Handbook on Networks in Innovation and Crisis Management: Theory and Practice in a Dynamic and Disruptive Environment

Edited by
Roland Ortt
Claudia Bücker
Stefan Klein

Delft, Leiden, Münster 2016
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Volume 1: Network Dynamics and Formation of Coalitions
Volume 2: Social Value Creation in Dynamic Networked Situations
Volume 3: Decision Making and Logistics in Dynamic Networked Situations

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Volume 1: Network Dynamics and Formation of Coalitions

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Introduction to the Handbook

The handbook aims to codify, align and disseminate research results that focus on the phenomena of network formation and evolution, the decision support and decision-making, as well as the modeling and planning aimed at coordination of network actors - organizations or individuals – in crisis management. Whereby we refer to crises as disruptive events of significant magnitude, such as natural disasters, acts of terrorism but also disruptive innovation.

The handbook is divided in three volumes, joining groups of researchers with similar interests.

1. Network dynamics and formation of coalitions.
2. Social value creation in dynamic networked situations.
3. Decision making and logistics in dynamic networked situations.

The first volume, network dynamics and coalition formation, explores how networks of actors (companies, non-governmental institutions, and so on) come into being and evolve over time. This volume is providing basic ideas about the dynamic and networked situation which the contributions in the other two volumes have to deal with. Typical questions could be: How do actors align after a crisis situation, how do networks evolve in the period thereafter? How do actors align and evolve around disruptive technological innovations? The second volume focuses on how these networks can create value or produce societal functions while the network of actors changes. The third volume focuses on analyzing information (e.g. big data) and providing decision support while the network of actors changes. This volume also aims to capture the logistics in chaotic disruptive situations. So, in short: volume 1 looks at how the network itself unfolds, volume 2 focuses on how to produce value, innovations or provide societal functions in such a network, volume 3 focuses on analyzing data to support decision making and logistics in such networks.

The contributors to this handbook are the early stage researchers, additional authors of the chapters, the mentors of the early stage researchers, and the partners that directly or indirectly contributed to the program in general and this handbook in particular.

We acknowledge the funding that was provided as part of the Marie Curie program from the EU. This funding enabled us to build a sustainable network of academic and non-academic partners around PhDs, early stage researchers. In the network these early stage researchers could gather data and feedback, could develop ideas through presentations and discussions, could complete their scientific work and apply or implement it in practice during secondments while at the same time they could explore their future career options.

We acknowledge the invaluable contribution from the academic and non-academic partners: they mentored and accommodated the early stage researchers, allowed them to explore their research issues and facilitated them in their development.
The program has inspired us all. We have gained a lot. But we also lost a good friend, colleague and mentor, in the midst of the program: professor Bernhard Katzy († 12th November, 2015).

**The editorial team**

Roland Ortt  
Claudia Bücker  
Stefan Klein
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Volume 1: Network Dynamics and Formation of Coalitions

Introduction to the Volume

This volume serves as a forum for researchers and partners with an interest in Network Dynamics and Formation of Coalitions. It brings together scholars (and practitioners) from several disciplines and practices that want to understand network dynamics inside and beyond organizational boundaries. To that end they study various contexts, including networks of professionals, organizational networks in industries, and crisis response networks. The latter setting is ideal, given the rapid organizational formation that can be observed in response to a crisis situation (e.g. a tsunami, a bomb attack, etc.): a highly dynamic situation that arises unexpectedly, is threatening, requires fast responses and challenges existing resources. To further our understanding of network dynamics, this volume roots its theoretical perspective on coalition theory, from the Political Science domain as well as insights from other disciplines, such as Technology and Innovation Management and Organization Science.

The editorial team
Roland Ortt
Claudia Bücker
Stefan Klein
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Towards the Typology of Career Paths for Technology and Innovation Management Professionals within Crisis Management Realm

Negin Samaee, Ozgur Dedehayir, Bernhard Katzy, and Robert Verburg

In this chapter we discuss the typology of career paths for technology and innovation management (TIM) professionals, and its importance in crisis management realm. Research on crisis management illustrates that preparation and response to crises require the involvement of different individuals, public and private related institutions. In order to achieve solutions for crisis situations, this collaboration and communication occur through the vital role of the utilization of variable technologies. The applied technologies vary from low to advanced technologies, such as information and communication technologies (ICT), information systems, simulation, social media, and etc. Therefore, requiring advanced technologies turns the crisis management arena to the high-tech industry (Leidner et al., 2009). Hence, it requires to hire professionals who can manage technologies and innovations, and can make a decision to efficiently use them.

Managing technological crisis management systems requires knowledge of technology and innovation management (TIM). TIM has garnered burgeoning interest and taken center stage with respect to the strategy making of organizations in technology intensive industries (Roberts, 2001; Cetindamar & Pala, 2011; Medcof, 2007). The consequence of these developments has been the introduction of new positions in industry that specify roles pertaining to technology and innovation management. Over the last few decades, scholars have dedicated an increasing amount of their research efforts to the Technology and Innovation Management education and its programs (Kocoaglu, 1994; Badawy, 1998), but less attention has been paid on the connection between the educational programs and their output, namely, the careers that graduates pursue beyond graduation. And yet, the career paths of TIM professionals can reflect the efficacy of graduate programs, while concurrently leading to better understanding of the possible avenues TIM experts are able to follow, to the benefit of both graduates and prospective employers (i.e. industry, government, and academia) who aim to fulfil positional requirements.

The objective of this chapter is consequently to address this research gap by exploring the career paths, in other words the generic types of occupational movements (e.g. Joseph et.al, 2012), of TIM professionals after graduation. In this preliminary work, we study the career trajectories of
the CTO (Chief Technology Officer), a TIM professional and senior executive in top management (Adler & Ferdows, 1990), who is responsible for the coordination of technological efforts between different business units and corporate research, and for assessing long–term strategies for technologies and R&D units (Cetindamar & Pala, 2011).

This chapter is based on the following publication:


The specific goals of this chapter are threefold: (1) to study the career paths of CTOs; (2) to explore the relationship between career paths and the educational background of CTOs; and (3) to explore the relationship between career paths and the length of time required to become a CTO (after graduating from university). By tracing the occupational sequence of CTOs, we purport to derive generic career paths that are available to this particular TIM professional. In this regard, we follow the lead of prior scholars such as Tremblay et al. (2002) and Ranson (2003), who have identified career paths of engineers, and Joseph et al. (2012) who have examined career paths in the Information Technology (IT) sector. Hence, this study aims to contribute to the literature by identifying new career path types in the TIM field within the crisis management realm, while concurrently exploring connections with the educational background of the studied sample.

Theory, related work

Career and career path

A career can be generally defined as “the evolving sequence of a person’s work experiences over time” (Arthur et al., 1989). While careers have traditionally been seen to be linear progressions along a hierarchical course, current conceptualizations on careers are non-linear and less constrained due to more mobility of employees, organizations, and industries (Holzle, 2010; Crawford et al., 2013). Recent scholars have subsequently perceived careers as having an adaptive characteristic (e.g. Bloch 2005). The notion of a ‘boundaryless career’ and ‘protean career’ (Arthur, 1994; Hall & Mirvis, 1995) have been proposed to capture the adaptation of an individual’s career to the changing environment, for instance, as that brought about by globalization and the ubiquity of information and communication technology (Crawford et al., 2013). At the same time, these non-traditional perceptions of careers have redirected the focal center of careers away from the encompassing organization or occupation to the individual. The sequence of movements between occupational positions that define an individual’s career fittingly conjure a path along which the individual navigates professionally over time (Adamson et al., 1998; Inkson, 2004; Cappellen &
While career related movements can take many shapes and sizes, the literature informs us that these modes of movement can be classified as belonging to particular generic groups, or ‘career paths’. In this chapter, we follow Joseph et al.’s (2012, p. 429) definition of career paths as “models or prototypes characterizing the career sequences of a group of individuals”. Therefore, an individual’s sequence of occupational movements become the observable manifestation of a particular career path. The review of the management and business literature (encompassing the TIM literature) identified several scholarly works addressing career paths in different occupational settings. We summarize our findings in Table 1.

Table 1: Career paths in the management and business literature.

<table>
<thead>
<tr>
<th>Publication</th>
<th>Occupational Context</th>
<th>Empirical Method</th>
<th>Proposed Career Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holzle (2010)</td>
<td>project managers</td>
<td>interview</td>
<td>- project manager career path</td>
</tr>
<tr>
<td>Cappellen and Janssens (2005)</td>
<td>global managers</td>
<td>literature review</td>
<td>- global career path</td>
</tr>
<tr>
<td>Andresen and Biemann (2013)</td>
<td>expatriates</td>
<td>survey</td>
<td>- international organizational career</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- international boundaryless career</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- transnational career</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- early career</td>
</tr>
<tr>
<td>Ranson (2003)</td>
<td>engineers</td>
<td>interview</td>
<td>- organizational career path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- occupational career path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- entrepreneurial career path (adapted from Brown (1982))</td>
</tr>
<tr>
<td>Tremblay et al. (2002)</td>
<td>engineers</td>
<td>questionnaire survey</td>
<td>- technical path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- management path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- project-based path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- entrepreneurial path</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- hybrid path</td>
</tr>
<tr>
<td>Joseph et al. (2012)</td>
<td>IT professionals</td>
<td>longitudinal study</td>
<td>- IT career</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(work histories)</td>
<td>- PLM (professional labor market) career</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- SLM (secondary labor market) career</td>
</tr>
</tbody>
</table>

Firstly, Holzle (2010) explores the career path of project managers within 20 different organizations, focusing on the factors that stimulate career progression. The paper takes a more or less traditional viewpoint of the project manager career path, depicting it as a series of stepwise, hierarchical transitions (e.g. the sequence of being project manager, senior project manager, and project director) within a single organization. Holzle (2010) suggests that the required skills of the project manager varies with the career path level, whereby the requirement for soft skills such as leadership increases, while the requirement for hard skills like expertise decreases with progression along the career path.
Addressing the international employment context, Cappellen and Janssens (2005) highlight the notion of the boundaryless career and illustrate the ‘global career path’ as an emergent phenomenon at the intersection of individual (i.e. interests, skills, and life experiences), organizational (i.e. employment setting and its requirements), and global environment (i.e. economic, technological, and cultural factors). Andresen and Biemann (2013) in turn develop a taxonomy of four international career patterns of expatriates from a survey of German-speaking managers. They propose that the ‘international organizational career’ is characterized by loyalty to a single employer with low spatial mobility (i.e. limited number of different geographical locations during the employment period), while the ‘international boundaryless career’ emphasizes employment in multiple organizations and industries. The third pattern of the ‘transnational career’, by contrast, is marked by multiple geographical locations within the same organization, while the final, ‘early career’ pattern, refers to the managers which work for a number of years as an expatriate followed by repatriation to their home country.

Our review also identified two studies focusing on engineering careers in Canada. Ranson (2003) firstly employs the three generic career paths proposed by Brown (1982): (i) the ‘organizational’ career path pertains to a progressive work history that materializes within one organization; (ii) the ‘occupational’ career path denotes professional advancement attained through movement between organizations; and (iii) the ‘entrepreneurial’ career path refers to self-employment. Ranson analyzes the career paths of 317 engineers who have graduated from a Faculty of Engineering at a Canadian university over a 10 year period extending from 1980 until 1990. A majority of career paths from the study align with Brown’s framework but also a number of additional groups are identified. These include late starters (i.e. individuals who have started a permanent position recently, often due to turbulent economic conditions), individuals who exited an engineering career in preference for another, and individuals that are not in paid employment.

In the second study, Tremblay et al. (2002) propose three career paths in addition to the traditional technical and managerial career paths available to engineers. Results obtained from a survey of 900 engineers reveal the ‘project-based path’, which attracts many engineers who are able to practice and refine their technical competence in a setting that does not provide formal guidelines. Engineers may also follow an ‘entrepreneurial career path’ and move beyond the boundaries of their organization by starting their own business. By contrast, in the ‘hybrid path’ engineers may opt to combine some of the aforementioned paths (e.g. technical and management), thereby avoiding lock-in to a single path.

Finally, Joseph et al. (2012) address the career paths of individuals in the Information and Communication Technology (ICT) sector. A longitudinal study of the work histories of 500 individuals in ICT related occupations, during a period stretching from 1979 until 2006, reveals
three broad career paths. The ‘ICT career’ encompasses individuals who enter the ICT field directly or soon after graduation and who remain in this field for the remainder of their working lives. Individuals following an ICT career path tend to select either a technical ICT career or a managerial ICT career. Secondly, the ‘PLM (professional labor market) career’ is marked by an early entry into the ICT field, followed by a transition into a non-IT occupation. The PLM career can similarly be subdivided into the technical PLM career or the managerial PLM career. And thirdly, the ‘SLM (secondary labor market) career’ comprises individuals who enter the IT profession later in their work histories, converging into this arena from a wide range of prior occupations. The study results propose four subgroups of IT professionals following the SLM career path, namely, technical administration and support; clerical; craft, production, and service; and non-dominant occupation.

Our review shows that career paths in only a few occupational contexts related to management and business have been examined by scholars hitherto. In light of the objective of this chapter, the contribution of Joseph et al. (2012) on ICT professionals comes closest to the realm of TIM, and we believe that our exploration of career paths available to CTOs will complement this work as well as the management and business disciplines in general.

**Method**

This empirical study focuses on the career trajectories of CTOs (Chief Technology Officers), senior executive officers who have a responsibility for managing technology and innovation in organizations and aligning the firm’s strategy with technological plans (Adamson et al., 1998). To study the careers of CTOs, we analyzed the sequence of their career movements on a popular online social media platform for professionals (LinkedIn). We limited our search in the LinkedIn database to current CTOs in the area of Eindhoven, The Netherlands. Our selection of this geographical setting was based on the Eindhoven region being a high technology area dominated by the presence of the multinational electronics firm Philips. Moreover, the region hosts the Technical University of Eindhoven, and attracts technology-based start-ups and SMEs. Together, we deemed these characteristics to render the Eindhoven region highly fertile for our exploration of CTO career paths.

Our search on LinkedIn yielded a total of 105 CTOs employed in the Eindhoven region. We collected all data concerning the occupational positions held by these individuals since the time of graduation (from university) as well as the commencement and end dates of these positions. Additionally, we gathered data on the educational background of these CTOs, recording the degree title, institution, and the date of graduation. In order to arrive at a reliable dataset, we removed data points (i.e. CTOs and data connected with their occupations and educational
background) that were: (i) ambiguous in their nature (e.g. uncertainty as to occupational title); (ii) not occupational in their nature (e.g. board member or stakeholder); and (iii) pertained to CTOs who listed only a single position or an incomplete series in their career histories. The final dataset used in our empirical exploration included $N = 84$ CTOs.

Next, we coded the wide spectrum of occupational titles stipulated by the CTOs across their employment histories, arriving at the occupational categories of ‘technical’, ‘manager’, ‘academic’, ‘entrepreneur’, ‘consultant’, and ‘other’ (occupations deemed not to contribute to career related expertise). To secure inter-rater reliability, we triangulated the coded data and discussed discrepancies to arrive at a general consensus among the authors. Following the lead of Joseph et al. (2012), we then analyzed the coded work histories of CTOs by sequentially listing their career movements over time. We additionally calculated the duration of employment in a given occupational position along the career trajectory of each CTO as the difference between the start and end dates provided. We noted that CTOs at times listed multiple occupational categories that were held concurrently, or that sequential occupational positions overlapped in time. In these cases we opted to count and list the duration (i.e. in number of years) of each concurrently held occupational category, even if this meant that overlaps were not removed. Based on the durations that professionals spent on these occupational codes, we derived three overarching types of career path for CTOs, namely, single, dual, and hybrid.

**Results**

We present the results of our explorative study in three sections. In the first part we present the results of descriptive statistics, and in the following section highlight the different types of occupational movements pursued by CTOs. The third section then presents the relationship between the CTO career paths and educational background of these professionals, and, in turn, the relationship between career paths and the duration between graduation and acquisition of a CTO position.

**Demographic, occupational and educational profile of sample**

Following the presented information in LinkedIn from the studied sample, the summary of important descriptive statistics is reported here:

- **Gender:** The majority of the sample were male (98%).
- **Education:** The majority of CTOs in this sample had a Master of Science background (35%), or a Bachelor of Science and engineering degree from different fields of studies (34%). Some CTOs in our sample held a Ph.D. (18%), or MBA and MBI degrees from business schools (13%).

