Essays on ‘Disorganization’ in Contemporary Organizations

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Abstract

Twentieth century management thought consisted of assuming ‘order’ as a necessary condition for increasing employee productivity. However, from mid-century a number of studies started to indicate that assuming ‘order’ as a necessary condition for productivity is misguided. More recent studies have shown that ‘order’ may be largely detrimental to productivity. These findings have prompted researchers to look deeper into organizational ‘order’ and ‘disorder’. In this work the term disorder now has been replaced with the broader concept of ‘disorganization’. In its various incarnations (i.e. chaos, disorder, mess, entropy), disorganization has been explored in many biological, cultural, social, legal, physical, information and political systems. Disorganization is universally encountered within all organizations but has received relatively little attention from academics and practitioners in the management field. This is due to ambiguities in the concept, strongly held management beliefs (i.e. assuming order is good), and a general negative perception of disorganization. These issues have led to major shortcomings and confusion among academics in advancing research directed towards understanding disorganization. This research attempts to address these issues in depth and explores the usefulness of disorganization in contemporary organizations. The research herein is a systematic study of disorganization in

order to achieve three specific objectives: a) Provide a theoretical clarification of disorganization and its benefits, b) Develop an understanding of the causes, characteristics, and effects of disorganization, c) Understand the implications of disorganization for academic research and management practice. In order to achieve these objectives novel techniques for theory building and experimental simulation design have been utilized. The research relies on agent-based simulations and conventional data analysis techniques. This work explores disorganization operating within organizations and how it affects its individuals and teams and falls under organizational behavior and presents three primary contributions in terms of theory, method and empirical evidence.

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Declaration

This thesis consists of three years research I have undertaken on the topic of ‘disorganization’. Both chapter 3 and 4 have been peer reviewed and published. I was the primary author of all the publications. The method (Agent based modeling), conceptual developments and the simulation models have been presented at 2 conferences (EURAM 2015 and 2016) and 2 workshops (AIBS 2014, 2015). Chapter 2 has been accepted to the Huddersfield University research conference in 2017. Chapter 5 is prepared for publication in 2018. For each of the aforementioned conference and workshop papers and presentations, I am the primary author and presenter.

Chapter 1: Introduction

Over the past century management thought consisted of assuming ‘order’ as a necessary condition for increasing employee productivity (Taylor, 1911; Nonaka, 1988; Alvesson and Spicer, 2012). Starting from the rational management paradigm spearheaded by scientific management (Taylor, 1911) all the way up to more recent open management paradigms (Gomes et al., 2003), many scholars have supported the idea that increasing organizational structure and organizing work in a rigid manner yields to increased productivity (Thompson et al., 2009). However, from mid-20th Century a number of studies indicated that assuming ‘order’ to be a necessary condition for productivity is misguided (Crozier, 1969; Merton, 1968). In fact, more recent studies have shown that ‘order’ may be largely detrimental to productivity, especially when it limits the ability of employees to exercise their autonomy (Crozier, 1969; Merton, 1968; Mayo, 2013; Dickson and Roethlisberger, 2003). These findings have prompted researchers to look deeper into organizational “order” and “disorder” (Warglien and Masuch, 1996; Abrahamson, 2002; Abrahamson and Freedman, 2007). In the past three decades studies which indicated both theoretically and empirically the advantages of “disorder” as opposed to “order” in increasing employee productivity have emerged (Warglien and Masuch, 1996; Abrahamson and Freedman, 2007; Fioretti and Lomi, 2008). Further studies have shown the importance of disorder in increasing employee autonomy and generating increased employee motivation and job satisfaction (Tietjen and Myers, 1998).

The research into “disorder” and its advantages now have been advanced mainly on theoretical fronts while empirical research into disorganization is still in its infancy (Abrahamson and Freedman, 2007). There have been theoretical developments in the concepts which have now led to the concept of ‘disorganization’ of which disorder is only one aspect of the larger process of organizational disorganization. Disorganization in its various incarnations (i.e. chaos, disorder, mess, entropy) has been explored in many biological, cultural, social, legal, physical, information, political systems (Lindgren and Schwartz, 2009; Rutten and Ven Der Veen, 2012). Disorganization studies in each of these contexts present various nuances to the conversation of disorganization in the larger context. Some of these concepts are interoperable among disciplines while other concepts loose its utility out of its disciplinary context. The research discussed in this document focuses on disorganization in the specific social systems context of contemporary organizations. This research falls under organizational behavior and presents implications to human resource management. Organizations can be defined as socially organized complex human systems (Abrahamson, 2002) and consist of individuals hierarchically (tightly or loosely) ordered within it. These individuals often act in teams to achieve common goals. Therefore, the research herein explores disorganization operating within organizations and how it affects its individuals and teams. This research is of particular interest to contemporary management practitioners and researchers alike as disorganization is encountered universally within all organizations (Abrahamson, 2002) even though it has received relatively little attention from academics and practitioners in the past (Abrahamson, 2002). This is due to ambiguities in the concept, strongly held management beliefs (i.e. assuming order is good), and a general negative perception of disorganization. These issues have led to major shortcomings and confusion among academics in advancing research directed to the understanding of disorganization.

This research attempts to address each one of these issues in depth and explores the usefulness of disorganization in contemporary organizations. In order to address these shortcomings, the following research aims at '*studying of the concept of disorganization and its effect on individuals and teams in organizations'*. In line with the aforementioned aim, the research herein is a systematic study of "disorganization" in order to achieve three specific objectives. These are as follows.

a. Provide a theoretical clarification of disorganization and its benefits
b. Develop an understanding of the causes, characteristics, and effects of disorganization
c. Understand the implications of disorganization for academic research and management practice.

In order to achieve these objectives I utilize novel techniques for theory building and experimental design, namely agent-based simulations (Gilbert, 2008; Edmonds, 2013; Secchi, 2013), as well as big data analysis techniques (Scheutz and Mayer, 2016). Computer simulations have been utilized in mathematics (Berselli, Lliescu and Layton, 2005), physics (Birdsall and Langdon, 2004), chemistry (Van-Gunsteren and Berendsen, 1990), biology (Davidsson, 2002), astronomy (Bell and Trundle, 2008), economics (Cohen and Cyert, 1961), psychology (Ostrom, 1988, Edmonds, 1999), neuroscience (Medina and Mauk, 2000), and many other scientific disciplines but are only starting to be embraced by management scholars today (Fioretti, 2013; Secchi, 2016; Secchi and Neumann, 2016). This research is one of the first systematic utilizations of simulations to the study of human behavior in organizations (mapping to the field of organizational behavior).

As a whole, the research undertaken makes three primary contributions in terms of theory, method and empirical evidence. Theoretically, the research makes the case for disorganization and provides a clarification of the concept of disorganization while introducing a categorization of disorganization into types which can then be empirically studied in a systematic manner. In terms of method, the research makes the case for "simulations" as a viable, practical and cost effective methodological tool for theory building and experimental design. The research further contributes in presenting empirical evidence for disorganization while highlighting the key challenges likely to be encountered in the empirical research of disorganization. Finally, the research is not only a case for both disorganization and simulations but in fact a demonstration of how an organizational construct (disorganization) can be studied using novel methodological tools (simulations).

This chapter consists of the introduction of the topic and the method and focuses on explaining how the concept of "disorganization" fits within the broader field of organizational behavior and management. The chapter also explains the connection of the concept to traditional management theory in order to draw comparisons and contrasts and to expose the research gap I am trying to fill. The chapter next discusses the philosophical assumptions underlying the research as a lead up to explaining the methodology used. In this section, first, the case of the methodology used for the research is discussed. Simulations are introduced as a methodological tool for management research and specifically agent-based modeling is introduced along with its benefits for researching organizational behavior. Finally, the first chapter is used to outline the structure of the thesis in order to enhance the readability of the document.

1.1 Why Study "Disorganization"?

Over the past century, organizational management has gone through a considerable level of evolution. Starting from the turn of the century (1900), organizations were seeking methods to increase the efficiency and effectiveness of their workforce in order to bolster productivity (Taylor, 1911). This attempt gave rise to the classical/rational management paradigm (Scott, 1998). Starting from Taylor (1911), the classical management paradigm sought to rationalize the organizational functions with a focus on worker efficiency. The focus was on integrating the scientific method into managing people in order to obtain optimal efficiency in work processes. In operationalizing scientific management, practitioners and scholars alike started embracing organizational "order" and structure as the basis for increasing productivity (Shenhav, 2002; Nelson, 1974; Mowrer, 1939). In doing so managers sought to replace the old ad hoc rules of thumb with a clear and rigid set of rules, regulations, and management structures (Taylor, 1911). By mid-century, the limitations of the rational management paradigm were surfacing (Mayo, 1949). The most prominent issue with the rational model of management was the deliberate neglect of the employee and the over emphasis on systemization of work processes (Scott, 1998). Rectifying these issues later, management theorists and practitioners sought to shift the focus from efficiency to a more people-centric management paradigm (Tirpak et al., 2006); this is referred to as the natural systems viewpoint (Dickson, 1939). Nevertheless, this natural systems viewpoint still focused on hierarchical structure and order as a basis for increasing productivity (Abrahamson, 2002). What shifted in this natural systems viewpoint was not how management is structured, the hierarchical nature of organizations or the underlying assumption 'order leads to productivity' but how the employees were viewed and treated (i.e. working conditions). Finally at the later parts of the century the focus once again shifted to a contingency-oriented management paradigm. Scholars started focusing on the relationships organizations have with their external environment and how the external environment shaped the functions of the organizations (Pondy and Mitroff, 1979). This shift in thinking led to the acceptance of a plurality of management styles as opposed to a 'grand theory' of management as envisaged by some earlier pioneers of management theory (Mayo, 1945). Once again as with the natural systems viewpoint and the rational management viewpoint before it, the “open” management paradigm too shared the same underlying assumptions. Namely, that “order leads to better productivity” and structure was still viewed as a means to achieve organizational efficiency.

In time, however, these underlying assumptions started to unravel; starting from the later parts of 1950’s experimental scientist started to observe both in their laboratories and in real life studies that increased order does not always lead to the better productivity or efficiency (Crozier, 1969; Merton, 1968). These findings baffled the majority of management scholars as it was an unexpected finding (Dickson and Roethlisberger, 2003; Abrahamson and Freedman, 2007). Further research carried out in subsequent decades corroborated the findings of Merton (1968) and Crozier (1969) and showed that order is not a necessary condition for increasing productivity. In fact, research indicated that order in some cases leads to dramatic falls in productivity (Abrahamson, 2002). These decreases in productivity were accounted as being due to the lack of autonomy employees encountered when organizations increased order (Warglien and Masuch, 1996). Another cause of these decreases was observed as being due to employees having access to either unsuitable, low quality or mismatching resources due to the large number of restrictions imposed upon them (Abrahamson and Freedman, 2007). A further cause for these decreases was the increase in organizational complexity to unmanageable levels due to the high order and rigid rules and regulations (Abrahamson, 2002). Further research found that some of the most productive organizations tend to have a simple structure and minimal regulations (Larsen, 2002; Foss, 2003); These findings prompted scholars to start systematically studying the **a)** processes of reducing organizational structure and **b)** trying to understand the increasing complexity within organizations (Damanpour, 1996). In comparison, when observing the literature on the subject it is clear that a lot of research attention has been given to “**b**” (Abrahamson, 2002) and “**a**” has largely been ignored.

