drills; and communications with public. To discharge its education and awareness responsibilities, HFC runs a public website, issues booklets, pamphlets and brochures, provides real-time instructions and explains current
developments and national training events. HFC also runs annual national drills known as “Turning Point” series. HFC closely coordinates with MoE to ensure that the schools also facilitate each student’s practical ability to cope with an actual emergency situation through drills. As part of its practical preparation program, HFC also instructs the public on how to prepare a safe space in their homes (HFC Website, N.d.) and distributes protective kits that include gas masks and atropine injections to the entire population (Larsen and Pravecek 2006).

Additionally, HFC is the main agency that conducts risk communications prior to, during, and after a crisis with the public. Israeli law allows HFC and IDF to control all the public and private broadcasting mediums during an actual emergency. Additionally, IDF and HFC can utilize their own radio stations to relay their risk messages to the public before and during an incident.

INP is the key for SAR programs. INP, in close partnership with HFC, runs a national awareness campaign to educate and instruct the public about what to look out for and how to report any noted suspicious person, activity or vehicle. To that effect, INP publishes brochures, posters and bus advertisements that are ubiquitously advertised to the public. The public is provided with a single point of contact and easy reporting procedures.

Variety, Parsimony, Harmony. This triplet is concerned with the system’s ability to balance demands with available resources. While the system needs to have the ability to meet both the known and unforeseen challenges, system resource constraints require that its design is most parsimonious. Although other hazards are also taken into account, the Israeli system’s main focus is understandably on the terrorist threat (Figure 7). Although both the death and injury toll has been on the decrease since 2002, the possibility of a terrorist attack disrupting daily life is often higher than the possibility of a natural disaster striking Israel (Israeli Ministry of Foreign Affairs Website, N.d.). Accordingly, most of the preparedness programs emphasize neutralizing the traumatic impact of terrorist attacks. This also allows a certain level of decrease on the budget compared to what it would have been if the preparedness system was designed to put equal emphasis on all hazards.

On the other hand, the Israeli preparedness system adopts a comprehensive definition of the “public”. It includes ordinary citizens and segments of the public who are involved with critical infrastructure such as hospitals and industrial plants as well as uniformed responders. This interpretation results in an expensive preparedness program since instead of educating and training only those members of the public with official homeland security and emergency management duties, the system is tasked with providing a baseline preparedness skill set to the entire population.

Openness, Hierarchy, Emergence. This triplet addresses the ability of the system to
evolve in response to unanticipated challenges. Openness can be defined as the flexibility of system boundary to incorporate new components, resources and functions. Depending on the new configuration of the components in the system, there may be emergent behavior that the system needs to assimilate or accommodate. Israel has “no openness” to its public preparedness system as far as new components are concerned since its boundary is maximally inclusive of all the public at large. The Israeli system is, however, open to the possibility that the new resources and functions may be brought in to accommodate the requirements of the evolving security environment.

Discussion of Findings

The Conceptagon serves two distinct but related functions. First, it provides a framework for systems thinkers to follow during the inquiry, synthesis and analysis of their system of interest. Second, it provides a means for systems thinkers to approach their systems through the same set of concepts; though subscribing to different domains of interest, they can now more conveniently share their findings and insights, thus contributing to the accumulation of scientific knowledge on systems in a more coherent and systematic way. The latter is to take place as a natural and gradual result of the former with no particular additional effort required of the systems thinkers. Therefore, it is all the more essential that the first function of the Conceptagon is facilitated and well established.

This paper aims to extend the practical understanding and acceptance of the Conceptagon as a useful systems thinking tool. The Conceptagon provides a set of concepts and ideas that ensure all the essential elements of a given system are addressed. We propose the case that the Conceptagon can be taken one step further and argue that it is more than just a conceptual framework. It is an analytic tool that provides additional insights into any system under inquiry. During the application of the Conceptagon, the systems thinker can assess the system in a way that builds on an iterative process of learning. The insights uncovered through consideration of a triplet can and may feed into the application of another triplet in a mutually reinforcing process of inquiry where unexpected feedback and counterintuitive links are uncovered and considered.

In this paper, we argued that Israeli public preparedness is a system of systems that is embedded within the broader Israeli emergency management system. Then with the help of the Conceptagon, we focused on the public preparedness system by reviewing its pieces. We defined the interior of the preparedness system as well as the exterior. The influence of the exterior on the behavior of the inputs and the overall success of system transformation was noted throughout the case study. Similarly, the Conceptagon required us to evaluate not only the four-faceted strategy of preparedness in Israel, but also how these different programs of preparedness serve as distinct pieces of a coherent national strategy. Some of the implications uncovered may not have been so obvious without the concepts, principles and tools of systems thinking. While public awareness and education provides the groundwork for a capable public, drills and training exercises take the preparedness to a more active level. Deeper relationships became clear as we explored the feedback between these two components: Confidence building and active partnership between response personnel and public is critical for successful emergency management. Drills provide one such confidence building measure. Furthermore, such exercises provide a platform for public to test emergency plans for their feasibility.

Systems-oriented assessment of the Israeli public preparedness system reveals that Israeli public resilience is an outcome of an extensive
system of preparedness that is comprised of many components and the complex relationships and feedbacks between them. For a successful homeland security and emergency management enterprise, authorities in the US or anywhere else may consider adapting the same complex systemic approach to the issue of public resilience as Israel.

References


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Biographies

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