• Number of Positions: The number of positions that has been taken to become a CTO ranges from 1 to 17, with an average of 5.9 (standard deviation 4). Approximately 54% of sample required less than 5.9 positions to become a CTO.

Given the wide diversity of employment positions listed by CTOs in our sample, we defined six occupational codes - ‘Technical’, ‘Manager’, ‘Academic’, ‘Entrepreneur’, ‘Consultant’, and ‘other’- to categorize these positions and help us trace the career trajectories of the professionals. These codes are elaborated in Table 2.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>occupation deemed to require a greater portion of expertise in designing, engineering, and developing</td>
<td>engineer, software developer</td>
</tr>
<tr>
<td>Manager</td>
<td>occupation deemed to require a greater portion of expertise in managing projects, strategy, and resources (e.g. human and financial)</td>
<td>project manager, managing director</td>
</tr>
<tr>
<td>Academic</td>
<td>occupation deemed to require a greater portion of expertise in scholarly or scientific endeavor</td>
<td>professor, researcher</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>occupation deemed to require a greater portion of expertise in starting or owning a new venture</td>
<td>company owner, company founder</td>
</tr>
<tr>
<td>Consultant</td>
<td>occupation deemed to require a greater portion of expertise in providing consultation services</td>
<td>consultant, senior consultant</td>
</tr>
<tr>
<td>Other</td>
<td>occupation deemed not to contribute to career related expertise</td>
<td>military, teacher</td>
</tr>
</tbody>
</table>

By tracing the sequence of occupational codes for the CTOs since graduation, we revealed three generic career path categories: ‘single’, ‘dual’, and ‘hybrid’. We classified a CTO as pursuing a single career path when he or she was employed in only one occupational category from the time of graduation until the acquisition of a CTO position. For the dual career path, the professionals were employed in two occupational categories, though spending more years on one of those two categories. And in the hybrid career path, three or more types of occupations have been pursued, although one occupational type generally emerged as a dominant one. A total of 14 CTOs out of 84 (i.e., 16.5%) pursued the single career path. Fig. 1 presents the distribution of these single career paths with respect to the sub-categories of technical, managerial, academic, entrepreneurial, and consultant. A majority of CTOs in the figure pursue the single career path that is purely managerial, followed by the purely technical career path.
Fig. 2 shows the frequency of dual career paths, followed by 24 CTOs out of our sample of 84 (i.e. 28.5%). A majority of the CTOs pursuing a dual career path display a profile with managerial occupations as primary and technical occupations as secondary (6 out of 24).

Fig. 3 elaborates on the findings presented in Fig. 2 by listing the frequencies of the primary occupations (i.e. dominant occupations) in the CTOs’ dual career paths. It appears that technical positions (11 out of 24) followed by managerial positions (10 out of 24) are primary for CTOs following dual careers. Surprisingly, only a few individuals have primarily pursued an entrepreneurial, consultancy, or academic occupation on the way to becoming a CTO.

Fig. 3 elaborates on the findings presented in Fig. 2 by listing the frequencies of the primary occupations (i.e. dominant occupations) in the CTOs’ dual career paths. It appears that technical positions (11 out of 24) followed by managerial positions (10 out of 24) are primary for CTOs following dual careers. Surprisingly, only a few individuals have primarily pursued an entrepreneurial, consultancy, or academic occupation on the way to becoming a CTO.
While Fig. 3 presents the frequency of primary occupations in dual career paths, Fig. 4 highlights the secondary occupations followed by CTOs. The figure shows that the technical occupation is most common as secondary position in dual career paths (34%), followed by entrepreneurial occupations (26%).

![Fig. 4. Frequency of secondary occupations in dual career paths.](image)

While a reasonable portion of CTOs in our sample followed a single or dual career path, more than half of the sample (i.e. 46 out of 84) pursued a hybrid career path. Fig. 5 presents the distribution of hybrid career paths with respect to primary occupational category. From the figure we see that the majority of CTOs in our sample prefer pursuing several occupational roles over the course of their career prior to becoming a CTO. Most individuals who follow the hybrid career path have a technical occupational core (13 out of 46). These are followed closely by individuals pursuing a hybrid (entrepreneurial) career path (10 out of 46), hybrid (managerial) career path (9 out of 46), and hybrid (academic) career path (8 out of 46).

![Fig. 5. Frequency of hybrid career paths and primary occupations.](image)

In summary, the hybrid career path (55%) is followed by the majority of CTOs in the studied sample, with the technical, entrepreneurial, and managerial occupations being the dominant focus of these hybrid career paths. About 28.5% of the studied sample follow a dual career path,
with the majority of these individuals pursuing the manager (technical) dual career path. Only 16.5% of the sample pursue a single career path. Table 3 presents a brief summary on the frequency of primary career paths in the three categories.

Table 3- Percentage of CTOs following different career paths.

<table>
<thead>
<tr>
<th>Generic Career Path</th>
<th>Single</th>
<th>Dual</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>3.5</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>1</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Manager</td>
<td>11</td>
<td>11.5</td>
<td>11</td>
</tr>
<tr>
<td>Academic</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Consultant</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>sum</strong></td>
<td><strong>16.5</strong></td>
<td><strong>28.5</strong></td>
<td><strong>55</strong></td>
</tr>
</tbody>
</table>

The next section addresses the educational profile of the studied sample of CTOs, followed by a discussion on the duration between graduation and acquiring a CTO position.

**CTO Education**

68 out of the 84 CTOs in our sample listed sufficient information about their academic background. The educational background of this sample (i.e. the highest educational degree earned by each CTO) ranged from a Bachelor of Science (B.S), Bachelor of Arts (B.A), HBO (certificate of the programs of professional higher education in the Netherlands), and Ing (equivalent to the B.S. and obtained by graduates from polytechnics in the Netherlands) degree, to the Ph.D. Fig. 7 presents the ratio of these graduation degrees among the CTOs.

As shown in the above chart, the largest group in the sample (35%) attained a Master of Science degree, closely followed by CTOs who graduated with Bachelor of Science and Engineering degrees (34%). It is also apparent that a substantial ratio of CTOs possessed a doctoral degree.
(18%) or a specialized degree in the business field (13%), such as an MBA, EMBA, or MBI (Master of Business Innovation).

Table 4 presents the educational level of CTOs in each of the generic career paths available to them.

<table>
<thead>
<tr>
<th>Generic Career Path</th>
<th>Single</th>
<th>Dual</th>
<th>Hybrid</th>
<th>sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph.D., PDEng</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>M.Sc., ir</td>
<td>3</td>
<td>6</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>MBA, EMBA, MBI</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>B.Sc., B.A., HBO, ing</td>
<td>3</td>
<td>9</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>

We observe that individuals following a single career path have an even distribution with respect to their educational background. Interestingly, CTOs who have a Master or Bachelor of Science and engineering degree tend to follow a hybrid career path. This result might be moderated by the higher level of technical training acquired through these programs (thus encouraging the graduates to first seek employment in a technical field and later in managerial occupations).

**From Graduation to CTO**

After graduating from their respective education programs, the CTOs in our study required varying durations of time to acquire their executive position. In Table 5 we present the average number of years (and standard deviation) required to become a CTO, with respect to the generic career path types. For this exercise we considered a reduced sample size of 68 CTOs (from the 84 in our complete dataset), precluding some due to the incomplete Educational and Academic backgrounds they provided on their respective LinkedIn pages.

<table>
<thead>
<tr>
<th>Generic Career Path</th>
<th>Single</th>
<th>Dual</th>
<th>Hybrid</th>
<th>sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>13.53</td>
<td>14.61</td>
<td>15.36</td>
<td>13.88</td>
</tr>
<tr>
<td>SD</td>
<td>(9.96)</td>
<td>(10.08)</td>
<td>(9.87)</td>
<td>(9.87)</td>
</tr>
</tbody>
</table>

Among the CTOs we included in this study, we observed a large variance for the duration between graduating from university and gaining a CTO position, which ranged from 0 to 36 years. The average number of years across all CTOs in our dataset was 13.88, with a mode of 13 years, and standard deviation of 9.87. We were surprised to find that some CTOs gained their position between 1 to 10 years before graduation, and in our study we considered this as a duration of 0 years in order to have no adverse effect on data analysis. The above table shows that the average...
duration between graduation and attaining a CTO position increases as career paths become hybridized.

Overall we found that approximately 56% of the studied population had acquired the CTO position quicker than the population mode (i.e. 13 years), while the remaining 44% had been slower than the mode. In Fig 8, we explore the relationship between the quickness to become a CTO and educational background by comparing the two groups (i.e. the quicker and slower CTOs).

![Fig. 7. Frequency of academic degrees with respect to the population mode of duration required to become a CTO.](image)

In general we see that individuals who have a Bachelor or Masters degree (for both the science and business disciplines) are slightly more likely to become CTO quicker than the population mode. By contrast, individuals holding a Ph.D. degree are more likely to take longer than the mode in attaining a CTO position. To elaborate this further, Table 6 presents the average durations of time required for CTOs holding different degrees.

<table>
<thead>
<tr>
<th>Educational Degree</th>
<th>Ph.D.</th>
<th>B.Sc., B.A., HBO, ing</th>
<th>M.Sc., ir</th>
<th>MBA, EMBA</th>
<th>M.S., MBI, PDEng</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Mean</td>
<td>17.45</td>
<td>12.37</td>
<td>5.4</td>
<td>16.7</td>
<td>13.88</td>
</tr>
<tr>
<td>Sample Standard Deviation</td>
<td>(9.85)</td>
<td>(10.04)</td>
<td>(9.96)</td>
<td>(9.94)</td>
<td>(9.87)</td>
</tr>
</tbody>
</table>

The above table clearly indicates that those in possession of a Masters degree in business acquire the CTO position much more rapidly than other degree holders. Interestingly, those with the highest and the lowest levels of education take longer to become CTOs, on average. Finally, we explored the influence of educational background together with career paths on the length of time required to attain the CTO position. We present the results in Table 7.
The table indicates that individuals with a Masters degree in the business field reach the CTO position quicker when following the hybrid career path. Furthermore, it is apparent that following a single career path after having acquired any of the degrees, except for the Bachelor level degree, results in the slowest path to the CTO position.

**Discussion**

The typology of career paths has received recognition in scientific studies from different workforces such as Information Technology, Project Management and so on (Joseph et al., 2012; Holzle, 2010), but less attention has been paid to the career path of TIM professionals in management literature. To cover this gap, we have conducted this explorative study to (1) investigate main types of TIM career path; (2) explore the types with the highest attainment; (3) to assess the status of educational background associated with the duration between graduation and the achievement of CTO position. Therefore, we collected the work histories of CTOs from LinkedIn who are employed in the region of Eindhoven in the Netherlands where the headquarters of the electronics giant Philips and Eindhoven Technical University are located.

This study investigates three main types of career path within five occupational codes: single, dual and hybrid, and the occupational codes: Technical, Managerial, Entrepreneur, Consultancy, and Academic. The lowest proportions of individuals pursue single career path category (16 %) and, single-managerial sub career path is followed by the majority of individuals in this category (Fig. 1). About 28 % of the target sample pursue dual career path. The managerial (technical) sub-career path is followed by the majority of individuals, in which the managerial code is a predominant one (Fig.2). By analyzing the dominant career paths of the “dual” category, it became apparent that firstly the technical and then the managerial path are pursued by the majority of individuals (Fig.3 & Fig.4). In comparison, more than half of the studied sample (55%) have pursued the hybrid career path category. The majority of individuals follow the technical path as a dominant
occupation. Then entrepreneur and managerial paths are pursued as dominant occupations in hybrid career path. Interestingly, we investigated that (consultant) and (other) tracks are followed by the fewer proportions of individuals (Fig.6).

As a result, the findings proved that TIM professionals are not bounded in one organization or occupation. They choose a series of career paths to pursue CTO position. Noticeably, technical and managerial paths are followed by the majority proportions of TIM professionals as dominant occupations in the histories of their work.

We studied the role of educational background on the speed of gaining CTO position. Fig. 7 shows that the majority of individuals have attained Master of sciences (35%) and Bachelor’s degrees (34%). We studied the frequency of educational background in each category and discovered that individuals in single career paths are likely to have attained Master degrees and higher (76.92%). Among them is a large group of individuals who have attained a Master of Science and MBA degree (46.14%).

Individuals in dual career paths have an equal tendency to have attained Bachelor’s degree and Master’s degree (42.85%) but the main proportion of them gained a bachelor degree in comparison with the sum of MBA and Master degree. In the hybrid career path category, the majority of individuals have attained Master degrees (52.94%), but with more individuals who have attained to the Master of sciences rather than MBA (44.11%). In the following, more individuals have attained to Bachelor’s degree (35.92%) in the hybrid category.

In order to assess whether the educational background has an effect on gaining a CTO position in a short period or over time, we calculated the duration from graduation to the CTO position for the target sample and the Mean score of each educational group in different career path categories. We investigated that individuals, who have attained Master of sciences and MBA degrees, have spent less time than the remainder of the target sample and pursue CTO position quicker than the group with Bachelor’s and Ph.D. degrees. The average years to the CTO position is 13.88 years, SD 9.87. Individuals, who have attained Ph.D. degrees, have spent more years than the average (Mean 17.45; SD 9.85).

In order to explore through which career path category individuals gain the CTO position in a short time, we calculated the Mean score of all three categories and investigated that individuals who pursued the single career path category (Mean 13.53; SD 9.96), achieved a CTO position in less than the average time since the graduation. Furthermore, individuals who followed the dual (Mean 14.61; SD 10.08) and hybrid career path categories (Mean 15.36; SD 9.87) achieved a CTO position later than the ones in the single category and needed longer than the average number of
years (Mean 13.88 years, SD 9.87). We anticipated that individuals who had pursued hybrid or dual categories paths would spent more time to achieve the CTO position. In the following section we address the limitations and implication for future studies.

**Limitations**

This study has a number of limitations that are required to be considered while collecting data from LinkedIn and assessing the results. Although data collection and utilization from LinkedIn are quite novel and allowed us to explore TIM career path types, the lack of complete information and profiles constrained us to the existing data and made us remove some cases from the analysis.

The review of the career path literature highlights the shift of careers from traditional to more flexible and dynamic ones (Kocaoglu, 1994). Following the study of literature on the several types of career paths of other fields, our findings support that TIM careers are not employer-dependent and also are flexible in employment context with respect to the required educational degrees or background (Badawy, 1998). We were constrained by the limitation in the profiles of our target sample, and there was no opportunity to assess the career success of the target sample.

**Conclusions**

In this chapter we discuss the types of career path of technology and innovation management professionals who play an important role in managing technologies within the crisis and disaster management realm.

The boundaryless career literature highlights the shift of careers from traditional to more flexible and dynamic careers (Brauch, 2006). Our findings support that TIM careers are boundaryless, they are not employer-dependent and are flexible in their employment context, e.g. with respect to the required educational degrees, background and career opportunities (DeFillippi & Arthur, 1996).

The theoretical contribution of this study is the replication of prior scholarly work centering on career paths, specifically in the field of technology and innovation management. Furthermore, through studying the educational background as one of the main human capital traits, our findings try to provide some implications for TIM program directors to be considered when designing university programs. This paper identifies three TIM career path types within five subgroups, which are pursued by the majority of the studied sample.

We have identified four conclusions:
Firstly, our study has some practical implications for TIM program directors in universities and human resource managers. The results of this study show that TIM professionals vary in their backgrounds with different educational and academic degrees, and follow several career paths. Also the high percentage in the proportions of hybrid and dual career paths reveals that there is no boundary for the TIM workforce to work in one organization. This point is important for human resource managers in order to consider these varieties and the broad scope in designing and managing their careers.

Secondly, it is a salient point that the majority of individuals pursued a technically oriented career. Also, the findings show that individuals with Master’s degree have gained the CTO position in a shorter time in comparison with the Mode of the target sample. They also represented the the majority of the individuals. It is important for TIM program directors to notice that the main proportion of individuals pursued a technical track within their occupational career. Therefore, designing the TIM discipline in engineering curricula based on the industries requirement and technological trends should not be neglected.

Thirdly, the results highlight in which of the identified career path category individuals achieve a CTO position in a shorter time than in the others, but, we were constrained by the sample size and could not analyze the correlation between career path types and achieving a CTO position in a shorter or longer time. Therefore, for future research, we propose to compile a large data set and analyze this correlation and compare different regions and countries.