Given this disproportionate research attention some ambiguity has been introduced to the study of disorganization (Abrahamson and Freedman, 2007). It is an ongoing effort (Larsen, 2002; Abrahamson, 2002) to balance the research attention in order to have a better theory of disorganization. Disorganization as a concept currently stands in direct opposition to the rational management paradigm consisting of rigid structures and inflexible rules. Disorganization does nevertheless stand in a more favorable position in comparison to natural (organic/employee centered) and open (contingency theories) systems views of management given that disorganization embraces contingency and natural phenomena within a system. However, it does not neatly coincide with either viewpoint. This is because the underlying assumption of all three viewpoints (rational, natural and open systems) seem to be favoring “order” or ”organization” as opposed to “disorder” or ”disorganization”.

The research presented in this document challenges the assumption of “order” as a favorable state for organizations. Building on previous research, theoretical arguments (Warglien and Masuch, 1996) are presented along with experimental evidence (Cohen et al. 1972; Fioretti and Lomi, 2008) as to why "order" is not necessary for increasing productivity while highlighting the merits of disorganization. By bringing to bear the pitfalls of embracing "order" and the merits of "disorganization" this research expands current management theory by providing new ways of looking at managing individuals and teams in organizations. It argues for "disorganization" to be viewed as an asset and a management tool which can be utilized for enhancing creativity, employee satisfaction, efficiency and effectiveness in an organization and explores ways in which disorganization can be managed.

1.2 Research Philosophy

The disorganization literature consists of a predominantly pragmatic realist philosophical approach where researchers devise theories to explain phenomena observed within organizations (Weaver et al., 2014). A realist approach focuses on a theory's explanatory power (Kemeny and Oppenheim, 1955). However, a theory which has a high explanatory power does not necessarily have a high predictive power (Niiniluoto, 2014). Therefore, simulations which are virtual representations of phenomena usually come out of an instrumentalist philosophical approach (Epstein, 1999). An instrumentalist emphasizes a theory's predictive power over its explanatory power, denies that theories have true values, and usually defines scientific progress by referring to other virtues theories may have, such as their increasing empirical success (Boero and

Squazzoni, 2005). This is known as *scaffolding (*Schank et al., 2013*)*. Scaffolding is the conceptual support structure used to explore a given concept (Schank et al., 2013). The scaffold itself would not be a fully accurate representation of the real world, but instead acts as a mechanism to aid the understanding of a concept (Azevedo and Hadwin, 2005). Toy models such as the '*little man computer (LMC)*' used to teach advanced Von Neumann architecture (VNA) concepts in commuter science are prominent examples of an instrumentalist approach (Yehezkel et al., 2001). The LMC model taken as a whole is a very simple and incomplete representation of VNA however it provides the conceptual scaffolding needed to understand the concept and even make predictions (Osborne and Yurcik, 2002). A realist perspective in contrast attempts to represent the real world through the theories as accurately as possible and has a larger emphasis on explanatory power. However, instrumentalism and realism are not mutually exclusive (Kemeny and Oppenheim, 1955). As Schank et al. (2013) argue, when the level of detail (granularity) of a model increases — the closer it gets to mimicking the real world; this is apparent especially when the modeling involves individual agents — which necessitates more representation of the real world, thus Grimm et al., (2005) argue modelers working at the individual level by default have a realist approach to some extent. Therefore, as Bonabeau, (1997) and Schank et al., (2013) mention most work involving agent based modeling uses a reconciled philosophical perspective where realism and instrumentalism are combined in order to achieve systematic power (combination of explanatory power and predictive power) as the arbiter of a good theory. More and more research which involves agent based models developed using empirical data are examples of such a philosophical emphasis on systematic power (Kemeny and Oppenheim, 1955). While the simulation components (chapter 3 and 4) of the research discussed in this document use an instrumentalist approach to make better predictions about disorganization, the theoretical (chapter 2) and empirical (chapter 5) portions of this research take a more conventional realist approach. Taken as a whole the research herein focuses on attempting to reach high systematic power overall.

1.3 Methodology

Starting from the realist standpoint that considers disorganization as an objective phenomenon to be studied the research methodology had to be carefully constructed. The aim of the methodology was to develop a theoretical understanding of disorganization and then study the implications of the theory in a systematic manner. Then the study of the implications was used to enhance current theory and to open up avenues for future empirical study. The conventional methodological approach generally takes the form depicted in Figure 1.

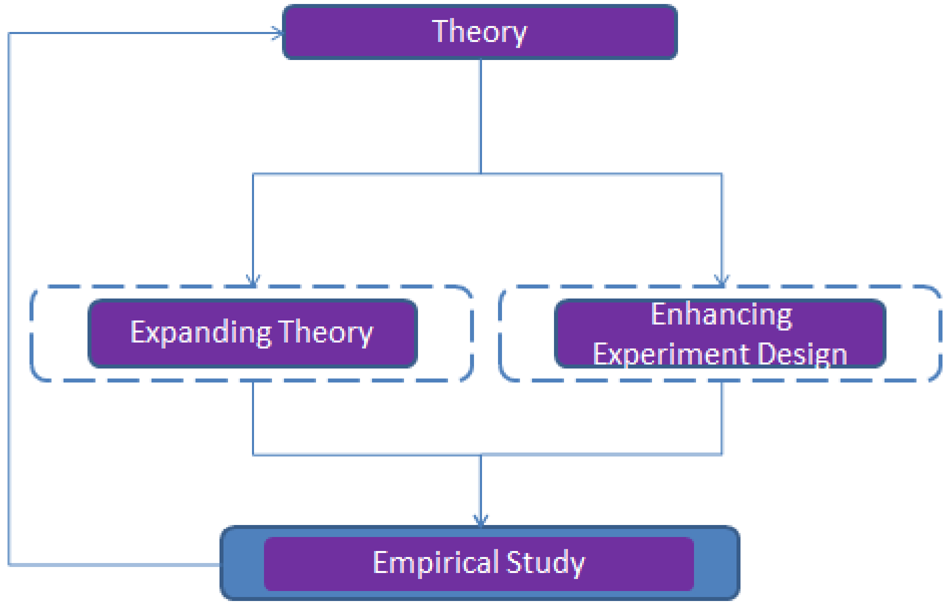

Figure 1: Conventional Methodology

As depicted in Figure 1, the first step in the research process involves developing an understanding of current literature. This includes a comprehensive literature search and review (Kothari, 2004). This effort is then followed by developing conceptual expansions (Scandura and Williams, 2000) to the current theory along with experimental research (Rosenthal and Rosnow, 1991) in order to first corroborate current theory and then to test new conceptual developments. This process then yields to expansions of the body of knowledge and these expansions subsequently become “current” literature in the research area and the process reconvenes. This process has proven to be effective for decades and has yielded satisfactory results over the years (Scandura and Williams, 2000). Nevertheless as many scholars point out, this process is by no means at its optimum and a lot of improvement can be made

(Kothari, 2004). One of the major issues with conventional process is the ad hoc nature of how conceptual developments and experimental designs are constructed (Kothari, 2004). In the conventional approach, the conceptual developments and experiments are based on a researcher's understanding of the current theory (Rosenthal and Rosnow, 1991). This then means that the “understanding” a researcher develops by surveying the literature is vital for the process to work accurately. Any mistakes or lapses in the understanding would lead to inaccurate conceptual and experimental designs which in some cases lead to temporal, financial and manpower wastage (Peffers et al., 2007). In order to minimize mistakes and lapses that could occur in understanding theory and subsequent experiment design, many scientific disciplines place optimization processes to the research plan (Fu, 2002). Among the optimization processes available to the modern day scholar technology plays vital role (Pinsonneault and Kraemer, 1993). One such technology driven technique is simulations. A simulation provides a process for understanding a given the theory and its implications in detail (De Jong and Van Joolingen, 1998). Simulations act not only as an optimization tool but also as a methodological “third leg” in research (Secchi and Neumann, 2016). It should, however, be noted that simulations do not replace the conventional empirical studies instead, they act as a parallel research method which is both an aid and an optimizer of conventional research approaches. A *computer simulation* is usually a software program, run on a single computer, or a network of computers, to reproduce behavior of a system or to explore behaviors of systems which can be inaccessible through conventional methods (Brockman and Dawkins, 2009). Simulations are numerical in nature at a fundamental level (Santner, 2013). Under its numerical description simulations can be broadly categorized either as a deterministic and non-deterministic (stochastic) models. The most common form of simulations used in science tends to be statistical simulations which are deterministic (Chang, 2012, Stefan and Atman, 2015). This means that the underlying initial conditions and the relationships defined can be evolved in time and each state of the system can be predicted beforehand given sufficient computing (calculating) power. Therefore these deterministic models tend to be used for forecasting future states of a system to high accuracy (Santner, 2013). These simulations usually work based on generalizations such as density or concentration of a given construct (Niazi and Hussain, 2011). Such deterministic simulations focus on macroscopic system dynamics (i.e. how a system behaves holistically).

On the other hand the non-deterministic types of simulation models even though start with a specified set of initial conditions can have unpredictable evolution over time. Thus calculating precise future states of such a non-deterministic model is extremely complicated even though a formal representation and approximate predictions can be made (Santner, 2013). Both these categories of simulations have proven to be highly effective in their respective domains and the questions of which simulations approach to use tend to depend on the questions and level of analysis one is aiming to study through the simulation. A study which aims to simulate emergent and chaotic behavior generally tends to be stochastic in nature. However, how these simulations are developed can differ. A stochastic simulation which models chaotic behavior can be either formalized based on relationships of entities within the model or on an individual basis. Most stochastic equation-based modeling techniques such as dynamic stochastic general equilibrium (DSGE) modeling use a top down approach and assumes systems are either in a steady state (equilibrium) or moving between two equilibriums. However, some systems tend to be in a constant state of dynamism or take a considerably long time between equilibriums which results in chaotic and emergent behavior within the system. Simulating such complexity and emergence tend to prove problematic through conventional simulation techniques which require a high emphasis on the relationships among the agents within a system.

As a solution to this problem agent based modeling has been introduced into the conversation. Agent based modeling provides the capability of modeling individual agents with characteristics independent of any other agent thus providing a level of autonomy to agents within the model which were previously hard to simulate through conventional methods. Agent based simulations are a special type of discrete simulation that does not rely on a model with an underlying equation which defines the system as a whole, but can nonetheless be represented formally at an individual level. In ABM each agent possesses an internal state and set of behaviors or rules that determine how the agent's state is updated from one time-step to the next. Over the past decade the support for agent based models has grown significantly where some researchers suggest ABM does a better job at representing system complexities than standard modeling techniques (Arthur, 2006). In a rudimentary sense, a simulation can draw parallels to a diagram. A diagrammatic representation of a concept is utilized to visualize and to understand a certain concept better. In some cases, a diagram is used to communicate a complicated concept in a simple manner. In other instances, a diagram is used to outline the key points a certain concept entails. The diagram then acts as a sense-making tool and a tool which provides a different perspective for a concept being studied, perhaps a better or simpler perspective. Simulations too can be utilized in such a manner. Unlike diagrams, however, simulations provide a broader range of options for the sense-making process. Simulations not only provide the ability to visualize concepts but also provide the capability of taking concepts and ideas to their logical conclusions within a short period of time. Furthermore, simulations provide the ability to visualize and envisage possibilities and to make predictions. With the availability of powerful computers and modern-day analysis techniques, this approach provides a robust way of understanding theories and their implications. However, the capabilities of simulations are not only limited to the sense-making process, instead, they can be utilized to test ideas and devise experiments that can be impossible to study in a real word setting due to logistic limitations. Thus, simulations provide the researcher with the capability of studying a concept far beyond a traditional approach would have allowed. A prominent example for this can be seen in astronomy. With current technology, humans are barely capable of studying the edge of the solar system utilizing probes. However with the advent of powerful simulation techniques, astronomers are now capable of simulating how the universe behave far beyond the solar system without actually having sent a probe to do the job (Hockney and Eastwood, 1988). Without such techniques, the expansion of astronomy theories would have been a far more tedious process and, in some cases, would have taken hundreds of years. Similar examples are present in neuroscience (Margulies et al., 1990) and economics (Broadie and Glasserman, 1997). A closer example of how simulations can effectively help management research is when a research team encounters logistical issues with data collection/storage or analysis (i.e. financial, manpower related, unaccounted circumstances). Using the conventional process any such issues would have severe drawbacks to the research process. With the use of simulations, researchers are now able to build on real world data and simulate situations in a ‘*virtual laboratory*’ which are logistically impossible to access in real life (Secchi and Neumann, 2016). Another reason for using simulations is the ability of a simulation to be tweaked easily; changing parameters, outcome variables and study dynamics (Gilbert, 2008). Such a change in a conventional study would require substantial investment and manpower. Among all the reasons for simulations, one of the most persuasive and useful aspects of simulations is the ability to use them to find out which possible research avenue to pursue from a competing set of research avenues (Bazghandi, 2012). Before simulations, this was done through intelligent guesswork (Bazghandi, 2012). With the advent of simulations, researchers are now able to "test" the implications of a theory and study the multiple outcomes at once; the simulation will then indicate which outcomes are worth pursuing and which are not. This ability of simulations to provide a filter for optimization is the most prominent case for using simulations as a methodological optimizer (Secchi and Neumann, 2016.