Finally, the functions and responsibilities of CTOs are varied between different organizations and the lack of information about their activities, limited us to study a heterogeneous group of individuals. Therefore, studying a homogenous target group in terms of the size of company, varieties in CTOs’ responsibilities, etc., might result in new findings in future studies.

References


A State of the Art Review: Digital Volunteerism and Crisis Response Coalitions in the Social Media Age

John. P. Sabou and Edwin Bakker

Abstract

Digital Volunteerism is a phenomenon borne from the persistent and pervasive use of social media by citizens all over the globe. Civic engagement for socially identifiable goals is an age old tradition, but the invention of digital social media has brought new foresight to the way societies define efficiency. This is especially true where digital volunteers manage the shape, response, and long-term recovery of crises that includes sustainable resilience to future emergencies. The personal use of social media has gone beyond simply connecting and sharing with friends and family, its use has become an organizing tool where identities can be fostered around common interests like crisis response, and where citizens can offer their services directly to crisis managers instead of going through weeks of training and deployment. This chapter views crisis as a state of emergency or event where social connections are observed contributing to cases of humanitarian response. For the purposes of this chapter, crises are identified as regional in physicality, but socially global. The implication of this view is that social relationships can make or break the operations and coordination of a crisis response and as such, international policies and alliances are changing to include more citizen participation over digital mediums in light of the rising trend of self-organizing citizens and their crisis response constellations. Constellations in the case refer to clusters of citizens that emerge during extreme events, yet having no formal structure or leadership. The reality of having a constellation of citizens however, whether as volunteers, or other supporting elements included into a formal policy is fraught with difficulties and entrenched assumptions. Faster and effective crisis management paradigms (which encompass crisis response activities) require the capitalization on the skilled and present resources of crisis responding agencies combined with an information and awareness generative public. To that end, the impetus for exploring adaptive models that help identify the means to mobilize the most resourceful and adaptive configurations of committed citizens for crisis response has become an ongoing debate in practice and literature. Consequently, the literature on digital volunteerism in crisis response is small and struggles to gain acceptance as a legitimate field of science among the broader academic community. Accordingly it is being said among some scholars that the self-organization of citizens alone is not enough to justify a model for digital civic engagement in crises. This chapter will elaborate the complexity of framing digital volunteerism to official conceptions of coalitions by drawing on two bodies of literature; 1) Digital
civic engagement behavior in crisis, 2) Coalition formation principles and stakeholdership, and 3) the organizational limitations that result from merging these fields.

**Digital Civic Engagement Behavior**

**i. Social Mobilization Theory**

Advances in computer science and knowledge technologies have allowed social media to be populated by a persistent and global web of users. The application of these technologies enables users to aggregate and examine complex information in ways that can be more easily understood and made meaningful for first responders and government actors during crises. What is more interesting is the way citizens form ownership around problems that either directly or indirectly relate to them. The concept of 'digital civic engagement' is the starting point at which a user identifies with common themes over social media forums and decides he or she ‘wants’ to do something but may be constrained by a number of factors attributed to normal life (i.e. finances, job/family commitments, lack of knowledge or professional skill). Nonetheless, that user will gravitate to clusters of other users around crisis related themes and form groups that actively seek to offer their services, which can range in complexity and commitment. The phenomena of civic engagement via social media is exemplified through cases such as:

A. The 2011 Christchurch, New Zealand earthquake, where Canterbury University students self-organized a volunteer workforce of 10,000 people to assist with clearing debris, liquefaction sludge, and information dissemination using a web-based platform to organize volunteers by updating job positions, taking notes in the field, and sharing images on social media.

B. Typhoon Haiyan (Yolanda) which rocked the Philippines in 2013 saw an international response in the form of digital humanitarians using OpenStreetMap, where volunteers from around the globe helped predict map locations in the Philippines where the typhoon would make landfall. The call resulted in various satellite imagery companies such as DigitalGlobe, CNES-Astrium, and Landsat to release typhoon imagery to disaster-stricken locations (OpenStreetMapWiki 2015) which further prompting 1,670 mapping advocates worldwide to take action. The contributed mapping data enabled street-level accurate post-disaster maps on various islands in the Visayas region hit by typhoon Haiyan to OpenStreetMap while simultaneously raw data from OpenStreetMap was extracted, compiled, and produced various products including paper maps and daily-updated GPS-assisted navigation which helped various international humanitarian agencies such as the International Red Cross, American Red Cross, International Organization for Migration, United Nations Office for the Coordination of Humanitarian Affairs, and USAID, to operate on relief and rescue operations accurately (Guardian 2013, ICRC 2013, Opensource 2014, American Red Cross 2014, ICRC 2013).
C. The 2014 search for missing Malaysian Airliner MH-370 enlisted the help of over 3 million digital volunteers worldwide using the web application Tomnod, where it’s owner - DigitalGlobe, a Colorado-based satellite imaging company, uploaded over 24,000 square kilometers (9,300 square miles) of high-resolution imagery which was collected in some of the areas where the plane was originally thought to be (Merelli 2014). The images where scrutinized by users around the globe, which to date is the largest example of citizen volunteers engaging in open access, goal oriented, manual synthesis of image data. These examples of grassroots collaborations are indicative of a rising demand in augmenting traditional government responses to crisis with self-generated citizen volunteers that reach beyond borders.

Aldon Morris and Cedric Herrin maintained that the mobilization potential of a crowd is largely determined by the pre-existing organization of [citizens] and the distinctiveness and density of the interpersonal networks of members (Jenkins 1983). To this end involvement of distinct and dense networks are important to successful mobilization. To this effect, crowds with weak identities and sparse networks will not be as successful as crowds that have access to strong identities and dense networks. Social mobilization theory focuses on instrumental reason and rational collective behaviour to describe the type of organization in a crowd rather than an irrational mob (Zald & Ash, 1966). Instead of panicked disorder, mobilization occurs due to rational, organizational behaviour. This is further expounded by Zald and Ash (1966) arguing for the ‘iron law of oligarchy,’ which maintains that social mobilization movements will become inherently oligarchic and conservative, regardless of how democratically and charismatically they started. This belief in the institutionalization and bureaucratization of social mobilization in an iron law relies on concentration of power, hierarchy, resources, mobilization structures, and ideological framing (Zald & Ash, 1966; Zald & Garner, 2012). Zald and Ash (1966) dispute this proposition by arguing that leadership, recruitment, and commitment of members have a more powerful influence on the trajectory of a movement than does the characteristics that support the iron law of oligarchy.

**ii. Emergence of Grassroots Collaborative Networks**

Gaining a meaningful understanding around the self-organization of citizens requires going to the point at which such phenomena originated, beginning with ‘grassroots collaborative networks’. Grassroots collaborative entities or networks refer to the amalgam of citizens that coalesce around problems they personally find relevant. Accordingly, an understanding of the ‘self-directed’ gravitation to digital civic engagement beyond simple observation, which for the purposes of this chapter we will refer to as ‘digital volunteerism’, requires a broader understanding of the distinction between volunteers and citizens. ‘Volunteers’ - as they are commonly understood in crisis management - can indeed be a constellation of citizens
responding to a situation in which they feel personal interest or sympathy and offer support in specific ways that alleviate the less immediate responsibilities of governments, and crisis response organizations. Citizens are not however volunteers initially, but can form into groups or clusters of individuals who may offer their services in some volunteering capacity. Even so, traditional volunteers are often understood and managed by existing crisis organizations with already prearranged regiments of manpower that have had some form of formal induction as extensions of crisis responding constellations. Large organizations and NGOs, such as the UNOCHA, the Red Cross, and the Dutch Bedrijfshulpverlening [BHV] or “citizen safety liaison” office are examples of corporate like entities that offer training regimens for individuals seeking to be identified as volunteers. The American Red Cross, for example, exercises a manual approach to matching resources gaps with skilled individuals, relying on human volunteers to identify relevant content and match resource requests with offers. This results in high confidence in the judgments, but at a high cost of human labor (Purohit, Hampton et al. 2014). Studies conducted by Reuter et al. (2013), used data-driven and machine learning techniques to determine the extraction and population of an ontology from social media focusing on resource suppliers during crisis. Their prototype system organized the groups, activities, tasks, and comments available in social media and the need to address the problems of storage, query, and representation to render the data useful for human review (Reuter et al. 2013). They successfully were able to identify available resources and match them through specialized portals such as Recovers.org, AIDMatrix.org, and VolunteerMatch.com to provide registration of volunteers and donations. These efforts are compatible with the concern for the limited crisis response knowledge in the informal or ‘digital volunteer’ response community and the need for contact with key players in the formal realm of crisis actors (Varga et al. 2013).

iii. Digital communities as intermediaries of information
Civic engagement through Information Communication Technologies collaboration is perhaps the single most transformative power presented by social media. At a macro level, technologies are playing a significant role in the emergence of “communities of interest that go beyond the confinements or boundaries of the nation state...” (Cammaerts and Van Audenhove 2005). In this way, emergency services actors are joining forces with citizen “infomediaries” to collaborate on achieving common goals in a manner that was not possible in the absence of information technologies. World governments have acknowledged the need to broaden their connectivity to citizens in a desire to create a more open access and participatory global culture. Official multi-government initiatives have been created to realize this goal. For example, the Open Government Partnership (OGP) is an international organization seeking strong commitments from participating government institutions to promote transparency and increase civic participation through information technologies. OGP was launched in 2011 to provide an international platform for domestic reformers committed to making their governments more open,
accountable, and responsive to citizens, and it functions as a multi-stakeholder global platform designed to partner governments and civil society in the struggle for greater transparency and accountability in civic issues like crisis response. In its Articles of Declaration, member governments commit to “creating mechanisms to enable greater collaboration between governments and civil society organizations and businesses” and acknowledge that “new technologies offer opportunities for information sharing, public participation, and collaboration.” The acknowledgment of and commitment to collaboration, including through new ICTs, ensure that the value of collaboration is recognized across the globe. On a micro level, Kuriyan et al. (2011) highlight how technologies can be used to enhance analytical and visualization tools that help users to understand raw information. For example, platforms that have an aggregation function can facilitate dialogue among geographically disparate citizens and enable them to share and compare their experiences. Adding to this is evidence from crowdsourced mapping efforts (Shkabatur 2014). The technology tools used in mapping projects allow multiple parties, including civil society organizations as “infomediaries”, citizens as beneficiaries, and governments as service providers, to work together towards achieving a common goal. A noteworthy approach by Starbird (Starbird and Stamberger 2010; Starbird et al. 2012) focuses on exploiting the collective wisdom of the informal response community in vetting and amplifying verified information, to damp rumors and misleading posts by combining the participation of the crowd with machine processing. The UN Cluster system classifies resources according to the organization responsible for that type. Imran et al. (2013) uses a data-driven approach to the classification of resource types with supervised classification. In this way digital volunteers, and citizens in general are often viewed by governments and their crisis response agencies as affordable resources and there have been a number of instances where that has been the case. But who organizes those resources and how determines a level of ownership from small clusters of citizens themselves.

iv. "Volunteeters": Self-organized digital volunteers during Crisis

The empirical study of digital civic engagement is most visible in the crisis response of “digital volunteers”, or emergent clusters of citizens that form working groups using social media. The aftermath of the January 12, 2010 Haiti earthquake was an event that illustrates the behaviors and mechanisms of self-organizing in the information space of a microblogging environment, where volunteer collaborations were newly found and distributed across continents. The motivations, resources, activities and products of digital volunteers describes how seemingly small features of the technical environment offered structure for self-organizing (Starbird & Palen 2011). This phenomena in the context of the Haiti earthquake was rapid and their activities often remarkable. Previous research and development efforts have emphasized the potential for “crowdsourcing” via social media to increase situational awareness during crisis events (Liu 2010, Okolloh 2009). However, use of the popular umbrella term often mistakenly assumes behaviors
that constitute “crowdsourcing” to be a novel by-products of social media. Spontaneous volunteerism is not a new feature of crisis events (Starbird & Palen 2011, Dynes 1970, Fritz 1957, Kendra 2003, Tierney 2001). Yet, applying an existing framework of self-organization in disaster settings to new digital volunteer behaviors reveals innovative forms of volunteerism that were not previously possible (Kreps 1994). Though initially not widely used, the innovation of Twitter for example, served as an opening to seeing and subsequently broaden the sphere of digital volunteerism in scope and distance (Guy 2010, Hughes 2008, Kreps 1994, Qu 2009, Starbird et al. 2010, Vieweg et al. 2010), and enriching physical crisis events with the characteristics of a multi-disciplinary and global crowd. Emergent groups are usually self-organizing, and come about in disaster settings to meet some unmet need. How they come together is the subject of Kreps and Bosworth, who discuss collective behavior and organizing through a progressive manifestation (Kreps & Bosworth 1994). Kreps and Bosworth empirically described in their work a historical survey of accounts of emergent organizations in numerous disasters and crises, and employed their framework to the behavior that many have come to call “crowdsourcing”. In practical application, the Haiti disaster was the medium of Twitter, as much as Twitter was the medium of citizens who digitally became “voluntweeters”, i.e. volunteers sending Twitter messages (tweeting). Their initiation into the space was through the accessibility of “individual capacities and collective technologies of human populations” around the globe (Kreps & Bosworth 1994).

Twitter was the gateway into an information space that itself contained resourceful features that helped would-be volunteers navigate within it, and begin to self-organize with others in an evolving practice of crisis tweeting. This engagement of a civic nature led to the rise of individual clusters of a variety of skills and self-appointed responsibilities. In their extensive research on twitter activity during the Haiti crisis, Kate Starbird and Leysia Palen discovered and documented multiple cases of citizen self-organization into working groups stemming from personal identification with the event (Starbird & Palen 2011). Of those that began tweeting for Haiti as a way of volunteering their time— sometimes entire days—from areas far removed from the event, most entered the space with little direction or knowledge about how to help. There are volunteers who contributed greatly to the Haiti response and relief efforts, but then fell away after a time. With Haiti as the sole focus of their Twitter use, their accounts go dormant or are even deleted entirely after their event participation ceases. Still, others started reflecting on what it meant to be a good “crisis tweeter,” and publicly identify as such (Starbird & Palen 2011). Though some of these multi-event crisis tweeters continued to work without affiliating with an organization, others found emerging organizations like Humanity Road and StandByTaskforce as digital “places” to focus their volunteer activities. Both Humanity Road and StandByTaskforce are virtual organizations that were sparked by digital volunteering activities during the 2009 political unrest in Iran, but then formalized during the Haiti event (Starbird & Palen 2011).
v. Long term engagement of the citizen volunteers

The analytical task of understanding the constantly changing social relations that accompany crisis is enormous. Ethnographic work is inherent to the process, particularly for what is known as “multi-sited” ethnography which “takes unexpected trajectories in tracing a cultural formation across and within multiple sites of activity” and “ethnographically constructs aspects of the life or social system itself through the associations and connections” (Marcus, 1995). Marcus states, “research on crises in today’s networked world practically demands a ‘multi-sited approach’ (1995), for long term planning and resilience requires a fundamental understanding behind the principles of civic engagement. The empirical examination of the products and motivations of crisis tweeters who emerged in the aftermath of the 2010 Haiti Earthquake reveals important features of self-organizing in a highly networked world attributed to social media-related behaviors. In this case, as a collection of resources, capacities, and a progression to increasingly more defined tasks and organizational identity. The formation of Humanity Road and StandByTaskforce represents the full culmination, as described by Kreps and Bosworth, of the graduation from resources to “domain”-driven features of organization (2010), suggesting that digital volunteers and crisis twitterers are representative of a new form of previously recognized organizing behavior made possible through the availability of new media. Sociologists of disaster, including Dynes, call organizations that did not exist prior to a major disruption of the social order “emergent organizations”—groups of people that previously had no standing structure or defined tasks (Dynes 1970). These emergent organizations, made of up of willing citizen actors, constitute the latest addition to the constellation of actors expected at the scene of crisis, both physically and digitally. In order for future crisis response and coordination to be successful, investing into new paradigms of crisis coordination and management between governments and digital crowds requires cultivation of broader relationships. This phenomenon can best be epitomized as coalition creation, and can mostly be observed in the field of political science where coalition formation is known as a stratagem to buy and sell social capital to achieve political aims.