In constructing the research methodology I have opted for an approach which utilizes the benefits of simulations not only to enhance the research process but also to operationalize and demonstrate how simulations can be used in management research. This research is one of the first instances where simulations have been systematically used to study a concept in organizational behavior.

1.4 Method Selection

For a researcher utilizing simulations for enhancing the research process, there are a few competing techniques. Most research which involves simulations use techniques that can be referred to as “equation-based modeling”. These modeling techniques require the researchers to have a substantial knowledge of mathematics because each of the constructs within the simulation is mathematically defined (Janssen, 2005). Furthermore, these mathematical objects then require being defined in relationship to other mathematical objects within the model as a whole in order for them to interact (Bazghandi, 2012). Such an approach is very effective in economics which has well-defined relationships among various constructs. However, adopting this method to social science creates a unique set of problems (Secchi and Neumann, 2016), the first of which being the added requirement for management researchers to be competent in mathematics (Bazghandi, 2012). Such a requirement, as trivial as it seems, has kept many management researchers from embracing simulations as a viable optimizer. This was due to the fact that it takes substantial investment to learn the techniques at which point the benefits of the technique are overshadowed by the stress of learning it (Bazghandi, 2012). From a more technical aspect, as opposed to hard science or economics, management research deals with individual agent (sometimes acting in small or large groups) within organizations (Fioretti and Lomi, 2008). The behaviors each of these agents cannot be easily reduced to an equation (Secchi and Neumann, 2016. It would be a far better option to model individual agents as independent entities with inherent behaviors rather than an equation which has relationships to other equations (Secchi and Neumann, 2016). Such an agent-based modeling approach would eliminate added technical difficulties and make the modeling process easier and faster (Lomi and Harrison, 2012). The application of agent based modeling for studying organizational concepts have been discussed in detail in chapter 3 and 4.

1.5 Agent-Based Modeling (ABM)

ABM is well suited to simulate phenomena in the field of organizational behavior (Lomi and Harrison, 2012; Secchi, 2015) because it allows for capturing emergent phenomena as well as unexpected behaviors and is flexible in the parameters that can be specified within the model (Gilbert and Terna, 2000; Gilbert, 2008). Modeling is the process of building an abstraction of a system for a specific purpose (Galán et al., 2009). An agent based model in particular is a computer program which tries to simulate real world phenomena (Moss, 1998; Edmonds, 1999). The extent which an ABM describes the real world can vary (Edmonds and Moss, 2004). ABM provides a bottom up approach where one can specify micro level individual agents (entities) within the model, without having to define macro level system dynamics. When the simulation is executed these micro level interactions of individuals can display macro level (group) phenomena which could not be predicted before the execution of the simulation (emergence). This capability of the technique to enable researchers to study emergence in complex systems is a key reason social scientist are embracing this technique. This approach facilitates a more straightforward link between the entities in the target system (i.e. individuals in a given organization) and the parts of the model that are used to represent them (agents within the model). As with ABM models where micro level interactions produce macro level phenomena, real world organizations display similar characteristics, therefore using the technique provides a direct method representing and studying the real world (Edmonds, 2001). However, given that ABM as a technique is novel to social science, the ways in which ABMs are developed vary considerably (Edmonds and Moss, 2004). Some researchers tend to prefer simple models while others prefer more descriptive models (Edmonds, 1999; Edmonds and Moss, 2004). Another important fact of ABM is that the technique can be used in conjunction with more established research techniques (statistical analysis, data mining) and can use either quantitative or qualitative data as a basis for modeling (Moss and Edmonds, 2005; Galán et al., 2009). With the optimization process (agent-based simulations) in place, the research methodology takes the form of Figure 2.

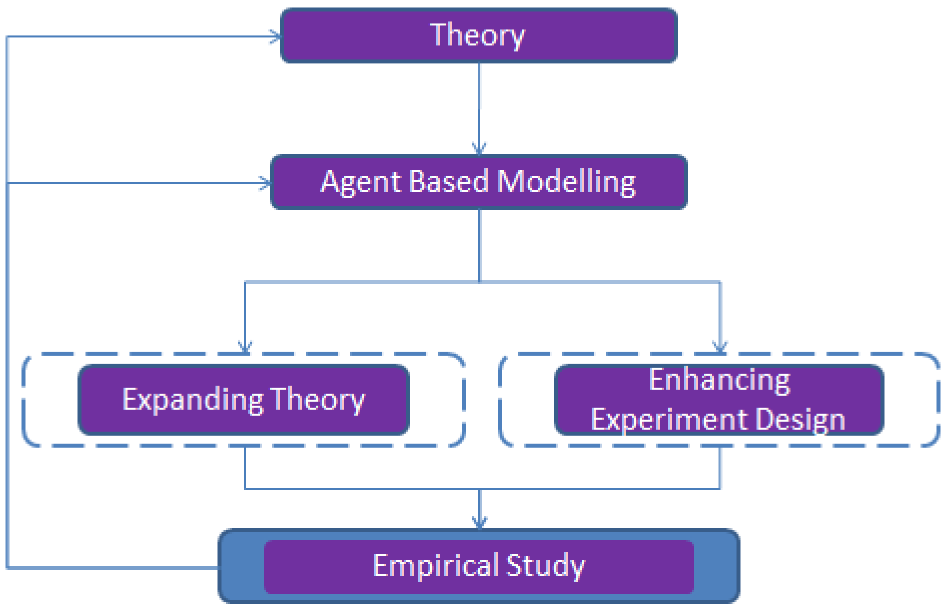

Figure 2: Optimized Methodology

In Figure 2 the conventional processes depicted in Figure 1 are retained; however a new intermediary process has been added for optimization and accuracy. This methodological approach has been used by multiple researchers (Epstein, 2006; Fioretti and Lomi, 2008). This model is especially appropriate for studying disorganization since the concept has not yet been fully understood and a theoretical understanding of disorganization is lacking. Therefore, using a conventional methodological approach (as depicted in Figure 1) would pose challenges to researchers in developing research studies. Therefore utilizing the methodology with a simulation based research optimization step would provide more bases for developing research studies. Thus, the model depicted above (Figure 2) was chosen as the methodological approach for exploring the concept of disorganization.

1.6 Thesis Structure

The thesis consists of six chapters. Each chapter is written in a way to create a link between each of the major components of the research undertaken in the past three years. Large sections (including whole chapters) have been published and presented at conferences, each of which duly highlighted. These sections are marked in footnotes. The *second* chapter sets forth the theoretical underpinning of the research. The chapter outlines how the concept of "disorganization" evolved chronologically to its present day status. Furthermore, the inadequacy of research interest and disproportionate research attention is also discussed. This is then followed by how disorganization is manifested in practice based on examples and research studies. Next, a collation of the theoretical ideas is discussed which then is used to introduce *new* conceptual developments to the theory. The conceptual developments are namely 1) the two paradigms of studying disorganization (*state and process based*) and 2) three types of disorganization (*natural*, *functional and structural*). These developments provide a clarification of the current literature and introduce more granularities to current theory by highlighting the nuances in each different type of disorganization.

With the theoretical framework and the conceptual developments completed chapter *three* moves into the operationalization of disorganization through simulations. This chapter introduces the pilot study used in the early stages of the research process, followed by subsequent developments and results. This chapter focuses on how disorganization affects individuals within organizations. The work has been peer reviewed, presented and published (Herath et al., 2016). The chapter consists of a theoretical framework and a method section detailing the particular aspects of theory and methodology used for the study. The main contribution of this chapter is that it is one of the first instances simulations (agent-based modeling) are utilized to study disorganization and its theoretical implications in a systematic manner thus laying the foundation for a better understanding of disorganization to be developed. Not only this provides insight into the understanding of the characteristics and effects of disorganization but also help consolidate simulations as a viable methodological technique for research.

Chapter *four* takes the research presented in chapter three to the next logical level. This was primarily prompted by the peer review process of the third chapter where it was suggested to expand research to a “team” based study which would provide and understanding of how disorganization affects larger units of the organization (e.g., groups, departments, divisions, subsidiaries) and ultimately the organizations as a whole. The research on this chapter too was peer reviewed, presented and accepted for publication (Herath et al., 2017). As with chapter three, chapter four too contains a theoretical and method section detailing the particular theoretical aspects and methods used for the study discussed within it. In this particular chapter, building on the previous individual study a team-based simulation was developed. The team-based simulation was designed in a manner which could integrate empirical data as a basis for the model. The integration of empirical data is once again a case of using simulations as a methodological tool for experimental calibration. Using real world data the model was developed and subsequently the data analysis and results are discussed both in terms of implications for research, practice and methodology.

Following the completion of the research discussed in chapter four the primary objectives of the research were achieved. These were to 1**)** Provide a theoretical clarification of disorganization and its benefits **2)** develop an understanding of the causes, characteristics, and effects of disorganization and **3)** understand the implications of disorganization for academic research and management practitioners. However, given that the research conducted has a lot of potential for growth and offers a lot of opportunities it was appropriate to open up future research avenues as a final contribution of this research.

In doing so, chapter *five* explores how disorganization research can be expanded. Now that the theoretical clarification is present along with better understanding of disorganization (through the simulations) the logical next step in this process is to measure and observe disorganization in real world organizations. This requires a scale to be developed as currently there is no validated disorganization measurement scale. This scale then requires validation. Upon validation, the scale can be utilized to measure disorganization. This entails another research project in itself and goes beyond the scope of the research goals set forth for this research project discussed here. However, the research discussed herein provides the theoretical backbone for future empirical research while the simulations provide the optimization and direction for how the empirical scale and subsequent studies should be carried out.

Nevertheless as a first step in opening up empirical study of disorganization, a preliminary study was carried out as basis for future developments. The intention of the study in chapter five was to use data gathered by a public body (UK Work and employment relations survey) and to see if disorganization has an effect on workers' productivity. The findings of this study open up an empirical research avenue for disorganization studies.

Following the preliminary empirical study, chapter *six* provides the overall summary and evaluation of the research. This chapter links up chapter two (theoretical underpinning), three (understanding disorganization), chapter four (further development of disorganization) and chapter five (empirical exploration of disorganization) and draws out implications of each of the chapters into a consolidated whole. This chapter also details how each of the research objectives set forth at the beginning of the research was achieved while highlighting the next steps in disorganization research.

Chapter 2: Literature Review [1]

This chapter explores disorganization in its core components. First, disorganization and its definitions are discussed (2.1, 2.2). Then, how disorganization was introduced as a solution for too much order is discussed (2.3). Following that, the causes (2.4), characteristics (2.5) and the conventional types of disorganization (2.6) are explored, detailing the nuances of disorganization research. This is then followed by discussing the *garbage can model* (GCM) which operationalized disorganization in a simulation for the first time (2.7), and using it at a benchmark for the current study. Following the GCM three prominent examples of how disorganization is used in the world through loose coupling (2.7.1), lean production (2.7.2) and innovation (2.7.3) are explored. These real world examples are followed up by a detailed discussion of the consequences (2.8) and the purported benefits of disorganization (2.9). Next, the gaps in disorganization research (2.10) and the implications of disorganization for management theory are discussed (2.11).

[1] This chapter has been peer reviewed and accepted for the Huddersfield University, Business School Conference (2017)

The final sections of this chapter are used to introduce new conceptual ideas I developed in furthering disorganization research (2.12).

2.1 Introduction to Disorganization

“Disorganization” is generally associated with catastrophes or is considered detrimental for an organization’s successful functioning (Taylor, 2003; March, 1991). However given the complexity, the nature (vast network of suppliers, intermediaries, customers and stakeholders) and the environment (social, political, economic and technological) which businesses reside in, disorganization is bound to occur to some degree (Bridges, 2009; Sellen and Harper, 2003). This view is shared by many researchers (Axelrod et al., 2000; Anderson and McDaniel Jr, 1999; Boisot and Child, 1999; Stacey, 1995). Researchers also, and for a long time, have tried to understand organizations as systems that are inherently disorganized (continuing non-equilibrium and self-organizing; Shimizu, 1978). Furthermore, given the advances in technology (Wang et al., 2011) new organizational models are emerging (Ahuja and Carley, 1998; Child and McGrath, 2001). Virtual organizations (Kasper-Fuehrera and Ashkanasy, 2001) are a prominent example of a technology driven model of organizing, were the disorganization is inherent. These organizations use disorganization, i.e. reducing structural controls to encourage free association among employees, as a primary tool for tasks such as idea generation and innovation (Westwood and Clegg, 2009). Therefore, instead of having a pessimistic outlook towards disorganization it is beneficial to forge an enhanced understanding of the concept in order to be proactive in managing disorganization rather than being aversely reactive to it.

One of the fundamental reasons behind the interest in studying disorganization is its potential to generate guidelines for managers and researchers of how the ever increasing complexity present in the business world can be managed. Studying disorganization has potential to refine our general understanding of organizations highlighting previously overlooked benefits which might arise when organizations start embracing disorganization in order to manage complexity and unpredictability (Abrahamson, 2002; Weick, 1987). The study of disorganization in an organization not only provides insight in the sequence of planned activities, but also provides clear insights into the emerging dynamics within the organizational environment (Abrahamson, 2002). Some researchers even refer to disorganization as a lower form of order (Jantsch and Jantsch, 1980). Currently disorganization is a relatively overlooked research area which has the potential to deliver new insights in to management research (Abrahamson and Freedman, 2007). Furthermore given the growing complexity of the global business environment, understanding disorganization and methods of managing the same is of utmost importance.

2.2 What is Disorganization?

The aim of the literature review is to explore the progression of disorganization research over the years in order to understand the current status of the research and to emphasize major debates in contemporary scholarship pertaining to the research area.

2.2.1 Selection of Terminology

In recent years disorganization has been embraced by some researchers who have coined various labels to describe the phenomenon. '*Barrier free*', and '*virtual*' are some of these phrases (Dess et al., 1995). While others use disorganization as an umbrella term to refer to chaos, freedom (autonomy), fluctuation, randomness, redundancy, ambiguity and uncertainty (Eisenberg, 1984; Nonaka, 1988). In contemporary scholarship the words '*disorganization*', '*anarchy*', '*mess*' and '*disorder*' are used interchangeability (Abrahamson, 2002; Crozier and Thoenig, 1976; Cohen et al., 1972). However the usage of different terminology for the same phenomenon clouds proper meanings and the context of which the words are used is quite different (Hill et al., 2012). Disorder as an inevitable occurrence in organizations mainly comes into the organizational literature through the application of the 2ndlaw of thermodynamics to management theory (Stacey, 1993; Muller, 2000). The 2nd law of thermodynamics states that the total entropy (disorder or chaos) of an isolated system always increases over time. This law is consistently observed in organizations (Anderson, 1999). However, the application of thermodynamics in management has not had much progress in the past decade especially given the complications involved in understanding the increase of entropy on social systems (i.e. organizations) and in understanding how to manage the process of increasing disorder (Nonaka, 1988).

Therefore, using the term ‘*disorder*’ narrows the study only towards the study of the 2nd law of thermodynamics in management and leaves aside other viewpoints (Eisenberg, 1984). In contrast the word ‘*mess*’ is derived from a more layman’s view of how disorganization can be perceived. Furthermore, ‘*mess*’ by definition implies a negative state; therefore, usage of the term ‘*mess*’ is unwarranted. ‘*anarchy*’ on the other hand implies a complete lack of order and thus does not apply to the study of disorganization which is more of an organized anarchy (lack of order within defined boundaries; Cohen et al., 1972). The term “disorganization” is the best candidate term which can be used in the study of disorder, mess and anarchy since it can be used to subsume the other words while refraining from narrowing the scope of inquiry. It also does not imply any strong positive or negative state affairs relatively to others terms by definition.

2.2.2 Conceptual History of Disorganization

Ever since the advent of organized religions in the world, the concept of order has been an integral component in the conceptualization and practical inculcation and implementation of religious doctrine and practice (Kieser, 1987; Inauen et al., 2010). In a time where science was scarcely mainstream, the church was the main source of knowledge and purpose for masses of people (Abrahamson and Freedman, 2007). At these times order was viewed as sacred while disorganization was viewed as unholy (Abrahamson and Freedman, 2007). Due to this belief the 'monastery' culture consisted of highly organized environments with routines and process outlined for every daily activity (Inauen et al., 2010). In time this rigid highly ordered culture percolated down to the public and the belief that 'order is good' took hold in the public psyche (Reidhead, 1993). This concept of 'order is good and disorganization is bad' has since been a part of human development to this very day (Shenhav, 2002; Nelson, 1974; Mowrer, 1939). Starting from the early 18th century machine builders and engineers strived to standardize and systematize machines and machine tools (Noble, 1979; Sinclair and Hull, 1980). Even though the rise of a scientific world view became a much more empirical and practical search for knowledge (Stark, 1980; Layton Jr, 1986; Calvert, 1967), the basic concept of order as "good" has been present throughout the centuries (Layton Jr, 1986; Calhoun, 1960). The concept of order as a beneficial entity can be seen in almost all walks of life including business, engineering, philosophy, biology, physics and politics (Weber et al., 1922; Rapp, 1993; Bursik, 1988).

This bias towards order was referred to as the counterfeit movement or a reproduction of the reality (Tracy and Trethewey, 2005). This bias denies the disorganized (heterogeneous and inter-penetrative) character of transformation, deformation and reformation within an organization (Bergson, 1999). With the advent of scientific management (Taylor, 1911) the pursuit of efficiency, structuring and formalizing an organization was deemed to be of utmost importance (Taylor, 1911). Increase in mechanical engineering in the 19th and

20th century has been vouched as the primary driver of the scientific management paradigm (Sinclair and Hull, 1980). In complementing the scientific management ideal, Weber,(1922)’s bureaucratic vision of an organization promoted the hierarchical structuring, routines and division of labor (Simon, 1950). The ideals of scientific management and bureaucracy have been in practice for decades and have survived even in the modern era. This classical paradigm of management is referred to as rational management by Scott (1998). There are of course well established benefits of order such as the power to hold people accountable for actions and the power to manage and distribute organizational resources which have been empirically verified (Jones et al., 2010). However over the years many have come to experience that ‘*order*’ by itself has some limitations (Chia and King, 1998; Yan and Panteli, 2011) and too much order generally was detrimental (Crozier and Thoenig, 1976; Shenhav, 2002).

These limitations prompted the advent of the natural management paradigm (Scott, 1998) in which individuals within an organization were considered to be integral to the success of an organization. Natural management theories, prompted by studies such as the Hawthorn studies (Mayo, 1949) showed that rational management theories tend to overlook the role of individuals in organizations, thus subjecting employees to unreasonable stresses and machine-like routines that were not in the best interest of organizations (Tirpak et al., 2006). Natural management theories stress the importance of viewing employees as autonomous agents with varying levels of skills and abilities and deny the assumption of rational theorists that all employees adhere to a common goal (Scott, 1998). As Ashmos et al. (2002) and Gomes et al. (2003) mentions change in social systems is not discrete and linear as perceived; instead social systems are constantly changing and in flux from origination to cessation.

Gomes et al. (2003) mentions only a view that takes into account the heterogeneous, uncertain and ever changing aspects of social systems will accurately represent the real world organizational environment. Moving from the rational and natural theories of management, the open theories of management developed later exposed the idea that organizations are not closed systems (Shenhav, 2002) rather are entities contingent on its environment (Fisher, 1998). This vantage point provided the researchers the necessary paradigmatic tools to see the inherent complexities generated through the external environment (Scott, 1998; Pfeffer and Salancik, 2003). These complexities and uncertainties conjured by the external environment are viewed as *disorganization* by some researchers (Abrahamson, 2002; Pondy and Mitroff, 1979).

Disorganization does not directly fit in any of the three management paradigms discussed. However the concept of disorganization does align more closely with some paradigms than others (Abrahamson, 2002). The concept of disorganization in organizations came to light in the early seventies (Cohen et al., 1972; Goffman, 1972). Goffman's (1955) theory of social order initially presented the backdrop for understanding minimally structured environments through study of emergent structure such as ground rules (Goffman, 1983). Meanwhile, Cohen et al., (1972) presented a sociological theory (Heitsch et al., 2000) known as the “Garbage can model of decision making (GCM)”. The literature on the garbage can model (GCM) encompasses theory, empirical characteristics and simulations (Heitsch et al., 2000) [for an in depth look at the GCM Refer to section 2.6.1]. Moving on from the “Garbage can model” more studies into the benefits of disorganization have been conducted since the seventies (Thompson et al., 2009). Warglien and Masuch (1996) presented the idea of disorganization in organizations in a detailed manner amalgamating various research conducted by a multitude of researchers. As Warglien and Masuch, (1996) point out, Crozier and Thoenig's (1976) research in to blockage within organizations (bottlenecks in complex systems) shed some light into the issues pertaining to increasing order in organizations. At the present moment in time, the most recent contribution in terms of directly addressing the concept of disorganization is the work done by Abrahamson (2002). He presents a theory of disorganization in which the type of messes, the benefits of messes and the limitations of order have all been discussed in great detail. A clear industrial example of competing disorganization and order can be seen in the product manufacturing processes in many organizations (Gomes et al., 2003). As the demand for goods increases in the modern world many organizations have to innovate at an ever increasing pace (Yan and Panteli, 2011). This innovation effort has given birth to many new product innovation models which in turn has presented a dichotomy in the philosophy behind product development (Gomes et al., 2003).

The dichotomy lies in the traditional ordered paradigm of product innovation and the modern dynamic (disorganization) method of new product innovation (Tsukas and Knudsen, 2005).

Gomes et al. (2003) exposes the current status of the dichotomy by placing various product innovation models on a continuum. In one extreme, complete disorganization placed while the opposite end denotes complete order. After careful deliberation both conceptual and with the backing of empirical research Gomes et al. (2003) concludes that the coexistence of both ordered and disorganized paradigms of product innovation is critical for the modern organizations (Gomes et al., 2003). Furthermore, Gomes et al. (2003) posits that a mixed method which has organization and disorganization working together (managed disorganization) tends to present the best solution for many product innovation tasks faced by modern organizations.