Coalition Theory

i. Concept of Stakeholdership

Whether in political science, business, or any other field, coalitions are generally understood to be composed of representative constellations of actors that are called ‘stakeholders’, as each member has a stake in the overall objective of the coalition’s being, and each commits their own resources to the coalition’s success. In this chapter, ‘stakeholdership’ is defined as the corporate eligibility of a publicly visible group or agency for a strategic membership among a configuration of actors capable of committing resources or services to the response of a crisis. In the fields of ‘Strategy and ‘Business’, this is presented as a ‘theory of the firm’ (Freeman 1984). Stakeholders
in a coalition are traditionally represented by highly organized government agencies, civil organizations, for-profit entrepreneurs, civilian action groups and communities, etc. Together they represent the collective interests that requires a multi-organizational agenda. Eligibility for membership hinges on an overarching principle; that their identities are known to each other and their constituents so that accountability is fairly and legally distributed among all the participating actors. Stakeholdership is represented as the ‘clues, prescriptions, and visions for managerial action and thought’ (Freeman, 1994; Freeman, Wicks, & Parmar, 2004; Jensen, 2002; Jones, Felps, & Bigley, 2007), the building blocks of coalition development among crisis constellations. As Donaldson and Preston (1995, p. 67) argue, “the stakeholder theory [within coalition development] is managerial in the broad sense of that term but it does not simply describe existing situations or predict cause–effect relationships”. Rather it is frequently used as an analytical construct, mobilized retrospectively in order to describe the relationships between one organization (i.e. municipal fire department) and its external partners during a crisis (Brunet & Houbaert, 2007; Savage, Dunkin, & Ford, 2004; Shrivastava, 1987). In this way, traditional perspectives for crisis management are born at the juncture between crisis response and corporate strategy. Stakeholder management appears as an intuitively relevant framework to analyses of crisis management processes since the ‘normative’ branch of stakeholder theory relies on the central assumption that ‘the interests of all stakeholders are of intrinsic value.’ That is, a coalition of stakeholders merits consideration for its own sake and not merely because of its ability to further their own interests or that of some other groups’ (Donaldson & Preston, 1995, p. 67). Donaldson and Preston see normative stakeholder theory as the core of coalition building among corporate entities. The work of Alpaslan, Mitroff, and Green (2004) further exemplifies how normative stakeholder theory can be applied to crisis management to describe the fixed framework in which stakeholdership is determined. The authors build a classification of organizational attitudes towards stakeholders, where members are judged for inclusion in the group equally amongst one another and based on the value they generate, otherwise known as a ‘multifiduciary’ approach. This ensures that the coalition remains an exclusive entity where stakeholders are accountable to one another and will be less likely to experience crises in the future and more likely to recover quickly from them (Alpaslan et al., 2004).

**ii. Coalition Trust and Identity**

Alpaslan, Shrivastava and Siomkos make pragmatic arguments that 'trust' and 'identity' form the foundations of accountability among stakeholders in a coalition. 'Trust' and 'identity' are concepts in this chapter that refer to the principle characteristics of a stakeholder's relationship with its contributing partners. Unfortunately, these principles can be interpreted differently by diametric stakeholders which often leads to misinterpretation and inefficient management and coordination. Stakeholders' trust and identity are behavioral characteristics that play an important role in the overall success of a coalition and are better described as a pragmatic and
goal-oriented response, rather than a normative, cultural response to a clear stimulus like a crisis. Stakeholders affected by a crisis automatically derive corporate behavioral patterns towards others in general (Alpaslan et al., 2004; Sethi, 1979; Shrivastava & Siomkos, 1989), so as to avoid mismanagement of resources and accusations of wrongdoing among their fellow stakeholders. Still, Shrivastava & Siomkos (1989) point out that cultural orientation of a ‘firm’ does not constitute a practical guide to crisis management among diverse stakeholders when questions such as the prioritization of issues and other related problems are raised. In her book *Power in Coalition: strategies for strong unions and social change*, Amanda Tattersall writes on the process of building trust through identity. ‘Identity’, Tatersall argues, is always associated with common or shared experiences, within which trust is built through ‘collective unionism’.

**iii. Collective Unionism: Foundation of identity for new coalitions**

The term ‘collective unionism’ has frequently been used to describe coalitions as well as to identify strategies that extend beyond their relationships. Coined by James O’Connor in 1964 to describe the organizing strategies originally as the building of a local community of interracial unions of poor urban workers (O’Connor 1964a, 1964b; Frost 2001, 46). This was at a time when racial divides reached a breaking point leading into the civil rights movement in the United States. Autoworkers from the Industrial Union Department of the AFL-CIO began pioneering community reach out to organize around marginalized urban poor and their common interests in improving housing and schooling (Fine 2004, 308; Tait 2005). These projects were paralleled by similar initiatives at the time like Cesar Chavez’s farm worker unionism and the civil rights unionism of the Congress of Racial Equality (Flug 1990, 328). Labor geographers appropriated the term community unionism to bring an understanding of labor geography to literature on alliances. They presented a place-based approach that argued alliances at a local scale can rebuild union stakeholdership (Wills; Ellem 2003). In 1992 the term reemerged in the United States to describe coalitions between unions and community organizations at a time when unions were in decline (Banks 1992). Defining community unionism as coalitions also spread to Canada and Australia (Tufts 198; Lipsig-Mumme 2003; Cutcher 2004; Tatersall 2004, 2006; Muir 2008). At one level the term ‘community’ has been colloquial and vague, but it is not however meaningless. In union revitalization literature, community repeatedly conveys specific descriptions that provide a deeper foundation for understanding coalitions and defining related terms like community unionism (Tatersall 2009). In the general sense community conveys three different, but mutually connected and reinforcing meanings:

- Community as an organization.
- Community as a common interest or common identity.
- Community as a place.

The implication of community organization around inanimate but common grounds is indicative of a human communal behavior that fosters complex goals as an identity. In the broader context,
'community' refers to clusters of identities that exist more or less decentralized, but laterally possess common interests. Individuals gravitate to the closest organization that embodies that objective identity, or create their own social hierarchies to structure an emergent organization with the group's founding goals. As such, identity enables accountability, as it guarantees fixed positions within nascent organizations where social status and reputation can elevate certain individuals charged with the maintenance of the organization’s identity, and subsequently make them focal points of contact with the outside world.

**iv. Coalition Elements**

Returning to the work of Alpaslan, Mitroff, and Green (2004), adopting a multifiduciary membership between crisis response agencies and emergent volunteer communities becomes problematic due to the issues of accountability and clear leadership. From an agency's perspective it is difficult to adopt multifiduciarism to citizens who coalesce around crises spontaneously, because the commitment and verifiability of their contributions cannot be accounted for with accurate measurement. If for instance a board of stakeholders was held among a coalition of crisis responding actors, then spontaneous citizen networks would be the party whose leadership and vision was constantly changing at every meeting. Therefore, coalition success in the corporate sense, is dependent on four measurements:

- Success refers to *winning a specific external outcome*, the extent to which a coalition influences the decision of a political-economic nature.
- A successful coalition *shapes the broader political climate* and the environment within which future campaigns can be waged.
- Coalitions are only as successful as *the sustainability of their relationships* between members.
- Coalition success relates to the organizations in the coalition and whether the coalition works in a way that *increases its internal resource capacity and commitments* by developing new member leaders and strengthening campaigning skills and political vision (Tatersall 2011).

If coalitionism between crisis stakeholders and citizen volunteers is to be effectively applied between formal stakeholders and quasi-organizational citizens seeking coalition membership, the latter group must morph into a sustainable and publicly recognizable organization that can be held accountable for their work and commitments. Unfortunately this can only be done through long term engagement and incentivization to keep citizens engaged even after the crisis has abated, so as to allow self-generated organizational identities, as well as social hierarchies of such emergent groups to take shape.
v. From Volunteer to Stakeholder: Fitting volunteers into a coalition framework

The work of Meier and Crowley has tried to explain the inter-organizational complexity behind long term engagement of digital volunteers and larger agencies for crisis related coordination. Separately, Meier, Crowley, Vieweg, and Liu, have found that emergent groups of citizens or 'clusters', whether as volunteers or other supporting elements, must go through a process of maturation before they can be accepted as a coalition stakeholder, beginning with an initial party of citizen clusters around a participatory identity (Meier, 2011; Hughes et al. 2008). In 2011 crowdsourced crisis mapping had matured to a level of reputation and professionalism that led the United Nations to acknowledge the opportunities presented by social media and their role in sharing and managing information. Several disasters have occurred since Haiti’s earthquake, and volunteers involved in the Haiti mapping have supported other crowdsourcing initiatives, such as in the wake of earthquakes in Chile and floods in Pakistan (Meier 2011). The consequences of this continued engagement have been twofold: first, it has helped to build knowledge and experience in the volunteer community; second, it has demonstrated a reliable commitment of volunteers, proving that an organized structure could harness real-time crowdsourcing effectively when it is needed (Vieweg & Liu 2012). The SBTF was established during the annual conference of the Crisis Mappers Standby Task Force, which had provided the space for exchanging information in a horizontal network, but had not set up standby teams for supporting crisis mapping. The rationale for pushing a conventional organization like the United Nations (UN) Office for the Coordination of Humanitarian Affairs (OCHA) to adopt previously unconventional methods of gathering information needs to be highlighted against the backdrop of current events and lack of current, effective tools for gathering information. In the popular insurrection in the Middle East and North Africa region, or what became known as the Arab Spring, Egyptian activists organized protests through social media, among other outlets including Facebook and Twitter, and brought about the resignation of an authoritarian leader. Other countries followed the Tunisian and Egyptian examples, and by February a civil war had unfolded in Libya. But the lack of first-hand information and the pressing need to make decisions and prepare timely relief in the crisis has been cited by Patrick Meier, co-founder of the SBTF and director of crisis mapping and strategic partnerships at Ushahidi, as the major reason why UN OCHA requested the SBTF’s crisis-mapping support for Libya. The credibility of crowdsourced information management and awareness of the relevance of social media are given as secondary reasons for the longest and most comprehensive deployment of the SBTF so far (Meier 2011). Yet the professionalism of this passive, crowdsourced, crisis-mapping exercise, capitalizing on the opportunity to collect information from several conventional and unconventional sources remotely and in real time, was the key factor in the success of the Libya crisis response coordination with UN OCHA's partner agencies on the ground (UN OCHA 2011, §9). The SBTF organized into various teams responsible for individual steps such as addressing technology issues concerning the platform and features, monitoring the media and translating, categorizing information, approving reports
and verifying information and sources. Almost 500 volunteers from more than 50 countries committed to support the Libya deployment, providing a tremendous amount of relevant information on events, food or medical needs, destruction or existence of infrastructure, and humanitarian responses. Furthermore, the direct link between crisis-mapping results and humanitarian responders, often criticized as the major flaw of crowdsourced activities, was ensured in this project because UN OCHA itself requested the SBTF deployment and thus was involved directly, matching the gathering of crowdsourced information with the needs of humanitarian responders. In retrospect, the Libya crisis represented the first full-fledged cooperation between crowdsourcing online initiatives and conventional international organizations. Since Libya, UN OCHA has invested proactively into sponsoring StandbyByTaskforce among its existing crisis response partners and continues to cultivate its relationship with the digital world of volunteers in complexity and scope.

Limitations

I. Citizen Anonymity, Corporate Assumptions, Non-Static Leadership

Typical coalitions are corporate alliances that have static relationships and processes that ensure accountability. Digital volunteers as newly established organizations may fit into this scheme, however the longevity of crowd mediated activities tend to gravitate toward a citizen’s freedom to engage and disengage from the problem at their convenience. Herein lies the dilemma, civic engagement is growing in complexity and demand, citizens seek to increase their role as stakeholders in crisis and security matters through remote participation, yet retain the freedom to disassociate from a problem if they so desire. Long-standing research on the sociology of crises suggests that the desire to help in times of emergency is age-old, and is a behavior that is critical to crisis response and recovery (Dynes 1970, Fischer 1998). Large numbers of people are known to converge onto the site in the wake of a disaster event to observe or to help (Fritz 1957, Kendra & Wachtendorf 2003). However, volunteers are not professionals, and their engagement can be plagued by numerous detrimental psychological states from prolonged exposure to high stress environments. Emotional impact from digital volunteering frequently sees individuals coming and going as a cause of being unable or untrained to cope with working with larger agencies. During Haiti, some volunteers remarked about rescue attempts that arrived too late and calls for help that went unanswered. One group of interviewed volunteers stated that they could not continue crisis tweeting and remarked that they were not sure that they would do it again, because the work was too “emotionally draining” (Starbird & Palen 2011). Another volunteer, one who had participated in crisis tweeting during the political unrest in Iran, talked about how she backed away from her account after that event, before starting again for Haiti.
Volunteer 1: “During Iran, I got very caught up in it and was on twitter constantly. I dropped off after that when I changed my [Twitter] name. I kept my follower count low, stayed away from politics and emotional issues.”

Though it is difficult to reach out to those who had ceased tweeting from their Haiti-focused accounts, speculation leads to the conclusion that some, like Carla, had abandoned their Haiti tweeting identities purposefully after suffering from emotional and perhaps also physical exhaustion (Vieweg, Hughes, Starbird, Palen 2010).

Frustration with formal response agencies, a theme that emerges persistently between citizens and governing agencies even in crises beyond Haiti, often ends with volunteers abandoning their engagement as well.

Volunteer 2: “This is getting frustrating. I keep seeing the same calls for help, day after day. Can the NGOs at least HIRE us so we can do this for them?”

Another voluntweeter felt unappreciated and even obstructed when the “formal” response moved into place, explaining how the new “organization” of response prevented them from accessing the resources that they had been using for their “informal” response activities (Vieweg, Hughes 2010).

Volunteer 3: “After that stage, it became clear that the larger NGOs were locking down streams of access for individuals. UN Cluster meetings were mandatory in order to obtain aid from the storage facilities. It became harder to help and our teams started to crumble due to feelings of powerlessness. It was a very frustrating time and most of my efforts turned more to shedding light on the broken system than trying to fight against it to get little done.”

Many participants who could be reached for a follow up said they hoped the formal response would learn how to better coordinate with social media volunteers in the future (Vieweg &Hughes 2010, Starbird & Palen 2010).

**ii. Digital Volunteer- Government Coalition dependencies**

Drawing on the experience of the Libyan crisis, the *StandbyByTaskforce* summarized the most important lessons learned from their collaboration with UNOCHA, citing major breakthroughs but also critical elements such as leadership being inadequate (Meier & Crowley 2012). It was of pivotal importance for the motivation of volunteers to provide feedback to them on how their work was making a difference. In this case through daily updates on exactly how the live map was used to inform decision making and response (Meier 2012). There was also an expressed need to dedicate more official UN project staff to distribute tasks and provide feedback to volunteers so as to better categorize information, standardize communication procedures, provide translation services for local languages, and better training (Tierney & Perry 2010, Meier 2012). “Duration of the *StandbyByTaskforce* deployment needed to be agreed and respected, and protocols on exit strategies should be devised (Meier 2012).” Also, the decision to transfer from the initial private map to a public map in the middle of recovery operations introduced security concerns that ultimately limited the recruitment of volunteers with crucial local
knowledge. In its own report on lessons learned, UN OCHA additionally emphasizes the importance of recognizing the efforts and results of volunteers and the need to protect individuals, for example, by omitting data that could be used in harmful ways, by not soliciting or storing information that could be personally compromising, and by using open-source standards and applications that are accessible (UN OCHA 2011, §3, 4). It is critical for governments to take a leading role in all facets of coalition management - from creation to data dissemination and analysis when it comes to dealing with civic engagement projects. In mid-2011, Malawi became the first country in the world to capture development aid activities at the subnational level in a publicly available, dynamic map (Moyo 2011). Although not explicitly stated, this goal also served the purpose of exercising coordination activities between Malawi government ministries, international agencies with Malawi citizens as supporting elements. Although far from being a sustainable coalition for crisis events, the experience did create relationships and learned lessons for future reference. Visualizing raw data for such initiatives as Malawi’s Open Aid Map can be done by outside groups who have the resources and technical capacity, such as CCAPS and AidData. However, a third-party solution is not sustainable (Greenhill, Romilly et al 2013). Greater government ownership of the crisis coordination effort is critical for sustainability, and as such requires fixed commitments in the form of leadership on the part of the government or acting coordinating agency. One of the greatest challenges is the high rate of turnover within government decision makers. For example, in Malawi, key focal points in the ministry transferred to another country in the middle of the data collection process. Focal point turnover must be managed by constant communication and collaboration to train replacement staff and familiarize them with the nature and importance of the ongoing work (Powers, Parks, Bradley 2011). It is also important for the government to take a lead role in requesting the compliance of its coalition partners. Government offices are constantly subjected to data and reporting requests from a variety of actors (government, headquarters, local initiatives, etc.). For example, this can lead to resistance in providing the information needed to build a publicly accessible dashboard. In fact, such resistance is often softened when a data request is accompanied by a letter from high-ranking officials in the relevant ministry or agency or wherever the Crisis Coordination Unit is located. Further, allowing the local government to set the agenda and schedule coalition agendas fosters government ownership and ensures sensitivity to any local political dynamics. However, it should be noted that a multi-stakeholder meeting is not a replacement for crisis coordination, which often needs to happen physically at the location of the crisis. Where possible, every effort should be made to build a strong relationship with local resources and their stakeholders, to ensure that the proper technical staff is in attendance, and to obtain the designation of an individual focal point (Weaver et al 2014).
Concluding remarks

i. Trust and Accountability is the failing point of creating a long-term, participatory inclined digital volunteer organization.

As expressed by Meier (2011), Crowley, Tierney & Perry (2001), and Greenhill & Romilly, ‘accountability’ is difficult to demand from a volunteer force that seeks to be involved in the saving of lives, yet retain the anonymity afforded them as ordinary citizens. While nascent organizations like StandbyTaskforce and HumanityRoad continue to mature, the bulk of their personnel consist of part-time or at leisure volunteers that can only take on the most basic of responsibilities. That is not to say that these networks have not been invaluable in their service, but to elevate them to the level of equal partner in an alliance of stakeholders is a matter that will require far more effort and patience from coalition facilitators. Drawing once more on the works of Alpaslan, Shrivastava and Siomkos (1989); ‘trust’ and 'identity' form the principle foundations of accountability among stakeholders in a coalition. ‘Trust’ and 'identity' are concepts in this chapter that refer to the principle characteristics of a stakeholder’s relationship with its contributing partners. Many ‘Digital Age’ proponents of social media supporting civic engagement allege that the key to bridging the accountability gap requires a fundamental shift in paradigm thinking among crisis responding agencies and their corresponding governments. Such a shift would probably require massive incentive and investment into the creation of a new culture advocating citizen stakeholdership in crisis related matters traditionally presided over by officials. Still, others like Shrivastava & Siomkos (1989) maintain that cultural orientation does not constitute a practical guide to crisis management among diverse stakeholders, and traditional powers of crisis coalitions may continue to see citizens as leveragable resources rather than as equal partners.

ii. Coalitions require organizational commitments: Nascent digital volunteer organizations still lack sufficient structure to be regarded as formal stakeholders.

Effective crisis response and management has been identified by certain scholars like Purohit, Hampton, Reuter, and Varga, as having long relied on both the formal and informal configurations of official and citizen actors. As this chapter has pointed out on several occasions, social mobilization increases the participation of the informal response community creating a global and persistent pool of passive resources that can be tapped by existing crisis coalitions and citizens. Yet challenges remain in realizing the two as a mutually cooperative system. Referring to the works of Alpaslan, Mitroff & Greene, Shrivastava & Siomkos, Sethi, and Tatersall, this chapter has elaborated on the principle behaviors that are inherent in the creation of a sustainable coalition (1989, 1979, 2004, 2009). Sustainability in this case depending on the strength of trust and identity in the relationship between different stakeholders that contribute to crisis response commitments. According Alpaslan, Mitroff, and Green (2004), adopting a
multifiduciary membership between crisis response agencies and emergent digital volunteer networks becomes problematic due to the issues of accountability and clear leadership. As Tatersall points out, the success of coalitions refers: i. *winning a specific external outcome*, ii. *shaping of the broader political climate for future campaigns*, iii. *the sustainability of stakeholder relationships*, and the iv. *centralization of resources that can be projected on short notice* (2011). Governments and non-profit organizations (NPOs) typically form partnerships, alliances and networks to manage a disaster or crisis and reserve the right to compel standards of compliance for membership (Moynihan, 2008; Kapucu, 2009; Ansell et al., 2010; Garrow, 2011). For Digital volunteer networks, gaining admittance as a responsible and more or less equal stakeholder requires morphing into a sustainable and publicly recognizable organization that can be held accountable for its volunteer’s work and commitments. Meier, Crowley, Vieweg, and Liu, found through practice and post-mortem interviews that consistent engagement by larger organizations like UN OCHA led to greater incentivization for long-term commitment. Through long-term commitment and consistent mentoring from sponsor coalition members, can a nascent citizen organization grow into the role it is intending to fill. However, alone and without direction most civic engagement initiatives will form for short durations and with varying degrees of usefulness. Without a helping hand from established stakeholders, young and prospective citizen engagement networks such as ‘digital volunteer’ groups can only be leveraged in a limited capacity for crisis events.

**iii. The success of digital volunteerism in a coalition climate is dependent on governments and their agencies taking the lead as coalition facilitators.**

Drawing on the literature from Meier, Palen, Starbird, Liu, Vieweg, and Crowley, this chapter concludes with a retrospection regarding the role of governments facilitating coalitions between established members and the latest actor to take the crisis response stage - the citizens. As explained, it is of strategic importance for the motivation of volunteers to provide feedback to them on how their work impacts the efforts of official responses to crises. As found by Powers, Bradley, Moyo, and Parks, soliciting skilled labor from a civilian population can be done with relative ease, however ensuring that the positive contribution becomes a reliable and repeatable service requires a longitudinal investment in which focal points from the government and/or its specific crisis coordinating unit maintain fixed relationship with the incoming citizen cluster. In this case, a staff member or entire team at UN OCHA for example would ideally be responsible for maintaining an online persona that directly deals with focal points from the volunteer network. This relationship would be in stark contrast to the Malawi example where Greenhill & Romilly found a high rate of turnover within government focal points tending to transfer posts without consultation, or expected that their involvement came to an end once a goal or certain level of activity had been achieved. Focal point turnover must be managed by constant communication and collaboration (Powers. Parks, Bradley 2011) and where possible, every effort
should be made to build a strong relationship with local resources and their stakeholders, to ensure that the proper technical staff is in attendance, and to obtain the designation of an individual focal point (Weaver et al 2014). It is critical for governments to take a leading role in all facets of coalition management - from creation to data dissemination to de-escalation or persistence surrounding the crisis. Allowing the local government to set the agenda fosters government ownership and creates a static avenue of communication where individual citizens can be inclined to participate repeatedly if given attention, dialogue, and feedback, thereby growing the identity needed to enrich a participatory culture.

References


Not Invented Here Syndrome

Lei Pi and Bernhard R. Katzy

Introduction

By defining innovation as organizational crisis, this chapter investigates how to overcome cultural barriers in the implementation of open innovation strategy. Specifically, it deals with how technology based companies can overcome the Not Invented Here syndrome (NIH) embedded in a company’s innovation culture, which refers to the phenomenon that R&D engineers resist to the ideas, knowledge or innovation coming from outside of the organization and separate themselves from the outside environment (Katz, Allen 1982).

This chapter tries to test the applicability of the Theory of Planned Behaviour (TPB) on the NIH syndrome and use the TPB model as the theoretic framework to analyse the NIH syndrome in technology based companies. This work is part of my PhD thesis, which endeavours to identify and propose means to overcome key barriers of an open innovation strategy implementation and innovation collaboration.

Literature Review

Innovation as Organizational Crisis

Based on various previous viewpoints on organizational crisis, Milburn Thomas, Schuler Randall and Watman Kenneth (1983) gave one of the most cited definition of organizational crisis:

Organizational crisis is: (a) opportunity for the organization to attain its current goals; or (b) demand or threat on the organization which either prevents the organization from attaining its goals or actually removes or reduces an organization's ability to attain its goals, that the organization seeks to resolve because the outcomes at stake are important and the resolution strategy is uncertain. ------Milburn et al. (1980)

In today’s fast changing business environment, companies have to be continuously innovative in order to survive and thrive. The lack of change and innovation led to increasingly outdated product offerings and cost structures significantly above the competitive level. A good example is Eastman Kodak (Gilbert Probst, Sebastian Raisch 2005). Failing to recognize new business trends
combined with the inability to innovate promptly may cause societal crises, such as numerous employees laid off or unrests in a country’s economy (e.g. Nokia’s mobile phone business). However, innovation encompasses both opportunity and threat. Innovation and innovation management entails cost and uncertainty. According to Damanpour’s (1996) definition:

“Innovation is conceived as a means of changing an organization, either as a response to changes in the external environment or as a preemptive action to influence the environment.” Damanpour (1996)

So innovation per se can be seen as changes and hence one form of organizational crisis. Companies need to carefully deploy their innovation strategy in order to maximize the opportunity or reduce the threat. Chesbrough and colleagues (2006) call for an open innovation strategy:

“The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.”
Chesbrough, Vanhaverbeke, & West (2006).

Open innovation is also a strategy which can help companies diversify risks and deal with uncertainties (Keupp, Gassmann 2009).

**Open Innovation Paradigm**

Companies can been seen as open systems to their environment which have to interact with the surroundings by absorbing required resources (e.g. technology and information) and exporting outputs (e.g. products and services) (Morgan et al. 1997). In the fast changing business environment, technology based companies are opening their boundaries and interacting more and more with other actors within their formal and informal networks. Open innovation is adopted by many firms as a strategy for reducing innovation cost and sharing risks. Since Chesbrough (2003) coined the conception of open innovation, open innovation has attracted great attention from academic scholars and industrial practitioners. Chesbrough’s seminal work has been cited more than 9000 times so far according to Google Scholar. New research continuously contributes to the open innovation topic from various theoretic perspectives and different levels (e.g. Individual, business units, ecosystems/communities, firms, regions and national innovation systems) (Chesbrough et al. 2006; Chesbrough, Bogers 2014). In practice, the successful cases of firms which have gain great benefits from implementing a successful open innovation strategy (P&G, IBM etc.) indicate that open innovation is not a transitory trend but a potential instrument for companies to achieve competitive advantages (Huston, Sakkab 2006).

However, the relationship between openness and innovation performance is not straight. Although some pioneering companies (e.g. P&G, Eli Lilly) have achieved great benefits from open innovation (Huston, Sakkab 2006; Schwartz, Huff 2010), many companies are struggling with the implementation of open innovation due to their limitations and numerous real or perceived
barriers (Saguy, I. Sam, Sirotinskaya 2014). Previous research has indicated that the impact of an open innovation strategy on the innovation performance can be mediated by many internal and external factors. The transformation of a firm from a closed innovation model to a more open model entails organizational changes in inter-organizational networks, organizational structures, evaluation processes, knowledge management systems (Chiaroni et al. 2010), organizational management and culture (Saguy, I. Sam, Sirotinskaya 2014).

**Cultural Aspect and Individual Level of Open Innovation**

When companies try to adapt themselves to the external environment, organizational culture plays an important role in organizational sustainability. A flexible and open culture are instrumental to handle the external exigencies (Kitchell 1995; Morgan et al. 1997). In the process of implementing an open innovation strategy and interacting with external partners, the organizational and cultural issues may arise as the main barrier to both in small and large companies (Vareska et al. 2009; Mortara, Minshall 2011). Due to innate barriers and resistance within organisations in terms of willingness and ability (Hauschildt, Kirchmann 2001), creating a culture that values outside competence and know-how is critical for open innovation practice (Gassmann et al. 2010). According to Kitchell (1995), corporate culture serves as a “transforming agent” which ensures company sustainability. When facing technology turbulence, successful, adaptive companies put cultural norms into practice which stresses flexibility to change, openness in communication, and a future orientation that focuses on staff development and strategic planning. Such cultural norms promote a company’s capacity for outreach (to markets, innovation, information, etc.) and its ability to assimilate technologies. Oppositely, companies that fail in fostering such cultural norms are less likely to adapt themselves to the turbulent environments (Brettel, Cleven 2011; Kitchell 1995). Individuals, who are the driving forces behind all organizational processes (Senge 1990) and carry a substantial responsibility for the actual adoption of an open innovation strategy, highly affect the success of open innovation implementation (Du Chatenier et al. 2010). Understanding the consequences and the managerial drivers of their attitudes to knowledge sharing is of crucial importance. An open innovation culture requires employees as individuals to embrace cultural openness as a powerful strength that takes in new thinking, attitudes and behaviors, and builds external thinking into all of an organization’s daily operations (Saguy, I. Sam, Sirotinskaya 2014). Although the cultural aspect of open innovation has been identified as an important issue, it is the most uncovered one. The impact of individual behaviour on the success of open innovation projects, in interaction with, e.g. the institutional environment, is a potential research field (Du Chatenier et al. 2010).

**Not-Invented-Here (NIH) syndrome**

Although many scholars attribute the first pioneers in NIH research to Katz and Allen (Gassmann
et al. 2010), the concept of NIH dates back to 1960s or even earlier (Clagett 1967). In his master’s thesis, Clagett (1967) described the NIH syndrome as the adverse attitude of technology-based organizations exhibiting resistance towards adopting outside innovation. More specifically, Antons and Piller (2014) define NIH as:

"A bias triggered by the negatively shaped attitude of an individual towards knowledge that has to cross a contextual (disciplinary), spatial or organizational (functional) boundary, resulting in either its sub-optimal utilization or its rejection as behavioral consequences of this attitude bias."

The most frequently cited paper on the NIH syndrome is from Katz and Allen (1982). However, Katz and Allen (1982) define the NIH syndrome as a kind of “self-sufficiency” of a project team which believes that they are at a superior status of knowledge in their field, which causes the group to show a tendency of reluctance to communicate with outsiders for new knowledge and reject new ideas from outside (Katz, Allen 1982). This definition somehow is different from the common concept in most literatures treating the NIH syndrome as attitude, though many of these literatures cite Katz and Allen’s (1982) work as the origin of NIH syndrome research (TAKAHASHI, INAMIZU 2012).

Katz and Allen (1982) attribute the cause of the NIH syndrome to the belief of a R&D group that they possess the cutting edge knowledge in their field, which prevents them from actively communicating with outside sources for new knowledge (Katz, Allen 1982). Hussinger and Wastyn (2011) analysed the role of knowledge sources and the success of the adopting organization on incurring the NIH syndrome. Their quantitative research shows that absorbing knowledge from competitors is more likely to incur the NIH syndrome relative to vertical absorbing knowledge from consumers, suppliers or universities. Such negative attitudes from employees will be reinforced if the acquiring company is perceived to be successful in its domain (Hussinger and Wastyn 2011). Drawing light from psychology research, Antons and Piller (2014) analyzed five underlying causes as potential antecedents of an NIH attitude: the ego-defensive function, the value-expressive function, the social-adjustive function, the knowledge function and the utilitarian function (Antons, Piller 2014).

The NIH syndrome may derive from and be affected by many factors: limited or negative experience with inward knowledge transfer, inappropriate incentive systems (Chesbrough, 2003), company value, management information systems, communication platforms, project decision criteria, supplier evaluation lists and its handling and so on. A better understanding of all these factors on the NIH phenomenon and an open innovation culture calls for inter-disciplinary research combining psychology theories (Gassmann et al. 2010).

The extant literature on the NIH syndrome mainly focuses on understanding what is the NIH
syndrome and what are its causes. Studies on employee attitudes towards knowledge are scarce and mainly qualitative research. We still do not know how attitudes like the NIH phenomenon affect the open innovation implementation and how the employees’ mindsets can be fostered to acquire the attitudes that are necessary for a company to actively interact with external partners for innovation (Gassmann et al. 2010; West, Bogers 2014; Burcharth, Ana Luíza de Araújo et al. 2014). Organizational countermeasures against the NIH syndrome are only mentioned anecdotally and their effectiveness lacks justification. Building up explicit open innovation processes, appropriate incentive system and involvement of employees in innovation adoption decision making are among those most frequently mentioned countermeasures (Katz, Allen 1982; Mehrwald 1999; Gassmann et al. 2010). However, no empirical research so far has tested the validity of these measures.