Furthermore, research conducted by Yan and Panteli (2011) has also pointed out the coexistence of order and disorganization in organizations. This aspect of coexistence seems to be present in new and emerging globally distributed organizations (Palmer et al., 2007) where leadership is based on job experience and skill rather than the hierarchically structured line of command. Furthermore, some studies suggest that disorganization promotes group inclusion and integrated behavior among team members more than in organized environments (Yan and Panteli, 2011). Even though the concept of disorganization has been relatively well established conceptually by the works of Abrahamson, (2002), Yan and Panteli, (2011) and Gomes et al., 2003) more empirical evidence and conceptual expansion is needed in order to strengthen the theory of disorganization. As Abrahamson and Freedman (2007) mention, the theory needs a both quantitative and qualitative underpinning in order for it to present a holistic idea of disorganization.

2.3 Order: Helpful or Troublesome?

Order in an organization refers to structural and cognitive order (formal rules and structure) which affect patterns of resource deployment, organizational structure, processes, systems and cultures (Nonaka, 1988). Ordering is seen as the process which is used to maintain internal and external balance within an organization (Nonaka, 1988). Over the years disorganization has been viewed as an obstacle for an organization (March, 1991). Many people within organizations defined the instances of disorganization which occur in an organization as “random deviations from an orderly state” of affairs which was detrimental to the proper functioning of a business (Warglien and Masuch, 1996; Abrahamson, 2002). This assumption led many organizations in the 20th century to embrace formalism and order in the organizational environment (Taylor, 1911). Furthermore, another assumption which accompanied formalism is the belief that increased order creates increased productivity (Nonaka, 1988). However the aforementioned assumptions have not been justified through empirical evidence (Alvesson and Spicer, 2012). As Heitsch et al. (2000) mentions looking at organizations as places for structure and rationality has led to unsatisfying outcomes. Alvesson and Spicer (2012) argue that the assumption that organizational order is good especially from a cognitive point of view needs to be challenged. They argue that most organizations have a significant level of "functional stupidity" which is inherent in the sense that one needs to recognize that the dynamics and reflexivity in an organization is inherently misguided (Alvesson and Spicer, 2012; Alvesson and Skoldberg, 2009). Organizations are generally categorized as open system with external factors such as market fluctuations, political changes and societal variations affecting them on a day to day basis (Gomes et al., 2003). However, traditional organizational theory attempted to depict organizations as more or less closed systems and tried to disregard the effects of the environment (Thompson et al., 2009). This attempt can be seen as a mechanism to implement order within the system, since having fewer variables to contend within the ordering process was much easier than when external variables were taken into account (Gomes et al., 2003). Therefore, stability was perceived as the essence of organizing (Shenhav, 2002). In this structured viewpoint improvement and innovation were marginal and sequential (Nonaka, 1988). The top managers were the drivers of innovation and strategy and no other influences were welcome in the innovation process (Warglien and Masuch, 1996). Stability, predictability and regularity were viewed as the virtues of good organizational governance (Nonaka et al., 1998). Therefore the work environment and processes were rationalized and operating routines were introduced (Gomes et al., 2003). This in turn removed disorganization as a variable and thus disorganization was not considered as a factor worth paying attention to (Nonaka et al., 1998).

One issue that has been observed in highly ordered work environments is the various forms of resistance shown by employees (Crozier, 1969; Merton, 1968; Agocs, 1997). In retrospect to beliefs in increasing order to increase productivity, Warglien and Masuch (1996) point out that the increase in formalism tends to create a vicious cycle within the organizational setting which decreases productivity in a dramatic manner (Crozier, 1969; Merton, 1968; Mayo, 2013 [1945]; Dickson and Roethlisberger, 2003). Figure 3 depicts the vicious cycle of too much formalism.

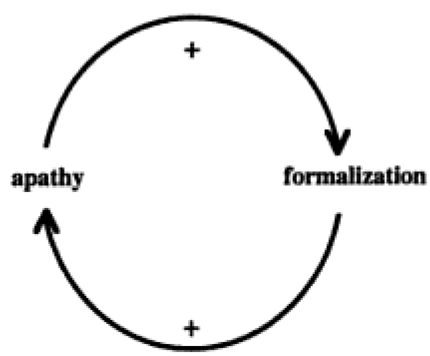

Figure 3: Formalism & Apathy: A Vicious Cycle (Crozier, 1969; Merton, 1968; Warglien and Masuch, 1996)

As depicted in Figure 3, the vicious cycle begins when the leadership of an organization increases the level of formalism within the organization. This increase in structure removes informal behavior among employees and integrates the employees into a rigorous structure. Instead of increasing the productivity this increased structure and reduced ‘elbow room’ (Crozier and Thoenig, 1976) makes the employees apathetic and alienated, thus reducing productivity of the organization. However, the leadership without understanding the issue at hand decides to increase formalism even further in order to make the employees work. However this only increases the apathy among the employees. This vicious cycle will halt once the management runs out of methods of formalization at which point the damage to the organization would already be done (Merton, 1968; Crozier and Thoenig, 1976). This vicious cycle is also known as the “control paradox” Streatfield (2001). The reason why this cycle is paradoxical is due to the assumption that “order is good”. If the assumption that *order is good* is removed and the negative aspects of increasing order are taken into account, this vicious cycle will no longer be paradoxical. Furthermore, in some situations structure creates red tape, political power plays and increases costs where solutions can be found in a more cost effective manner by being solution oriented rather than structure oriented (Brunsson, 1996; Bozeman and Feeney, 2011). Abrahamson and Freedman, (2007) further points out that when ordering there is always a cost incurred and it is imperative to assess the cost of ordering. Many organizations who have not taken cost of ordering into account spend unnecessary amounts of time and money on organizational ordering while gaining little or no benefit. Another issue of rational management is the idea of “order as good” is its implication that "disorganization is bad" (Thomas and Znaniecki, 1919). This implication has made many individuals, organizations and even nations overlook disorganization and categories any "disorganization" as unwanted or undesirable (Shenhav, 2002). There are of course clear detrimental effects of anarchy (a complete form of disorganization) on any system which have been studied over the years (Grieco, 1988). However, there has been only a negligible amount of interest in looking at milder forms of disorganization (Abrahamson, 2002). The most surprising findings pertaining to disorganization emerged initially from the arts (Beardsley, 1968) where disorganization was a centerpiece in desirable forms of artwork (Abrahamson and Freedman, 2007). Nevertheless in the mid decades of the twentieth century the benefits of disorganization in other disciplines started to become apparent (Heitsch et al., 2000).

2.4 Causes of Disorganization

Disorganization as a concept has a number of causes which has been highlighted by contemporary scholars (Schlogl, 1972; Andrews and Farris, 1967; Sahal, 1981). The causes of disorganization can be categorized into two branches. First, there is what is referred to as the 'intentional (planned)' causes of disorganization (Nonaka, 1988). Second, there is what is called 'unintentional (unplanned)' causes of disorganization (Abrahamson, 2002). Below this level of causation, Abrahamson, (2002) defined three subcategories of causes of disorganization which are sloppy and structural messes (messes originating due to ill-defined aspects in the organizational structure), indigenous messes (created by forces internal to the system, also known as strategic messes created by agents) and exogenous messes (occurs outside the system and overwhelms the system’s capacity to order). These subcategories however do not accurately cover all types of disorganization. In contemporary scholarship there is much more emphasis on disorganization as an unintentional phenomenon than as an intentional phenomenon (Abrahamson, 2002; Alvesson and Skoldberg, 2009). Therefore, the subcategories defined by Abrahamson, (2002) need to be re-characterized and expanded in order to encompass both the intentional and unintentional causes of disorganization (see section 2.15.2). The most recent instance of disorganization as an unintentional phenomenon is the ‘*disorderly accumulation of varied entities*’, an idea put forth by Abrahamson (2002). In unravelling the definition further we can discern that the unintended aggregation of multiple things (both physical and nonphysical such as tables, chairs, concepts, ideas and people, etc.) is a cause of disorganization under this definition. Another cause of unintentional disorganization has been put forth by a physicist who viewed ‘thermodynamic non-equilibrium’ (disorganization in a system) as caused by a temporary disturbance to the order of the system (Schlogl, 1972; Stacey, 1993). However, others argue and demonstrate that such non-equilibrium is not a disturbance but a spontaneous form or reorganization which is more commonly known as ‘order from chaos’ (Prigogine, 1984). On the other hand the deliberate easing of formalization (reduction of the hierarchy in an organization or the reduction of formal rules, routines or procedures) is an intentional cause of disorganization (Nonaka, 1988). The effects generated through the external environment presented in open theories of management (Scott, 1998; Fisher, 1998) also fall in the category of unintended forms of disorganization. The deliberate easing of rules in order to innovate has been seen as a viable form of intentional disorganization (Andrews and Farris, 1967; Ekvall, 1983; Amabile and Gryskiewicz, 1987; Baden-Fuller, 1995; Zhao, 2005; Schmitz et al., 2016). As Haken (1984) describes that innovation and entrepreneurship require a constant form of regeneration of ideas within an organization (Andrews and Farris, 1967; Crumpton, 2012; Carayannis and Bakouros, 2015). Nonaka (1988) also points out that informal human grouping within an organization is also a form of positive disorganization which can be both intentional and unintended. Sahal (1981) and Knights and Vurdubakis, (2005) describes technology as a basis for causing disorganization.

By analyzing the two causal types of disorganization it is clear that the unintentional type in general circumstances is an unavoidable phenomenon. On the other hand the intentional forms of disorganization are used more as strategic moves in order to gain a competitive advantage whenever needed (Haken, 1984; Thompson et al., 2013; Rothaermel, 2016). Both the aforementioned intentional and unintentional forms of disorganization have been discussed further in latter sections.

2.5 Characteristics of Disorganization

When studying the characteristics of disorganization, the definition of what constitutes disorganization has to be studied. Warglien and Masuch (1996) and Cuber (1940) present the idea of disorganization as a quest for order and intelligence in situations where conventional sense of orderliness reveals only confusion and noise. Abrahamson (2002) defines disorganization as the random accumulation of varied entities. In this context an entity could be either physical (papers on a desk, filing cabinets, etc.) or nonphysical (organizational relationships, information structures, organizational hierarchies, etc.). As March and Olsen (1986) point out, it is imperative to understand that disorganization does not mean organizational irrationality (i.e. aimless and full relaxation of rules). Instead disorganization can be seen as relaxation (intended or unintended) of the traditional organizational structure thus embracing a more informal approach in the work environment to achieve certain targets (Andrews and Farris, 1967). Recent studies have gained momentum in looking into disorganization as complexity (Stacey, 1995), emergent design (Hatch, 2012) and as a paradox (Clegg et al., 2002) this has inspired researchers to rethink the concept of disorganization in a more robust manner (Gomes et al., 2003). This is however only a partial description since it does not account for accumulation of entities as defined by Abrahamson (2002).

The major gap in current research is that a comparatively large emphasis is given towards unintentional disorganization while little or no direct emphasis on intentional types of disorganization. Furthermore, the definitions do not clarify the difference between disorganization and its related concepts (i.e. autonomy). Disorganization is not identical to autonomy. Autonomy in this case refers to the flexibility afforded to an individual or teams within an organization to carry out their tasks. Disorganization is a process which can be used to increase such autonomy in an organization. Therefore disorganization is the process which enables higher autonomy. A highly autonomous work environment cannot be directly considered a highly disorganized work environment. Instead a more precise description would be that a disorganized work environment has high employee autonomy as one of its characteristics. How this “process of disorganization” works has been discussed in detail in subsequent sections.