**A new Perspective on NIH: Theory of Planned Behavior**

This paper contends that defining the NIH syndrome as an attitude limits our understanding of the real phenomenon. This paper uses the Theory of Planned Behavior (TPB) as the theoretic framework to analyze the NIH syndrome and views the NIH phenomenon as the employee’s individual resistance against adopting external ideas, knowledge or innovation. Attitude constitutes a key part of NIH but is not the only part. According to Ajzen (1991), intentions to perform behaviors of different kinds can be predicted with high accuracy from attitudes toward the behavior, subjective norms, and perceived behavioral control; and these intentions, together with perceptions of behavioral control, account for considerable variance in actual behavior (Ajzen 1991).

The TPB model has been proven to be a powerful model with practical application in various fields to predict human intentions to perform a range of desirable behaviors (Ajzen, 1991). Evidence from narrative and meta-analytic reviews supports its efficacy as a predictor of intentions and behavior capable of explaining 20 percent or more of the variance in prospective measures of actual behavior (Armitage & Conner, 2001). This paper will first test the applicability of the TPB model on explaining the engineer’s intention towards conducting open innovation behavior. Then drawing on TPB theory and outcomes of its practical applications on other fields, possible measures will be proposed to the end of how to intervene the engineer’s intention towards open innovation behavior in order to promote open innovation activities and overcome the NIH syndrome.
Research questions and Hypothesis

This paper tries to answer the following questions:
1. Can we use the TPB model to explain employee’s (R&D engineers’) intention or motivation on utilizing innovation from the outside of the company?
2. In order or overcome the NIH syndrome, what measures can a company take to promote the engineers’ intention or motivation towards utilizing innovation from outside of the company through influencing the three constructs of intention?

Regarding the first research question, five research hypothesizes are proposed:

H1: The attitude of an engineer towards utilizing innovation from outside of the company influences his intention or motivation on utilizing innovation from outside.
H2: The subjective norm of an engineer towards utilizing innovation from outside of the company influences his intention or motivation on utilizing innovation from outside.
H3: The perceived behavioral of an engineer towards utilizing innovation from outside of the company influences his intention or motivation on utilizing innovation from outside.
H4: The perceived behavioral of an engineer towards utilizing innovation from outside of the company influences the actual behavior to utilize innovation from outside.
H5: The intention or motivation of an engineer towards utilizing innovation from outside of the company influences his actual behavior.

It is proposed that the TPB provides a useful approach for understanding the reactions of employees during times of organizational change. This model not only specifies the role of several social influence variables in predicting intentions to engage in specific behaviors but also can assist in understanding why common change management strategies (e.g., communication and participation strategies) lead to better change outcomes for employees (Jimmieson et al. 2008).
The extant literature on the NIH syndrome mainly focuses on understanding the NIH syndrome and its causes. The organizational countermeasures against the NIH syndrome are only mentioned anecdotally and their effectiveness lacks justification. This paper aims to contribute to the current research by empirically testing the validity of those most frequently mentioned organizational countermeasures (building up explicit open innovation processes, appropriate incentive system and involvement of employees in innovation adoption decision making) against the NIH syndrome (Katz, Allen 1982; Gassmann et al. 2010; Mehrwald 1999). Three hypotheses are raised regarding research question 2:

H6: Building up explicit processes to adopt external innovation helps promote the individual employee’s attitude, subjective norm and perceived behavioral control on external knowledge.

H7: A team-outcome oriented incentive system helps promote the individual employee’s attitude, subjective norm and perceived behavioral control on external knowledge.

H8: A high involvement of the individual engineer in decision making on adopting external innovation helps promote the individual employee’s attitude, subjective norm and perceived behavioral control on external knowledge.

**Research Approach**

To answer the first research question, this paper uses a quantitative approach to test the applicability of the TPB model on explaining the engineers’ intention and the following behavior on conducting open innovation activities. Questionnaires are developed to measure the concepts (variables) of the individual engineer’s behavior, intention, attitude, subjective norm and perceived behavior control. The Structural Equation Model (SEM) will be applied to test the proposed hypotheses.
A combined research approach of both qualitative and quantitative methods will be adopted to address research question 2. Planned in-depth case studies in the IT security industry aim to complement the literature review to test the countermeasures proposed by literature and to answer the research hypotheses raised regarding the second research question. Then, SEM will be adopted to test the validity of the model.

**Expected Outcomes**

The author expects that the applicability of the TPB model on the NIH syndrome analysis could be verified or partially verified. Although the NIH syndrome has been frequently identified as one key barrier of innovation collaboration and an open innovation strategy, extant literature lacks a theoretic framework to understand its causes and the means to overcome it. Once being tested, this work will provide a new perspective on the NIH syndrome and deepen our understanding on cultural barriers of open innovation and innovation collaboration.

The TPB model has been successfully applied to a variety of situations to predict human intentions to perform a range of desirable behaviors (Ajzen 1991). If the TPB model is also applicable to NIH analysis, we can draw lessons from other research fields and design possible approaches to influence the R&D engineer’s intention and behaviour on innovation collaboration in order to promote innovation, which is of great practical meaning. Specifically, this paper proposes and testifies the potential impact of tangible organizational measures on the constructs of the NIH syndrome, which may provide practitioners useful tools to overcome the NIH syndrome in the organizational innovation context.

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Organizations in Crisis Situations: Towards an Understanding of Capability Frameworks of Organizations in Turbulent and Networked Environments

Eula Bianca Villar & Francesc Miralles

Abstract

Crisis environments can be considered a “mess” with systems of interrelated problems that affect a multitude of actors. Two important characteristics of a crisis response environment are the following: (a) it is turbulent, and (b) networked. There is a high degree of dynamics as stakeholders are brought together to form networks in order to respond to a crisis. Of particular interest is assessing how well organizations maintain their competitive performance in such circumstances. From a theoretical standpoint, while the Dynamic Capabilities Theory provides a framework to study this phenomenon, it proves to be limited because of the moderating role that environmental turbulence plays. An Improvisational Framework has been posited as a potential extension of the Dynamic Capabilities Theory, and while it potentially addresses the limitation of the latter, it has scarcely been applied in networked environments. This work subsequently seeks to understand how improvisations can enhance scholarly understanding of sustained organizational performance of organizations in crisis contexts. The approach perceived for this study is exploratory and qualitative, using a single case to surface preliminary observations that are aimed at providing foundations for an eventual framework for understanding how improvisations are linked with performance outcomes of organizations that operate in networked and turbulent environments.
Introduction

Organizations aim for superior performance outcomes resulting from sustained competitive advantage. A key question among organizational management is how sustained competitive advantage is achieved. From a strategic perspective, theoretical discussions that have been supported empirically provide important insights for management. On the one hand, there is a theoretical argument for acquisition of organizational resources that are rare, valuable, inimitable and non-substitutable as key to competitive advantage, also known as the Resource Based View (RBV) (Eisenhardt & Martin, 2000; Teece, Pisano, & Shuen, 2007; Wernerfelt, 1995). However, as environmental dynamics were found to play a moderating role on the achievement of performance outcomes through sources of competitive advantage (Eisenhardt & Martin, 2000; Hanvanich, 2006), the applicability of resources as a source of competitive advantage in changing environments had been revisited. Specifically, it was found that RBV holds true in stable environments, but where the environment is fast-paced and characterized by uncertainty, organizations rely on more than their respective resources. In such cases, they rely on organizational ability to reconfigure resources and adapt to changing environments. RBV is thus enhanced by a complementary theory, Dynamic Capabilities Theory (DCT), arguing that the possession of dynamic capabilities can explain how organizations maintain competitive advantage and performance in dynamic environments (Eisenhardt & Martin, 2000). Dynamic Capabilities refer to strategic and organizational processes that create value for the organizations within dynamic markets through the manipulation of resources to create new value-creating strategies (Eisenhardt & Martin, 2000). Where resources are the physical, human, and organizational assets that are available to organizations, dynamic capabilities refer to the ability to mix and match the resources.

Both RBV and DCT provide important insights for organizations that operate in stable to dynamic environments. However, specific types of organizations operate in environments that, aside from being fast-paced (i.e. dynamic), are also characterized by high turbulence and complexity that exhaust organizational resources and capabilities. This is a situation especially reminiscent of crisis environments, where organizations that are critical to restore the normal functions of a society post-disaster can face stressful and novel situations. For example, fire brigades could respond to a fire incident, which can be considered dynamic and fast-paced given the requirement of quick response, but it is also possible that unanticipated characteristics of the fire would render specific resources and capabilities unsuitable for the situation. The Mann-Gulch Fire of 1949 was a classic case re-analyzed by Weick (1993), who described turbulent situations as ‘cosmology episodes’ where individual responders enacting the organizational goal lose meaning and structure. Critical situations wherein organizations have the urgency to respond quickly thus resort to actions that are conceived and executed simultaneously as they start to
make sense of the situation. Such actions are referred to as ‘improvisations’. The same has been empirically observed in the Tenerife Air Disaster (Weick, 1990), 9/11 Twin Tower Attack (Kendra & Wachtendorf, 2002; Wachtendorf, 2004), and the Apollo 13 (Crossan, 1998).

The environment upon which organizations are embedded may be conceptualized as a spectrum, which ranges from stable to turbulent environments, and where superior performance outcomes of organizations take root in specific resources, capabilities, and actions that apply to respective environments. These types of environment are manifested in crisis operations as an incident can evolve from a routine type of emergency to a phenomenon that can cause a breakdown of organizational sense-making due to complexity and novelty that has not been accounted for a priori. In extreme environments where improvisations are considered as organizational strategies to address situations of turbulence, scholars have cautioned as to the appropriateness of improvisation. Effectively undertaken, improvisations can yield positive outcomes, whereas ineffectively undertaken, it may yield negative implications for the organization. This is supported by the inquiry on improvisations raised by Weick (1998), who established that despite potential positive yields of improvisation, it is not without limitations. For example, within an organization, improvisation in one unit can also compound the problems faced by other units to which it is tightly coupled; moreover, improvisation may benefit some organizations under some conditions but may be a liability under other conditions (Weick, 1998). To this end, Weick (1998) advocated for the newfound urgency in organizational studies to understand improvisations and advocate the study of improvisations among organizations as a means ‘to cope with discontinuity, multiple commitments, interruptions, and transient purposes that dissolve without warning’.

Consistent with the potential issues on improvisation pointed out by Weick (1998), two characteristics are drawn from the environment in which organizations operate in: (a) they are turbulent, i.e. that which causes a collapse in sense-making and prompts improvisation, and (b) networked, i.e. that improvising organizations may be situated in a coupled system of different organizations. Indeed, citing the term coined by Russell Ackoff (1999), crisis environments are considered a “mess” with systems of interrelated problems that affect a multitude of actors (Dayton et al., 2004).

Turbulence and networks combined highlight the challenge of organizations to manage performance outcomes. On the one hand, organizations have to strategically resort to improvisations, and on the other hand, they have to effectively manage that such improvisation will not come at the cost of another organization in a network. This chapter explores how improvisations relate with performance outcomes at the organizational level in turbulent and networked environments, which are core characteristics of a crisis situation. Specifically, this chapter operates on the following assumptions: (a) first, that organizations have performance
targets, and depending on the type of environment that they operate in, they resort to various resources, capabilities, and strategic actions to achieve superior performance outcomes; (b) second, that performance outcomes are variables that are defined by the organization, based on the nature of the sector that they operate in; (c) organizations have tacit and implicit knowledge regarding their strategic plans to sustain superior performance – in most cases, tacit knowledge is institutionalized through plans which form the basis of organizational practices; and (d) specifically in crisis situations, organizations become more tightly coupled within a network of organizations.

To this end, this chapter seeks to show an example of an organization that uses improvisation as a strategic action in a crisis environment, and surface key observations that might inform how improvisations may be conceptually linked with achieving performance goals.

The proceeding sections will discuss the following: (a) theoretical grounding of the capability-approach to strategic performance of organizations, with emphasis on improvisations (b) operationalizing the research in the context of crisis environment, (c) case description and analysis, and (d) conclusions, including implications for future research.

**Theory**

*Capability Approach to Strategic Performance in Specific Environments*

As mentioned above, frameworks about superior performance outcomes through sustained competitive advantage stem from the perspective of strategic management. RBV uses resources as theoretical constructs to understand organizational performance. However, this has been extended to dynamic environments because it was not sufficient to understand how organizations maintain competitive advantage in dynamic situations of change (Eisenhardt & Martin, 2000). DCT is perceived as a theoretical enhancement of RBV for the purpose of applicability in dynamic environments – maintaining that competitive advantage is achieved in dynamic environments through organizational dynamic capabilities, i.e. the ability to reconfigure existing resources in order to adapt to situations of rapid change.

An important observation of DCT is the role that environmental turbulence plays in the effectiveness and applicability of dynamic capabilities (Eisenhardt & Martin, 2000; P. A. Pavlou & El Sawy, 2010). In the literature of competitive advantage and performance, turbulence describes the conditions of unpredictability in the environment due to rapid changes in varying factors including changing customer (or stakeholder) needs, emerging technologies, and competitive actions (P. A. Pavlou & El Sawy, 2010).
In theory, a distinction is made between dynamic and turbulent environments. Eisenhardt and Martin (2000) describe a certain environment according to ‘market dynamism’: ‘moderately dynamic markets’ are those where changes have relative predictability where industry structures, market boundaries, and players are clear and known; meanwhile, ‘high velocity markets’ are those where industry structures and market boundaries are blurred, and players are ambiguous and shifting. In high velocity markets, uncertainty cannot be modeled as probabilities because it is not possible to specify a priori future states (Eisenhardt & Martin, 2000).

In moderately dynamic environments, where changes occur frequently albeit at predictable and linear paths, dynamic capabilities are effective as they rely on cumulative and existing knowledge. Conversely, this situation changes in high-velocity environments (i.e. environments with high levels of turbulence), where change becomes non-linear and less predictable (Eisenhardt & Martin, 2000). In such cases, organizational dependence on existing routines diminishes. Instead, they are perceived to rely much more on rapid creation of new knowledge that can be applied to novel situations (Eisenhardt & Martin, 2000). Scholars refer to such actions as improvisations (Eisenhardt & Martin, 2000).

Pavlou and El Sawy (2010) argue that where dynamic capabilities diminish in effectiveness of applicability as an environment evolves to become highly turbulent, organizations have to shift to the use of improvisational capabilities. It is important to note that the concept of ‘improvisational capabilities’ is distinct from ‘improvisation’ per se, and this will be discussed in detail in the later section of this paper which is devoted to unpacking improvisation as a concept and contextualizing it for the purpose of this study.

As far as capabilities vis-à-vis environmental turbulence is concerned, it may be gleaned from the discussions above that the source of competitive advantage (and ultimately of performance) evolves depending on the level of turbulence. Where resources are key to achieve sustained performance in stable environments, dynamic capabilities become the source of sustained performance in dynamic environments with linear and predictable change. As soon as the environment becomes more turbulent, another set of capabilities much more potent than dynamic capabilities are necessary to maintain competitive advantage. Literature points to improvisation as a crucial root of such capabilities (Eisenhardt & Martin, 2000; Eisenhardt & Tabrizi, 1995; Weick, 1998). Figure 1 visually adapts this observation:
The argument that resources diminish in their impact or effectiveness for a specific environmental type is represented by the downward sloping segment. Y-Axis represents that impact or applicability of specific resources and capabilities, while x-axis illustrates the changing environmental dynamics. Contextualizing this in crisis environments requires a conceptual grounding of how ‘crisis’ is defined. The present literature on crisis management offers a pluralist approach to the definition of a “crisis”, given that there has been no universally accepted definition of the concept (Rodriquez, Quarantelli, & Dynes, 2007). Broadly defined, a crisis is characterized by non-trivial threats to life, well-being, or other significantly held values, by unpredictability, or by urgency (Leidner, Pan, & Pan, 2009). Brecher (1979) points that following are the required characteristics to consider a phenomenon as a crisis: events pose threat to basic values of a society, high probability of involvement in hostilities, and finite time for response to the external value threat (Boin, 2008). Meanwhile, the United Nations defines crisis as stemming from disaster or a catastrophe – where a disaster is defined as a serious disruption of the functioning of a society, while a catastrophe refers to disasters causing widespread human, material, and/or environmental losses that they exceed the ability of the affected part of the society to cope adequately using only its own resources (Hiltz, Diaz, & Mark, 2011). Most of the definitions place emphasis on the stakes involved in a crisis, e.g. time, resources, and damages.
Figure 1 incorporates environmental characteristic and treats crisis as an evolving phenomenon that affects the extent of environmental turbulence. Thus to contextualize the framework, crisis environments may turn from dynamic to highly turbulent situations, which consequently pose implications on the applicability of capabilities. While all crises disrupt the normal functions of a society, include massive material and immaterial losses, uncertainty, and require effective and efficient decision-making under time pressure, there are some forms of natural and man-made crises that have previously been anticipated and prepared for by organizations (e.g. incidents such as super-typhoons, fire, public shooting, chemical spill). These are types of crises that have observable parameters despite the uncertainty, thus enabling organizations to anticipate necessary adjustments (which are often institutionalized in an Emergency Plan) for effective response operations. Meanwhile, there are other types of crises that do not have observable parameters – and often these are disasters that have associated incidents (e.g. super-typhoons that cause landslides and urban flooding; fires that spread in sensitive industrial places and cause explosion; chemical spill disasters that cause health disasters).

**Network Approach to Strategic Performance in Specific Environments**

Aside from varying levels of turbulence, organizations also have to account for the networked characteristic of crisis environments. Networks are loosely defined as a collection of interconnected actors or objects. Different scholars have attempted to offer a definition of network and a synthesis of such definitions show the following characteristics (Scriven, 2013):

i. Dynamic, ongoing mutually beneficial relationship among actors are present

ii. There exists a multi-dimensional nature of exchanges among actors

iii. There is a more or less voluntary nature of the links among autonomous actors

Networks are often represented in performance theories as a web where resources and dynamic capabilities are located. They are perceived as external investments of the firm, mainly manifested as alliances or acquisitions (Rothaermel & Hess, 2007), and as a potential trigger for dynamic capabilities to enrich network alliances (Gulati, 1999).

As external investments, networks are perceived as a source of resources and dynamic capabilities that can aid organizations in innovation. Scholars argue that in environments characterized by complex and rapidly expanding knowledge bases, innovation lies within a network of learning comprised of independent actors (Powell, Koput, & Smith-Doerr, 1996; Rothaermel & Hess, 2007). Following this line of argument, dynamic capabilities are created when organizations leverage on their networks to acquire new resources and consequently learn new resource combinations (Rothaermel & Hess, 2007).
A complementary treatment of networks in performance theories is not that it is merely a source of resources and dynamic capabilities, but a potential trigger for dynamic capability creation. Specifically, this perspective underlines that the ability of organizations to enter into networks is a demonstration of organizational capabilities. The notion of ‘alliance formation capability’ was introduced by Gulati (1999), who posited that such a capability is acquired through prior membership in an inter-firm network. In other words, the capability of an organization to enter into future alliances comes from previous memberships in inter-firm network. Building on this, other scholars point to ‘alliance function’ as a form of dynamic capability (Dyer, Kale, & Singh, 2001), which consequently provide an opportunity for them to leverage certain advantages and manage sustained performance.

These complementary perspectives help frame the role of networks in an evolving environment (i.e. one that evolves from stable to dynamic to turbulent) where organizations play in. Specifically, these two perspectives are tightly linked with one another in the function of network impact on organization. Scholars underline the potential impact of networks in specific types of environments. In stable environments, networks function as a reserve where resources are located. As the environment becomes more dynamic and ultimately more turbulent, networks become a mechanism that firms utilize to create, extend, or modify their resources (O’Brien, 2010). In more turbulent environments, the network becomes an active contributor to firm performance as network membership and proactive network collaboration can create opportunities for shared gains.

This implies that the more turbulent an environment becomes, the higher the impact of the network could be. This is illustrated in Figure 2 below. The impact of the network is conceptualized as having increasing impact as the environment becomes more turbulent, which is represented by the upward sloping segment. It is also assumed that established organizations have existing networks (hence the segment does not commence at zero) regardless of the environmental condition. However, networks become most useful as an environment becomes more turbulent. Impact, which is represented by the Y-axis, is conceptualized as the extent of usefulness in achieving performance goals on specific environments. In crisis environments, organizations are embedded in a network of actors that have responsibility and capability to respond to a disaster. The nature of a crisis is inherently complex (i.e. a “mess”), with a system of interrelated and highly interactive problems that affect multiple parts of a social ecological system (Dayton et al., 2004). High complexity and interconnectedness of issues make it challenging for organizations to resolve such “mess” on their own, hence prompting networks of diverse institutions such as business, government, and civic society to deal with these cross-boundary issues (Svendsen & Laberge, 2005).
An example would be the case of a first response organization like the fire brigade. In stable environments, the daily operations of the organization do not rely heavily on its network and it can achieve specific performance goals as an autonomous organization. However, when the environment becomes dynamic and ultimately turbulent, as is the case when there is a fire incident, it becomes imperative for the organization to tap its network to effectively carry out its performance goals. The network could include hospitals for the placement of victims, police force for related investigation as well as ensuring orderly operations, and in severe instances, it may also include relief organizations.

Real examples of network formations among actors during crisis situations include: 2002 SARS Epidemic Outbreak in Singapore and the 2004 Asian Tsunami (Leidner et al., 2009), and the 2010 Haiti Earthquake (Dugdale, Walle, & Koeppinghoff, 2012), among others. Network formations differ in intensity and structure – and while the modern nature of societal crises encourages practitioners and theorists to move towards a more in-depth consideration of networks, such networks often exist as “adhocracies” where large amounts of communication and coordination are often unplanned yet delivered fast (Malone & Crowston, 1994).
Understanding Improvisations in Turbulent and Networked Environments

The previous sections presented the theoretical foundations of DCT as well as its theoretical applicability in turbulent and networked environments. Specifically, it has been ascertained that (a) dynamic capabilities are not sustainable in turbulent environments (Eisenhardt & Martin, 2000; P. A. Pavlou & El Sawy, 2010; P. Pavlou & El Sawy, 2007), and (b) that networks could be a source of alliance forming capabilities, which in turn could be used to leverage organizational position in sustaining competitive performance in dynamic environments (Dyer et al., 2001; Gulati, 1999).

Organizations have to resort to a strategic action in specific environments, but as existing resources and capabilities have limited applicability in turbulent environments, organizations have to resort to improvisations. However, precautions exist for organizations that operate in networked environment, as the network impact also becomes even more significant in turbulent environments. To this point, Weick (1999) argued that improvisations as a strategy in one actor may pose challenges to another actor upon which the former is tightly coupled with. A key question for organizations is: in environments where improvisation is inherently used as a strategic coping mechanism to urgently address unplanned for situations, and where the achievement of specific performance goals have implications for the network that an organization belongs to, how does superior performance outcome come about? Indeed, considering improvisations as a strategic action to address turbulent and networked environments has to be studied closely. This section is thus devoted to unpacking the concept of improvisation and its perceived role in organizational performance where the environment is turbulent and networked.

Improvisation is defined as the conception of action as it unfolds, drawing on available material, cognitive, affective, and social resources (Cunha, Da Cunha, & Kamoche, 1999). As an action, improvisation occurs as a reaction to environments characterized by uncertainty, where there is no perceived gap between the composition of the action, and the execution of the action (Moorman & Miner, 1998a). It is ‘organizational’ to the extent that those undertaking improvisations are either the ‘organization’ or members of the organization (Cunha et al., 1999; Moorman & Miner, 1998a).

Examples of situations where improvisations were used as a strategic coping mechanism for organizations have been provided earlier in the section on Introduction. Notwithstanding its potential positive yields, improvisations are also not without caveats. Weick (1998) argues the following: first, within an organization, improvisation in one unit can also compound the problems faced by other units to which it is tightly coupled; second, improvisation may benefit some organizations under some conditions but may be a liability under other conditions (Weick,
To this end, a ‘newfound urgency in organizational studies to understand improvisations’ and advocate the study of improvisations among organizations as a means ‘to cope with discontinuity, multiple commitments, interruptions, and transient purposes that dissolve without warning’ is put forth (Weick, 1998).

The current literature on improvisation is populated with various approaches, including an epistemological approach to improvisation rooted on jazz, with specific emphasis on definitions and processes of improvisation including a study of related concepts of learning, memory, and sense-making (Moorman & Miner, 1998a; Orlikowski, 1992; Weick, 1998); an area approach, where different application areas such as new product development and disaster management are used to empirically surface key processes of improvisation, including a study of related concepts on creativity and innovation (Kendra & Wachtendorf, 2002; Miner & Moorman, 2001; Wachtendorf, 2004); and a conceptual approach, with focus on developing a framework for understanding the key differences and applicability of dynamic capabilities and improvisational capabilities (P. A. Pavlou & El Sawy, 2010; P. Pavlou & El Sawy, 2007).

While performance outcomes and improvisation have been scarcely discussed, selected conceptual and empirical studies provide some foundations for conceptually linking the two. For example, in her study on improvisations during the 9/11 World Trade Center Disaster, Wachtendorf (2004) identify ‘ideal’ improvisation types and also identified potential enablers to successful improvisation. Wachtendorf (2004) makes an important contribution on identifying three types of improvisation: reproductive, adaptive, and creative improvisation types. This lends a framework on better understanding how and for what purpose organizations improvise, as well as points to the role of certain facilitators of ideal improvisation types, which can serve as a useful guide among organizations as to the type of improvisation that are likely to help them achieve performance goals. While her work provided extensive insights and findings on the elements that helped facilitate successful improvisation of each type, she acknowledged that more extensive research be undertaken to better understand the factors that influence the emergence of each improvisational type.

A study that specifically demonstrated the likely association between performance and improvisation was the empirical study of Vera and Crossan (2005) on team improvisation and innovative outcomes among various organizations. They found that there are several dimensions that impact the effectiveness of improvisation and its link with innovative outcomes (Vera & Crossan, 2005), including expertise, team work, experimental culture, real-time information and communication, memory, and training. Aside from the empirical approach to improvisation and a likely scale/measurement for effective improvisation, their findings substantiated the argument that effective improvisation can be learned, which entailed important implications in the
management literature, specifically in organizational learning, which is considered a strategic renewal of an organization (Vera & Crossan, 2005). Learning specifically ties in the discourse on understanding what enables effective improvisation and conceptually linking it with performance outcomes. However, the extent to which this is applicable among organizations that inherently operate in turbulent and networked environments, i.e. in crisis contexts, has yet to be explored. Certain characteristics make such organizations unique from improvising firms in routine environments: first, these organizations are essential to restore the normal functions of the society, and thus performance outcome is hinged not just on material but also immaterial losses; second, at the onset of a crisis, these organizations shift operations into networked environments, which implies that while some of them may normally operate in competitive environments, the underlying assumptions on how performance outcome is defined will also shift with due consideration of coordination; third, such networks are not necessarily permanent, and the composition of the groups undertaking response operations is not always the same.

Improvisation and Performance Outcomes: Framing the Links Based on the Theoretical Considerations and Assumptions
The theoretical discussions above surfaced some key considerations that can help inform how improvisation and performance outcomes can be conceptually linked with one another. Using the theoretical discussions as a basis, the following assumptions are held:

1. **Type of Environment.** Organizations operate in a type of environment that ranges from stable to highly turbulent environments. Specifically, dynamic environments have observable parameters. Meanwhile, highly turbulent environments have unobservable parameters where it is difficult to model uncertainties as probabilities because it is not possible to specify a priori the possible future states (Eisenhardt & Martin, 2000).
2. **Impact of Network.** Organizations are embedded in a network of multiple actors, where the stakes determine the strength of the inter-organizational relationship. Network relationships range from adhocracies to highly institutionalized structures (Malone & Crowston, 1994; Scriven, 2013; Svendsen & Laberge, 2005).
3. **Network Dependency.** Achieving competitive advantage in dynamic environments relies on alliance formation capability or temporary network dynamic capabilities of organizations (Dyer et al., 2001; Gulati, 1999; O’Brien, 2010).
4. **Impact of Capabilities.** Dynamic Capabilities become difficult to sustain in highly turbulent environments, and their impact decreases as an environment evolves from dynamic to highly turbulent situations (Eisenhardt & Martin, 2000; P. A. Pavlou & El Sawy, 2010; P. Pavlou & El Sawy, 2007).
Consequently, improvisational actions may be seen in light of the assumptions above. Where the assumptions hold, the following can be expected:

1. **The role of structure and process.** How an organization situates itself according to the structure and process of the network it belongs to defines the extent of improvisation.

2. **Interplay of Role between Organization and Individuals.** The explanatory variables of competitive advantage are communally undertaken by the individual and the organization. This is substantiated by the findings of Vera and Crossan (2005), who highlighted specific individual attributes such as skill, experience, knowledge, and training as key enablers for improvisation. Given that improvisation is defined as the simultaneous occurrence of the conception and execution of the action, it can be argued that the main architects of improvisation are the individuals, who enact the performance goals of an organization. Hence, as the environment becomes more turbulent, the role of the individual in upholding performance through improvisational actions becomes more prominent, and the role of the organization is constrained to dissemination of ‘improvisational rights’.

3. **Performance outcomes from improvising organizations stem from interactions of architects of improvisation with collective level attributes such as structure and process.** The literature on improvisations show that some of the core enablers of improvisation that take root in the individual and their respective interactions: sense-making (Weick, 1993), individual repertoire that aggregate to shared knowledge in communities such as past experience, education, skillset, and knowledge (Wachtendorf, 2004), creativity (Kendra & Wachtendorf, 2002), memory and learning (Moorman & Miner, 1998a), leadership, memory, individual characteristics of members (Cunha et al., 1999), among other things. How these elements interact with collective level constructs such as structure and process might explain performance outcomes.

Using the findings from a single case of a simulated chemical crisis response in a Barcelona-based response organization (RO) (Villar & Miralles, 2015), these expected outcomes are demonstrated in the following section.

**Case Description and Analysis**

This chapter uses an exploratory case study of an RO’s crisis response operations (Villar & Miralles, 2015). As mentioned above, crisis response environments are uncertain, highly complex, and highly turbulent. These characteristics condition the occurrence of improvisation. At the same time, crisis response environments warrant performance from ROs. The authors
explore instances of improvisation through a simulation activity of the official RO in charge of crisis management in the Autonomous Government of Catalonia in Spain. The RO simulated a category-III chemical spill crisis (ammonia spill) in one of the private chemical plants in Barcelona, where a total of 7000 population are expected to be affected. The case employed non-participant observation method which lasted for a total of 3 hours, and is complemented by pre- and post-simulation focused interviews with representatives of the decision-making body of the RO.

Villar and Miralles (2015) specifies the main objective of the RO, which is to simulate crisis response operations at both the strategic and tactical levels according to an institutionalized Emergency Plan, with a performance goal of zero-to-minimal casualty and quick crisis containment. Autonomous organizations including the fire brigade, police forces, hospitals, and rescue operations call center participated in the activity. To manage these autonomous organizations, three coordination centers have been established as gateways of information: (a) Advanced Command Center (ACC), which is the coordination center on the field, and where the lead coordinator heads the formation and deployment of the intervention group; (b) Coordination Center for Operations (CCO), which is in charge of all information management about the crisis, i.e. it is the main source and coordinator of information across all the organizations in the network, and (c) Coordination Center at the Local Municipal Level (CECOPAL), which is comprised of technical and political representatives from different organizations and whose main goal is to undertake strategic decisions that will ensure efficient and effective implementation of the Emergency plan (Villar & Miralles, 2015). ACC is considered as the tactical decision-maker on the field for quick response, CECOPAL was in charge of strategic operations decision-making, and CCO generates processed information to aid the two bodies in their tactical and strategic operations. Data was primarily collected at the level of the highest decision-making body, i.e. CECOPAL, and the salient points from the observation are depicted in Table 1 (Villar & Miralles, 2015):

Table 1 shows that the actions of the RO in relation to their overall performance goal of zero-to-minimum casualty were aligned with the institutionalized emergency plan, except for two specific instances highlight a departure from the plan (e.g. time sequences T2 and T4). Villar and Miralles (2015) use those two examples to demonstrate improvised actions to quickly respond to an unanticipated and unplanned situation. The findings are consistent and build on the expected outcomes discussed in Section 2.D. above:
<table>
<thead>
<tr>
<th>Timestamp Sequence</th>
<th>Action</th>
<th>Alignment with Plan (Aligned or Deviated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0 (Start: 10:30)</td>
<td>Crisis Notification: Chemical Plant notifies RO of Ammonia Spill.</td>
<td>Aligned</td>
</tr>
<tr>
<td>T1</td>
<td>Emergency Plan Activation: CCO activates Emergency Plan - Alarms in the vicinity were signaled - Push notification was sent to CECOPAL for assembly - ACC was deployed to evacuate people from intervention zones</td>
<td>Aligned</td>
</tr>
<tr>
<td>T2</td>
<td>CECOPAL situation: three out of eight members of CECOPAL did not receive the notification. - The assembly of CECOPAL was delayed because of delayed information. - 20 minutes after the activation, a member of CECOPAL called CCO to confirm if the Emergency Plan was activated</td>
<td>Deviated</td>
</tr>
<tr>
<td>T3</td>
<td>CECOPAL Assembly and Crisis Response Ongoing</td>
<td>Aligned</td>
</tr>
<tr>
<td>T4</td>
<td>Unanticipated Change in the Intervention Zone: - There was unanticipated wind change, which altered the intervention zone. - While CECOPAL had to undertake discussions for best strategy, ACC (as first responders) rerouted the response map to include the wider intervention zone.</td>
<td>Deviated</td>
</tr>
<tr>
<td>T5</td>
<td>Crisis response containment: - Based on improvised fast response of ACC, crisis was contained. - Alert level was lowered</td>
<td>Aligned</td>
</tr>
<tr>
<td>T6 (End: 11:59)</td>
<td>Emergency Plan deactivation: - Crisis response concluded with the following reports: 2 major injuries outside of intervention zone; 3 major injuries inside the chemical plan; 2 groups of handicapped people within the intervention zone</td>
<td>Aligned</td>
</tr>
</tbody>
</table>

Table 2: Salient Points from Observation, Chemical Spill Crisis Response of Barcelona-Based RO adapted from Villar and Miralles (2015)

**The Role of Structure and Process**

Process is understood to be a sequence of interdependent events and can include methods of coordination and integration among members of a certain network. Actor interaction varies according to the flexibility or rigidity of coordination processes. Meanwhile structure includes the
role of technological and ecological configurations that allow organizations to undertake coordination processes.