2.6 Conventional Types of Disorganization

The definition of disorganization itself has not received consensus in contemporary literature and the multitude of definitions available can be used to justify this argument (Eisenberg, 1984). One of the most prominent theories of disorganization is the time and context dependent view (March and Olsen, 1986). It can be characterized in to three types. Abrahamson (2002) describes three types of disorganization based on location, causation and dimension.

The location of disorganization varies according to the level of analysis (top management, middle management, etc.). Disorganization can also be located in various systems (human systems, cognitive systems, etc.). Based on its location in a system, each instance of disorganization can be further categorized into three sub categories. These are “to organize mess” (a disorganized state that needs to be organized sometime in the future), “organized mess” (an instance of disorganization which has been organized but improperly so) and “to remove mess” (an unwanted instance of disorganization).

When considering the causation-based disorganization (causes being intentional or unintentional), how these causes affect the accumulation of varied entities is taken into account (Abrahamson, 2002). The final type of disorganization is the dimensionality-based categorization. Messes can occur in various dimensions of an organizational structure. Abrahamson (2002) describes the dimensions as breadth, depth, volume and intensity. By looking into messes from its dimensionality a measure of messiness in an organization can be determined. The aforementioned categorization however, only addresses unintentional and uncontrollable forms of disorganization as defined by Abrahamson (2002). In order to fully define disorganization intentional forms of disorganization also have to be considered. One of the major studies in intentionally inducing disorganization into a system was the garbage can model (Cohen el., 1972). In the following section the garbage can model is discussed in detail.

2.7 The Garbage Can Model (GCM)

In order to capture the inherent predictability of decision making, Cohen et al. (1972) developed the so-called garbage can model. This model is highly influential and has garnered more than 9000 citations [2] in contemporary literature (Fioretti and Lomi, 2008). In this model disorganization was looked at as a conducive environment for effective decision making (Cohen et al., 1972; March et al., 1979). GCM emphasized the strategic aspects of the trial-and-error rather than the conventional analytic approach (March et al., 1979). The basic premise of the model is depicted in the diagrams below.

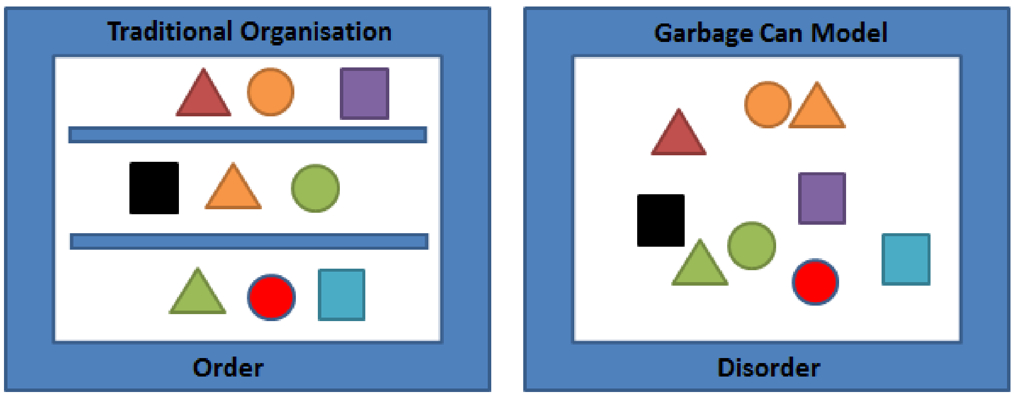

Figure 4: Contrast between conventional and GCM decision making

GCM focuses on four components involved in decision making; namely employees, problems (various issues internal and external to the organization), solutions (available options for solving problems) and opportunities (time when the decision is needed). These components are denoted by the geographic shapes shown in Figure 4. As depicted in Figure 4, in conventional settings, a decision maker is bounded within a defined hierarchy in an organization thus is only able to interact with certain problems, solutions and opportunities (Cohen

[2] (Google Scholar, 2016: https://goo.gl/MA0CKt) -From the 9000 plus citations, the most influential and prominent articles from the authors themselves and prominent collaborators are cited in this section.

et al., 1972). In such a scenario employees might not like the options they have and will be powerless to change their circumstances. However, in the GCM the hierarchical barriers are eliminated thus enabling free interaction of the four agents. This reduction of hierarchical barriers is the process of disorganization in this model. This process of disorganization increases the autonomy of the employees dramatically (Fioretti and Lomi, 2010; Cohen et al., 1972). This decreasing of barriers for free interaction is the process of disorganizing in the GCM. GCM promotes the idea that in complex situations which involve multiple variables in decision making a more flexible decision making environment is ideal (Cohen et al., 1972). Cohen et al. (1972) also presented the concept of "fluid participation" where time and effort of employees in an organization were considered to be varying.

Another concept presented in the GCM is "unclear technologies", where it is believed that organizational processes are not fully understood by the employees in the organization. Finally the GCM presents the concept of "problematic preferences" where it is regarded that the employee goals usually are heterogeneous, inconsistent and lacks clear definition. The GCM further argues that the interpretation of several organizational streams is the basis for decision making. These streams can also be viewed as the agents discussed earlier. As Heitsch et al. (2000) mentions the GCM has now become a key pillar in organizational theory. Miller et al. (1999), upon conducting empirical research, state that the garbage can model describes at least a part of any organization at various times.

Nevertheless the theory is not without its critics. In fact, Musselin (1996) explains that the model ignores the organizational context and gives the scenario where employees in a team who have never worked together before as a case which has been overlooked by the GCM. In turn to the aforementioned criticisms some key rebuttals have also been presented (Heitsch et al., 2000). They present a tool (Petri nets; Petri, 1980) which has the capability of handling special implicit processes and suggestions and even take into account hidden aspects thus incorporating the context at which decision making is taking place.

Given the nature of the GCM to simulate controlled anarchy, some researchers call it the nuclear reactor approach for decision making (Fioretti and Lomi, 2010) due to the uncontrollable nature of the reactions within the model. This model which was based on a simulation has recently received some upgrades in implementation (Fioretti and Lomi, 2008) and this has garnered new research interest in this area (Fioretti and Lomi, 2010). Nevertheless some researchers argue that the GCM only partially captures disorganization (Nonaka, 1988) due to inadequate representation of constructs such as agent skill level, type of task or the complexity of the problems are not considered. The GCM presents a scenario in which agents of a given system interact with each other without any formal structures or rules. This type of free flowing interaction increased the decision making efficiency of the entire system given that agents had the opportunity to obtain any given resource without obstacles. Such a system even though ideal poses practical challenges for implementation in a real world setting. However loosely structured working environments have since been embraced in contemporary organizations (Weick, 1990). In the next section three prominent examples of how disorganization is manifest in the real world will be dissected and discussed. The following examples play a pivotal role in providing real world exemplifications of disorganization at play. These three examples are ideal given that they have been implemented for over three decades and a large number of examples and cases are available to corroborate the points discussed in the following section. The key point which the following examples provide (section 2.7.1, 2.7.2 and 2.7.3) is a practical picture of how disorganization can coexist within highly organized systems. Furthermore, the examples emphasizes the benefits of integrating disorganization into organized processes in order to attained desired results (i.e. process efficiency, cost effectiveness, employee satisfaction).

2.7.1 Loose Coupling

Loose coupling (Glassman, 1973; Weick, 1976) is a concept that has been seen as a characteristic of disorganization (Abrahamson, 2002). The concept was brought to management by Weick (1976) and Orton and Weick (1990). Loose coupling occurs in many contexts (Orton and Weick, 1990). Generally loose coupling means the ability to couple things together while maintaining the ability to change the constituent parts without affecting the relationships among the parts as a whole (Glassman, 1973; Weick, 1976). In an organizational context the ability to change a team member within a team without affecting the team dynamics can be seen as loose coupling (Orton and Weick, 1990). One key advantage this brings is the ability to change or modify parts in a system while not affecting the other parts of the same system. Loose coupling provides resiliency to systems. In this context the relationship among team members are loosely coupled and such coupling is a characteristic of disorganization. In the process of disorganizing, coupling team members loosely is a viable option (Glassman, 1973; Weick, 1976). Loose coupling is also a concept prevalent in object-oriented development. In this development paradigm one class (a class in this context is a template which can be used and modified depending on the need of the programmer) is pointing to another class while having minimal knowledge of the other class. This relationship enables either of the classes to change in characteristics without losing the connection between them (Glassman, 1973; Babb and Chorev, 2016). This concept has been applied in management where individuals from various departments with little commonalities come together to work towards a common goal (Weick, 1991; Misangyi, 2016).

Just as loose coupling, another concept which is usually associated with disorganization is the widely utilized lean production. In the next section, lean production and its relationship to disorganization is discussed.

2.7.2 Lean Production

Lean production (LP) is a concept that has originated from the east (i.e. Toyota) (Womack et al., 1991; Holweg, 2007; Schonberger, 1982). LP is one of the paradigms which use the process of disorganization to reach its ends (Taira, 1996). However it should be made clear at this point that lean production is a highly organized activity. The element of disorganization in this highly organized activity lies in the flexibility of production process. Even though the steps of production, inputs and outputs are carefully planned under LP, the process (especially in the design stages) of product development is disorganized and worker autonomy and flexibility is considered essential. The malleability of hierarchical structures in order to create free flowing production processes is the element of disorganization within LP. The malleability of hierarchical structure exhibits both structural and functional disorganization. This process is a clear example of pockets of disorganization within a highly organized overall process. LP looks at any expenditure of resources allocated for any goal other than value addition to the customer to be wasteful (Taira, 1996; Metzen, 1996; Womack et al., 1991). Proponents of LP state that if rigid structure is not used to add value, then it is redundant and unnecessary thus a more ‘*disorganized*’ approach which is goal oriented (the goal being value addition) should be adopted (Metzen, 1996). How disorganization can be used to achieve specified goals is explored in chapter 3 in detail. There is some debate on what the proper goal of LP should be (Krijnen, 2007; Schonberger, 1982). Some argue that profit maximization is the goal (Krijnen, 2007; Feld, 2000; Ono, 1988) while others argue customer satisfaction is (Womack et al., 1991; Womack and Jones, 2010; Dennis, 2007). LP has four key principles which are (a) Pull (production based on customer demand), (b) One Piece Flow (focus on one item at a time and reduce complications), (c) Takt (measure and control time of production to fit varying demand) and (d) Zero Defects (Weed out defects before selling) (Feld, 2000; Womack and Jones, 2010). The principles then feed towards the larger goal of value addition (Taira, 1996) through continuous improvement (known as “Kaizen”) (Schonberger, 1982). Through the use of a disorganizing and dissolving process, LP combines advantages of small and medium sized production units with those of mass production giants (Metzen, 1996). LP is a form of fluid production, where changes and transformations are abundant (Womack and Jones, 2010). LP is a contemporary example of production processes moving away from traditional notions linked to *order* and demonstrates how disorganization can be embraced to increase organizational efficiency. Some researchers view LP as a contrasting style to the more rigid German and Scandinavian production styles where LP grants that the workers at every level have some knowledge to contribute to the production process (Holweg, 2007). This knowledge addition can be induced by a minimally structured (disorganized) work environment (Womack and Jones, 2010; Feld, 2000). However some researchers claim LP is ambiguous to an extent (Parker et al., 1997) while others completely disagree (Womack and Jones, 2010; Metzen, 1996; Dennis, 2007). LP is widely known as the world’s most powerful production system (Dennis, 2007) and the United States is known to be the leader of LP in the modern world (Holweg, 2007). This concept is now used universally as "lean thinking" (Womack and Jones, 2010).