In the case example, both T2 and T4 improvisations exhibited how methods of coordination and technology influence the way that individuals undertake actions. Coordination took place among three different main coordination centers, and within each coordination center, there were different representations from autonomous organizations. It was also obvious that information is one of the most important resources that allowed response to be undertaken. Information was centralized in CCO, and it was apparent that information was coordinated in a uni-direction – actions took place depending on the kind of information that the other coordination centers receive (Villar & Miralles, 2015).

At T2, there was incomplete diffusion of information to CECOPAL, leading to a delay in the assembly of CECOPAL. The coordination process as laid out in the Plan could be characterized as being more rigid than flexible in that information coordination was uni-directional and highly structured. Various studies find support that organizations that have highly structured processes are less prone to improvisations (Dougherty & Hardy, 1996; Leone, 2010). This potentially accounts for the hesitance of majority of the members of CECOPAL to undertake any action until everyone received information. However, this refutes the action undertaken by the RO representative to solicit first-hand information from CCO, even though such recourse was not programmed in the Emergency Plan, which is the script, that they are following. Cunha et al. (1999) argued that the rigidity or flexibility of coordination process does not solely account for the sense of urgency needed to undertake improvisation: milestones/action deadlines and clearly articulated goals are mechanisms that condition improvisations at a level that ensures effectiveness. During T2, CECOPAL was aware of their target performance outcomes (i.e. crisis containment with zero-to-minimal casualty), as well as the urgency of time. The same could be said with the improvisation that happened en masse at time sequence T4 when there was unexpected wind change, and strategic command was pending from CECOPAL so the ACC could redeploy effectively in the altered intervention zone. The ACC field commander instead improvised the response map and strategized deployment for its first responders while CECOPAL was discussing how to address the unanticipated situation. As the crisis response evolved, they found that the actions employed by the ACC were working, and CECOPAL supported it.

Crucial to this analysis is the interaction that transpired among four elements: the actor (i.e. represented organization) leading the improvisation, the rigidity of the coordination process, the urgency needed to respond to the crisis, and the performance target. On that note, the findings support the expectation on the role of process in eliciting improvisation among organizations that operate in crisis environments. Specifically:
Observation 1: The more flexible the coordination process, the more likely improvisations will occur. Where the coordination process is rigid, improvisations are likely to occur when urgent mechanisms (such as action deadline) and performance targets are clearly articulated.

This chapter also heavily draws on the role of the network, and the case findings demonstrate how network comes into play in situations of improvisation. The RO was not operating individually, it was embedded in a network of autonomous organizations that have stakes and roles in the crisis response (Villar & Miralles, 2015), which can be considered as a structural configuration of the organization. Performance outcomes therefore do not only rely on the ability of the RO to function and carry out its roles, but on the extent to which the dynamics among the members of the network allows the members to comfortably undertake their roles and actions. Felin et al (2012) contend that structure can constrain behavior, but they also enable efficient information processing, knowledge development and sharing, coordination and integration, and collective action. Moreover, the design of the decision-making activities within collective groups can affect capabilities.

T2 and T4 improvisations exhibited that as much as the Emergency Plan had clear stipulations on roles and structure, the members did not pay too much attention on the hierarchy of the members. The goal was clear, and all actions gravitated towards achieving the goal. In a post-simulation interview, the representatives who improvised in T2 and T4 mentioned that the plan was followed insofar as the goals and the roles were stipulated. In T2, even when the mayor had highest authority, the RO representative who improvised felt that by virtue of his membership in CECOPAL (which the Emergency Plan treats as the highest decision-making body among all the coordination centers), he was also granted authority.

Meanwhile, in T4 improvisation, the ACC commander mentioned that he interpreted his action more as a fulfillment of the role stipulated in the Emergency Plan. When the plan was revisited for post-simulation briefing, it was mentioned that the ideal situation would have been to wait for CECOPAL to come up with a strategic decision. However, there was agreement that the plan was not clear on which between the two prevailed during unanticipated situations: following the structure or executing their respective roles. The ACC interpreted the waiting time as an opportunity to exercise their role as stipulated in the plan, until CECOPAL came up with a decision.

Both instances surfaced the interaction of the organizational interpretation of the plan (note that the plan can be considered as the accepted institution that denotes the structure of crisis
response), the way the organizational function is perceived in relation to performance, as well as how the organizations individually situate themselves in a network of different actors with different representations. Thus:

**Observation 2:** The more open a structure is to interpretations, the more likely improvisations will occur. Where the structure is unclear and where urgency of action is perceived, the more likely improvisations will occur as a way to address performance goals.

Consistent with the expectation regarding the role of structure on improvisation, how the organization perceives its membership in a network of heterogeneous actors will influence the likelihood of improvisation. Specifically, the more the organization identifies with the goals and the role of the network as a whole, the more likely improvisations will occur as a means to achieve performance goals.

**Interplay of Role between Organization and Individuals**

Most research on improvisation has focuses on the organizational level. However, in the course of the observation conducted by the authors, a significant observation on the interplay between the organization and individual surfaced.

For example, the decision-making body (CECOPAL) was composed of individuals that held highest representation, authority and credibility of their respective offices. The group was comprised of representatives from the local municipality (including the mayor as the highest authority), police force, RO, health ministry, and fire brigade among others. At T2, the members who did not receive the push notification included the police force representative, the mayor, and another local municipality representative. No consensus was initially achieved on whether they should assemble or not, and discussions kept on as to what the Emergency Plan provides in such instances. No provision was found in the Emergency Plan, and without meaning to deviate from the plan, most members resolved to wait for all the notifications to come in. Twenty minutes later, the representative from the RO called the direct line of CCO to confirm if the Emergency Plan was indeed activated. Confirmation was received, and the mayor called the group to assembly.

The RO representative who deviated from the Plan is an experienced field officer who has been with the organization for more than ten years. In a post-simulation interview, he mentioned that at that instance, it was more important to work around the one-way information structure and get direct information than to lose time. The mayor was also newly elected – he had no prior experience of crisis simulation or a crisis response undertaken according to the institutions of the
municipality. During the post-simulation interview, he remarked that he was still in the learning process and was inclined to decide according the provisions of the Emergency Plan. It was implied that hesitance to deviate from the Emergency Plan despite the urgency of the situation, i.e. CECOPAL as the highest decision-making body that provides strategic direction to the rest of the coordination centers, can be attributed to his relatively scarce experience and knowledge of the individual. In contrast, the RO representative who is experienced in actual and simulated crisis response exhibited confidence to deviate from the plan in due consideration of the target performance outcomes.

On that note, individual experience accounts for the likelihood of improvisation in turbulent environments. Specifically, the more experienced an individual is, the more likely improvisations will occur. This argument is consistent with the findings of Cunha et al (1999) regarding the role of individual characteristics that affect improvisation. While improvisation at the organizational level has been defined as being undertaken by the individuals representing the organization (Moorman & Miner, 1998b), the findings of this study saw an important differentiating factor of the individual. In organizations as much as in networks, while actions are attributed to the institution, the very architect of improvisation is the individual. To this point, organizations can be considered as an aggregation of individuals that compose them, and some examples of individual level components that can account for capabilities include behavioral and psychological foundations (Felin, Foss, Heimeriks, & Madsen, 2012)

Figure 3 illustrates this proposed interplay. Specifically, in stable environments, where resources are used as explanatory variables for organizational performance, the architect of resource ownership is largely the organization. Resources are acquired by and owned by the organization. Like the case example used in this paper, resources such as emergency plan, digital command centers, best practices, and other related trainings are imparted by the organization for the individuals to follow during stable and routine situations. The role of the individuals is not entirely discounted because studies also provide support for the argument that knowledge, which can be considered as a resource that can lead to competitive advantage, is located in the individuals. Following this, competitive advantage may be affected when individuals leave or enter the organization (Abell & Felin, 2008; Felin et al., 2012). Nevertheless, given that resources go beyond knowledge, and organizations provide a way to standardize and routinize actions that lead to performance outcomes, the role of the individual as an active architect and owner of actions that lead to performance outcomes is minimal relative to the overall role of the organization.

This role sharing between the organization and the individual changes as the environment becomes dynamic. Specifically, the role of the individual becomes more pronounced as the environment becomes more dynamic and dynamic capabilities are practiced. This is posited
because reconfiguration of the certain resources to adapt to changing environments are equally undertaken by individual actions aimed at reconfiguration of resources, and the organization, which is the owner of the resources. Hence both the organization and the individual can be considered equal architects of dynamic capabilities.

![Interplay of the Role of Individuals and Organization vis-à-vis Type of Environment](image)

*Figure 3: Interplay of the Role of Individuals and Organization vis-à-vis Type of Environment (Adapted from Villar and Miralles, 2015)*

Finally, in turbulent environments, the individual takes prominent role as an architect of improvisation, while the organization takes minimal role. In the case used in this paper, the individuals did not have enough time to bounce back to acquire consensus with the organization as a collective in urgently addressing an unanticipated situation. This is consistent with what has previously been documented in different cases, e.g. the Mann-Gulch Fire (Weick, 1993), Disaster Response Coordination in the aftermath of 9/11 Twin Towers Attack (Wachtendorf, 2004), among others. In a related study on organizational transformation as an effect of improvised actions, Orlikowski (1992) remarked the effect of micro-level changes that actors enact over time on organizational change. The end-result of how an organization transforms is attributed to the changes that are enacted by actors at the micro-level over time as they make sense of and act in their respective environments (Orlikowski, 1992).

Nonetheless, the role of the organization as an architect of improvisation is not discounted entirely because the individuals, after all, are agents of the organization. Noting that improvisation blurs the distinction between conception and execution of action, the individuals as architects of improvisation will not have time to revert to the organization for validation. Just
the same, the organization has little control over the extent and type of improvisation that the individual will undertake since the type of environment (i.e. highly turbulent) is assumed to be novel and unfamiliar to the organization, where prior plans are not as valuable. This was exhibited in T4 when ACC took the opportunity to urgently address the change of intervention zone while they waited for the final strategic command of CECOPAL. Weick (1999) reconciles this by pointing out the role of the organization as a disseminator of ‘improvisational rights’. Specifically, when a firm disseminates improvisation rights, it tends to encourage the flexible treatment of pre-planned material (Weick, 1998).

The following observations are thus highlighted:

**Observation 3:** Organizations and individuals have shared role in achieving performance outcomes in certain environments. Where the environment is stable, organization as a collective takes the lead role as an architect of action (e.g. routines and resources acquisition) that leads to superior performance outcomes. Where the environment is dynamic, both organization as a collective and individual members take equal role as architects of actions (e.g. dynamic capabilities) that lead to superior performance outcomes. Finally, where the environment is turbulent, individual members of the organization take the lead role as an architect of actions (e.g. improvisations) that lead to superior performance outcomes.

**Performance outcomes of improvising organizations stemming from interactions of architects of improvisation with Structure and Process**

So far, the role of process and structure, as well as the role-sharing between individual and the organization, were discussed independently of one another. The findings allow for the conceptualization of a framework that can show a potential link between improvisation and performance outcome.

Specifically, certain facilitators of improvisation are located and enacted by the individuals, as was exemplified in T2 and T4. However, the individual characteristics can only enable effective improvisations up to a certain point. If the process had not been open to interpretation, it is possible that improvisation may have not ensued at both T2 and T4 examples. This is because the individual is ultimately embedded in a collective group. Building on the observations, this chapter thus proposes a conceptual framework for understanding how the interactions between individual and collective level attributes of improvisation explain why and how organizations achieve varying performance outcomes. Figure 4 depicts the conceptual framework, and follows the following logic:
1. Observation 1 and 2 shows that structure and process can facilitate the way in which improvisations occur;
2. Observation 3 shows that individuals and organizations have a shared role in enacting improvisation as a way to achieve performance goals;
3. Ultimately, the performance outcomes of improvising organizations could be influenced by the interaction of certain individual level attributes (e.g. skill, knowledge, experience) with collective level attributes of the organization (e.g. structure and process).

As an example, this conceptual framework could inform how improvisation came about and led to specific performance outcome in T2. The mayor, which had individual attributes characterized by low experience related to crisis, was acting within an organization that is considered highly structured and procedural. How can the interaction of the mayor’s individual attribute (of having low experience in crisis) with the structure and process that is highly rigid explain the non-occurrence of improvisation, and ultimately, a corresponding performance outcome? Likewise, the example of the RO representative who has, in contrast to the mayor, more experience interacting with the same collective level attribute of having highly structured and procedural design, could inform how improvisation came about, leading therefore to the achievement of the performance goal. The conceptual framework potentially provides a way to understand how performance outcomes varies as a result of the interaction of the collective level attributes and individual level attributes among improvising organizations.
Conclusion

This chapter was primarily motivated by understanding how improvisations are conceptually linked with performance outcomes of organizations that operate in turbulent and networked environments. There is general agreement in the literature that improvisations could either lead to negative or positive performance outcomes. Where improvisations yield positive results, not all of them can significantly contribute to competitive advantage. Explaining various performance effects (i.e. negative, positive, or neutral) as a result of improvised actions warranted an approach that takes into account the networked structure and process of the environment.

Using the case findings of a simulated chemical spill crisis (Villar & Miralles, 2015), observations that build on the way that structure and process enable improvisation among organizations that operate in a network are introduced in this paper. Specifically, the observations provide insights on: (a) the interaction of rigid and flexible process and structure with organizations and perceptions of urgency and performance targets, (b) the role-sharing between organizations and individuals in undertaking actions that may affect performance outcomes depending on the environmental context, and finally, (c) how performance outcomes stem from the interactions between individual and collective-level elements. The last point constitutes the main contribution of the chapter and has been conceptualized based on the main observations from the case.

Limitations and Future Research Implications

This chapter is not without limitations. The reason for using a single case is grounded on the primary motivation of the paper to explore and initially surface and unpack certain elements that can help explain improvisation and its varying impacts on performance outcomes. However, the findings of this study are constrained to a single case, and to enrich the discussion, future studies may want to look at expanding the number of cases. Further empirical grounding is also important, given that this paper is highly conceptual. Moreover, while the case simulated a crisis response which by nature of its category and potential impacts are considered to be highly turbulent, actual crisis environments are far less controlled than simulated crises. It would be interesting to find out if the same findings hold true in real crises with varying magnitudes. Finally, the membership of the network was only diverse insofar as background, skills, and experience are concerned. For this specific case, all members of the RO and the network it was embedded in have more or less similar cultural background. It would be interesting to find out if culture and member diversity plays a role on the likelihood of effective improvisation in bigger crises which have international impact and bring in various actors from varying cultural background.
References