While lean production is an interesting amalgamation of order and disorganization working in unison, innovation and entrepreneurship are also areas which share a similar relationship to disorganization. In the next section disorganization in innovation and entrepreneurship is discussed.

2.7.3 Disorganization as Innovation and Entrepreneurship

Innovation is the application of creativity (Amabile, 1996). Entrepreneurship is a form innovative implementation also known as "creative destruction" (Schumpeter, 1934) or "controlled revolution" (Haken, 1984). "Improvisation" is also a closely related concept to creativity and has a basis in disorganization (Berliner, 2009). This view of innovation is widely accepted (Bull and Willard, 1993). Creativity used to be something that was assumed to be done by creative people (Amabile, 1996). This assumption led to initial development in innovation research where many perceived creative people were studied (Barron, 1955; MacKinnon, 1962; Mackinnon, 1965; Barron, 1968). However this approach was limited since it ignored the role of the social environment in the process of innovation (Amabile, 1996). Thus, some researchers have started to look at innovation as a capacity inherent in every individual which, given the right "conditions", will produce the emergent property of innovation (Amabile, 1996). Researchers argue that this right condition comprises of "disorganization" (Schumpeter, 1934; Amabile, 1996). This condition-based view is embedded in the component view of creativity (Amabile, 1983;

Burnside et al., 1988; Amabile, 1996). The components include expertise, task motivation and creativity skills (Amabile, 1996). The conditions are various organizational influences of which disorganization is a key component (Schumpeter, 1934; Amabile, 1996). This theory of organizational influence of creativity brings in the individual components of creativity and matches it with organizational influences such as disorganization in order to produce innovation (Amabile, 1996).

There are some underlying necessary conditions for creativity under the aforementioned model. The conditions are individual autonomy (Amabile and Gryskiewicz, 1987; Andrews and Farris, 1967; Ekvall, 1983; King and West, 1987; Pelz, 1967; Paolillo and Brown, 1978; Siegel and Kaemmerer, 1978; West, 1987), certain level of control (not full anarchy) (Amabile and Gryskiewicz, 1987) and work-interest match (Bailyn, 1985; Amabile and Gryskiewicz, 1987). The way to increase autonomy and to create a condition for work-interest match is a certain level of disorganization (Amabile and Gryskiewicz, 1987). Nonaka (1988) proposes a similar notion where disorganization is seen as a key component in self renewal of organizations and as a process helping to manage change.

2.8 Consequences of Disorganization

Disorganization brings some unique consequences. These consequences depend mainly on the causal types of disorganization discussed earlier. If the cause of disorganization is unintentional the consequences that follow are also unintentional. One stand out consequences of such unintentional disorganization is cognitive aversion (vying away from disorganization due to preconceived notions of disorganization as a negative state) (Gosling et al., 2002). Many researchers argue such a cognitive aversion is unwarranted since disorganization yields beneficial outcomes under proper management (Drucker, 1993). Nevertheless, there does seem to be an effect of disorganization on observer viewpoints (Gosling et al., 2002). However researchers do caution that the beneficial outcomes of disorganization have not been empirically verified (Abrahamson and Freedman, 2007). The instances of disorganization which are created intentionally are generally made to achieve a predefined set of expected consequences. These expected consequences can be increased autonomy (Nonaka, 1988), grass root (lower level) decision making (Nonaka et al., 1998), innovation (Burnside et al., 1988), team cohesion and dynamic corporation (Kagono et al., 1985), cost reduction (Abrahamson, 2002) and resiliency of knowledge (where knowledge within the team is preserved even if individual of a team changes since knowledge is distributed among members) (Agocs, 1997). Some researchers argue that disorganization provides a basis for minimally structured work environment while accommodating uncertainty (Gomes et al., 2003; Weick, 1987).

2.8.1 Proposed Benefits of Disorganization

Over the years various benefits pertaining to disorganization have been introduced by researchers (Gosling et al., 2002). Researchers mention benefits for both unintentional and intentional types of disorganization.

The 'formalistic' viewpoint dismissed disorganization as a nuisance and only had a reactive approach in dealing with disorganization (Taylor, 1911). Nevertheless at the latter stages of the 20th century and early stages of the 21st century researchers have embraced a more proactive approach to disorganization (March and Olsen, 1986). From a more proactive point of view such disorganization can be seen as a factor of importance which – if managed correctly – could create positive outcomes (Warglien and Masuch, 1996). These are reducing cost (by avoiding unnecessary processes of organizing), maintaining organization focus (by letting go of the focus on organizing companies can focus on their core competencies) and enabling the power of parallel search. Warglien and Masuch (1996) pointed towards the latter element – i.e. the 'power of parallel search' – as a key beneficial aspect of disorganization, where highly uncertain situations can be better handled by agents with bounded rationality (Simon, 1950) attacking the problem from multiple vantage points and choosing the best emergent solutions. This concept has also been known as "intensive technologies" (Thompson, 1967) and "pluralism" (Lindblom, 1959). The core idea behind this concept is that in some cases attacking a problem consistently from various vantage points yields better and faster solutions than trying to solve a problem with one organized approach.

In the modern world some examples of benefits of disorganization can be seen (Gomes et al., 2003). As some researchers argue, internal structural messiness through participative decision making enhances the connectivity in organizations which in turn creates opportunities to self-organize and innovate (Yan and Panteli, 2011). As Ehrich and English (2012) points out, organizational messiness tends to create a conducive environment for emergent behavior in teams which can be beneficial. Less formalization also incubates grass roots leadership from the bottom up where every person takes a leadership role. This in turn creates new information and novel ideas (Nonaka et al., 1998). Through disorganization and loose coupling (relaxation of formal structures; Cohen et al., 1972) decision making can trickle down the organizational hierarchy enabling people with the most information about a situation to make a decision rather than wait until decisions were made above their control — i.e. seniority, authority or hierarchy (Ehrich and English, 2012). In a more practical viewpoint disorganization can be seen as saving money and time since it stops unnecessary organizing (i.e. expensive employee monitoring and evaluation systems) within an organization and helps remove structures that are cost yet does not yield considerable benefits (Agocs, 1997; Arthur, 1994; Crossan and Sorrenti, 2002).

Organizations which have relaxed working environments (Ford et al., 2003) such as Google, Facebook and Millennium IT are examples of organizations which embrace disorganization in the creative processes. The benefits of disorganization have been observed in many industries over the years. One prominent paradigms the benefits of disorganization have been utilized is in product design and development Gomes et al. (2003). Even though the perceived benefits of disorganization are abundant, in order to fully understand, manage and transfer beneficial disorganization in organizations, theoretical advancements as well as empirically evidence is needed (Warglien and Masuch, 1996).

2.8.2 Managing Disorganization

Even though some key benefits of disorganization have been discussed in contemporary scholarship it should be noted that at the root of the benefits of disorganization lies in its ability to be a managed process (Abrahamson, 2002). This can be seen as the process of *disorganizing* (Ackoff, 1981). One of the most talked about aspects in the management of disorganization can be described as freedom (autonomy) to act inside existing limits with minimal structure by reducing formal structure to a bare minimum (Gomes et al., 2003). Ackoff (1981) proposes an approach for disorganization management where disorganization is looked at holistically and can be used to remove unnecessary order. Ackoff (1993) further proposes a design approach to mess management where clinical and research based approaches can be used as a hybrid. The rigid internal rules are replaced by social rules (Nonaka et al., 1998). In this process, the entire activity of working becomes dynamic with multiple autonomous agents (across the organizational hierarchy) which are a stark contrast to the traditional paradigm where most of the autonomy lies with the higher levels of organizational hierarchy (Abrahamson and Freedman, 2007). However, the experience level of employees may influence the effectiveness of the disorganization (Weick, 1998) thus some researchers argue this is a shortcoming of disorganization (Gosling et al., 2002). In managing disorganization as Gomes et al. (2003) and Bateson (1979) proposes a diagnosis of the process should be carried out where the balance between control vs. innovativeness and principles vs. ideas should be diagnosed. Through the proper management of the disorganization various complex situations can be handled in a proactive way and environmental contingencies can be properly addressed (Abrahamson and Freedman, 2007). The benefits discussed here have not be been empirically verified, thus further researcher needs to be carried out in order to ascertain the validity of the benefits discussed here. In order to further the research into the benefits of disorganization and to ascertain the validity of the benefits, the theoretical and empirical gaps in current disorganization literature needs to be analyzed. The next section outlines and discusses these gaps in detail.

2.9 Theoretical and Empirical Gaps in Disorganization Research

The research pertaining to disorganization needs further development in contemporary literature (Abrahamson and Freedman, 2007; Abrahamson, 2002). The research community has largely overlooked disorganization; as Abrahamson, (2002, 141) mentions “Organizational scientists know a lot about how to organize something, but far less about how to avoid messes or to clean them up, and even less about how to actively mess up something”. Weick (1998) posits that one reason for the lack of interest could be the implication of the term ’*organization’* to denote orderly arrangements of cooperation which then by definition will exclude concepts like *disorganization* since it implies disorder. However it has been seen that disorganization is more of an epiphenomenon within the process of organizing rather than its antithesis (Nonaka et al., 1998). Therefore disorganization does not negate “being from becoming” (organization) (Whitehead, 2010) and instead is a part of the organization process (Allport, 1962; Mangham and Pye, 1991; Mintzberg and McHugh, 1985). Nevertheless, in the past few decades there has been resurgence in research interest (Thompson et al., 2009). Even though comparatively little attention has been given to understanding disorganization (Weick, 1998), the subject itself has been a recurring theme in organizational studies in the past half a century (Pfeffer, 1993). Nevertheless disorganization research is not a highly developed field exemplified by the lack of consensus among researchers (Pfeffer, 1993). Furthermore given the perceived benefits of disorganization in organizations, a revival in research interest for this important research area is of utmost importance (Abrahamson and Freedman, 2007). It should be noted that the study of disorganization has not only been prompted through conceptual contributions but also by industrial changes in the modern world (Gomes et al., 2003). For example, the new emergent product innovation models such as the ’flexible model’, ’integrative model’ and ‘improvisational model’ are such incidences (Gomes et al., 2003). What the aforementioned models have in common is the disorganized nature at its core. Each of the models uses minimal structure and is rather results driven rather than structure driven (Gomes et al., 2003).

Disorganization is a concept that has received some research attention from various vantage points (causes, locations, effects). As mentioned previously there is little agreement in the literature on the concept itself among contemporary scholars. One particular reason for the indecision among researchers is the multitude of definitions and concepts all addressing disorganization (Warglien and Masuch, 1996; Cuber, 1940).

This conceptual issue should be resolved or reconciled in order to properly demarcate between disorganization and order. Some provide an answer by stating that disorganization is a condition to bring in order (Nonaka et al., 1998). Another reason has been seen as a paradigmatic bias based on the conception that “order is good” (Thomas and Znaniecki, 1919; Nelson, 1974). From a theoretical vantage point disorganization tends to be a concept which has received various treatments. Researchers have looked at disorganization as a deterrent (March, 1991), as a different magnitude of order (Kagono et al., 1985), as a consequence of order (Weick, 1987), as an approach for innovation (Haken, 1984) and as a concept with positive merits (Yan and Panteli, 2011). With these multiple treatments of the same phenomena, a theoretical clarification as to 1) what can be defined as disorganization and 2) what the demarcation criteria between order and disorganization (Groves and Sampson, 1989). Furthermore, conceptual disadvantages of disorganization (Weick, 1998) also must be addressed (see Section 2.15).

From an empirical viewpoint, the gaps in research are more pronounced. It is argued that most of the benefits of disorganization cannot be determined a priory; given that some of the benefits are emergent and, at present, the behavior of disorganization is unpredictable (mainly due to the lack of studies that explore the dynamics of disorganization). Therefore, a series of empirical studies are required to formulate a normative account of disorganization (DiMaggio and Powell, 1983). There have been very little empirical treatments of the concept of disorganization apart from a few isolated studies (Gosling et al., 2002; Mowrer, 1939). One hindrance to the empirical study of disorganization has been exactly the same issue that students of disorganization accuse the traditional researches in organizational studies who view “order as good”. In fact, some researchers tend be promoting the view that ‘disorganization *is inherently good*’ due to the proposed benefits as discussed in section 2.11.1 (Abrahamson and Freedman, 2007). Such an implication can only be validated through empirical research and not necessarily through conceptual analysis alone. Empirical research is vital in determining the validity of the concept of disorganization and in the determination of effectiveness of various types of disorganization discusses various correlations among types of disorganization, characteristics, causes and consequences of disorganization proposed by researchers.

2.10 Implications of Disorganization Research

Disorganization and its hypothesized benefits lay out a clear set of implications for managers and management theory as a whole. These implications both criticize and complement various parts of organization management theory. Hence the following subsections will outline how disorganization research fits into the larger management paradigm.

2.10.1 Rational Management Theories

The concept of disorganization as discussed presents a direct criticism of rational management theory (Scott, 1998), in particular the theory of scientific management (SM) (Taylor, 1911). The primary goal in SM is to ensure efficiency in the organization (Taylor, 1911). This desired efficiency is achieved by carrying out a set of systematic procedures to make sure the organization performs at its optimal. This goal has an underlying implication; namely the implication that increasing formalization, measurement or structure will lead to better performance (Waring, 1992; Hong, 2006). This assumption led to early rational management practitioners to achieve `order` at all costs. The main cost in this kind of approach was that the workforce was seen as mere resources to be deployed when needed without any significant regard to their wellbeing or safety. Modern version of the rational viewpoint do not necessarily operate under such hard conditions as earlier versions of the theory, however the core principles of scientific management and the rational management paradigm has survived to this day and can be predominantly seen in emerging markets. Drucker (1993) also provides a corporatist view of SM. This view is generally regarded as a modified version of SM (Waring, 1992) that presents an ideological perspective (normative description) of what an organization should be. With disorganization at hand, SM seems to directly avoid the reality of the accumulation of varied entities and the pitfalls related to unnecessary measurement, routines and formalization (Alvesson and Spicer, 2012; Warglien and Masuch, 1996; Abrahamson, 2002). The bureaucracy theory of Weber, (1922) is also used as an ideal for the rational viewpoint. Bureaucracy implies the complete eradication of disorganization (Nonaka et al., 1998) and is also known as *homogenization*’ (Giddens, 1979).

The rationalistic viewpoint even though prevalent has shifted over the years to accommodate other viewpoints. In recent years, the principles of scientific management and bureaucratic management processes experienced some resurgence (Evans, 2010; Giannantonio and Hurley-Hanson, 2011). This is primarily driven by the most recent financial crises where organizations had to cut back on it work force and enhance focus on low cost efficiency in order to survive the crisis. This prompted researchers to provide a contemporary interpretation of SM (Kuleza et al., 2011). This contemporary interpretation views SM as principle which can be managed as needed (Salimath and Jones, 2011). Recent literature suggests the use of SM principles for innovation and entrepreneurship where the principles can be applied only at certain junctures of the innovation process. These recent developments provide environment where disorganization can be used in tandem with the principles of SM (Brennan, 2011). However, there are logical and conceptual arguments which have been made using disorganization as a basis for critiquing SM (Hong, 2006). These arguments however require empirical evidence (Hong, 2006). Only when the empirical evidence is in place the criticisms above can be substantiated. Nevertheless some evidence is provided through the research of Peters and Waterman (1984) which shows that highly successful organizations (especially technology and investment industries) emphasize more on action using any method possible including disorganization rather than focusing on establishing structure or formalization.

2.10.2 Natural Management Theories

Natural management theories (Scott, 1998) encompass management theories such as systems theory (Johnson et al., 1964) and fall more in line with the concept of disorganization as explored in contemporary literature. In natural management theories the emphasis on the individual is heightened (Mayo, 1949; Tirpak et al., 2006; Scott, 1998). Traditional rationalist theories focused on mechanizing organizations and increasing productivity through the increment of efficiency. Furthermore rationalist theories provided a basis for theories such as bureaucracy to be implemented. However, many scholars argued that a rationalistic viewpoint does not provide adequate autonomy for employees (Mayo, 1949). In contrast to the rational management paradigm the natural management theories emphasizes on the importance of the workforce to the organization. Under this viewpoint employees are seen as an integral part of the system which has to be properly maintained. This therefore is translated as better treatment of the workforce. It should be noted that even though the natural management theories advocate the consideration of employees as a pivotal part of an organizations management they still work under the assumption that ‘order’ is good. Therefore, even though natural organization theories do provide a more evolved approach to management it cannot be seen as the final solution for the problem. The concept of disorganization moves the concept of employee autonomy to a more extreme end where, the reduction of structure is used to inculcate team work, commonality among individuals and to enhance innovation (Schumpeter, 1934; Yan and Panteli, 2011).

2.10.3 Open Management Theories

The concept of disorganization aligns itself with the open theories of management in one key juncture which is the effect of the external environment on the functioning of an organization (Fisher, 1998). Open management theories suggest that an organization is contingent on its external environment (Scott, 1998; Pfeffer and Salancik, 2003). This contingency on the external environment is inherently disorganized given the fluctuations occurring in the external world (Fisher, 1998). Therefore the external environment can be seen as a cause (unintentional) of disorganization (Pondy and Mitroff, 1979). The extent of disorganization induced on a system through external influences has not been currently specified. It can be the case that the level of disorganization induced through the external environment can vary depending on sector, type of business or geographical and socioeconomic standing of an organization. Nevertheless, open management theorists emphasize that the external environment (which is inherently disorganized due to the lack of prior knowledge of how the external factors playout over time) is extremely important in management (Pondy and Mitroff, 1979; Scott, 1998; Fisher, 1998). To which extent disorganization complements this view of management is currently an open question.

2.11 Expanding Theory: Conceptual Developments

Through analyzing the literature on disorganization in academia it is apparent that there is a significant issue in defining disorganization in a concise and comprehensive manner (Schlogl, 1972; Stacey, 1993; Abrahamson, 2002). This ambiguity is in part due to how disorganization is characterized. In this section I try to reconfigure the description of disorganization based on current literature in order to make the concept more refined in its definition.

2.11.1 Disorganization: State v Process

From the literature considered thus far it is clear that many researchers tend to discuss the outcomes of disorganization and use these outcomes to define disorganization. This kind of characterization of disorganization can be named *state-based* or *outcome-based view of disorganization* Messy desks, lack of organizational structure, minimal rules imposed on employees and collective decision making are some of the characteristics used to define disorganization. The definition provided by Abrahamson, (2002) is a good example for such a state based view of disorganization. The state-based view even though helpful in capturing the outcomes (effects) of disorganization or in defining how disorganization should look like is not so good in considering what causes disorganization. This view further overlooks the mechanisms of disorganization which, in turn, creates ambiguity as to whether disorganization can be controlled or not.

In alleviating some of the issues in a state/outcome based view of disorganization a more process-based view can be developed. In a process-based view of disorganization, what causes the disorganized outcomes (as viewed from a state-based point of view) can be better understood. Using such a conceptualization, disorganization can be seen as the process of de-structuring highly structured organizational conditions in order to achieve intended results (i.e. efficiency increase, innovation). Viewing disorganization as a process also creates research avenues where research can be conducted into various mechanisms of disorganization which can be utilized depending on the intended results. Through the use of simulation, current research (Herath et al., 2016; Herath et al., 2017) is investigating these processes and how they differ from each other based on the intended outcomes (i.e. there can be a different way of destructing when more creativity is needed within an organization as apposed when more efficiency is needed). A process-based view further enables disorganization to be studied in a very detailed manner (Herath et al., 2016). With the development of a process based view of signalization to complement the more established state based view of disorganization would enable researchers define disorganization in a more concrete manner.

2.11.2 Re-characterizing Types of Disorganization

When looking at the current literature on the subject with a state and process based view of disorganization in mind, a distinction between three types of disorganization emerges. These three types can be coined natural, structural and functional disorganization.

Natural disorganization. This is the type of disorganization which occurs unintentionally and randomly without any deliberate action on the part of any agent (individual or organization). This type of disorganization is best viewed from a state-based vantage point since naturally occurring disorder can only be identified from the outcomes they produce. ‘*Disorderly accumulation of varied entities in hierarchically ordered complex human structures*’ (Abrahamson, 2002) is a clear definition of this kind of disorganization.

Structural disorganization. This type relies more on the literature covering disorganization as a process. This type of disorganization refers to how an organization or team is structured in terms of line of command and hierarchy. An organization/team can either be structurally organized or structurally disorganized.

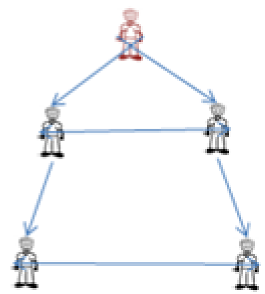

Figure 5: Structural Organization

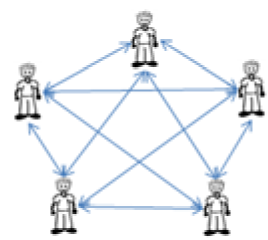

Figure 6: Structural Disorganization

As shown above, a structurally organized team (Figure 5: clear lines of authority and accountability with a leader at the top) would have a clear line of command, a highly structured hierarchy with clear authority with leaders and subordinates clearly defined. On the other hand a structurally disorganized team (Figure 6 would not have a highly organized hierarchy and the decision making and authority is shared among the members.

Functional disorganization. This other type refers to the control on access to resources imposed on individuals within an organization. A highly functionally organized work setting will have rigid rules on how individuals or teams can access resources while a functionally disorganized work setting will have flexible rules when it comes to access to resources.

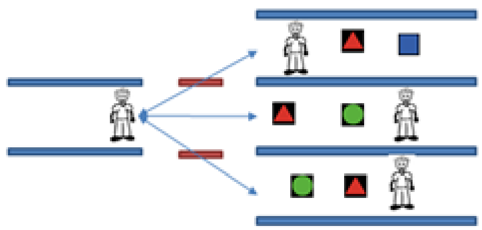

Figure 7: Functional Organization

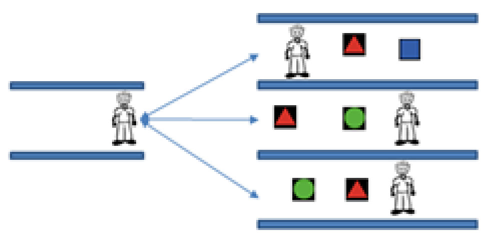

Figure 8: Functional Disorganization

As depicted above Figure 7 shows a highly functionally organized work environment. The employee on the left side is only allowed to access the resources on the same level as them self. On the other hand the employee on the left depicted in Figure 8 has access to resources at the same level as well as levels above and below them. Thus the employee depicted in Figure 8 has access to a larger pool of resources. These resources can also be of high quality given that they have access to resources to hierarchical levels above them.

2.11.3 Agent dependent and Agent independent disorganization

These three types of disorganization provide a basis for studying disorganization in a more detailed manner. The primary difference between natural disorganization and the other two types of disorganization (structural and functional) is that natural disorganization if not acted upon by an external force – agent (i.e. organizer) will always keep moving towards further disorganization. On the other hand functional and structural disorganization require a deliberate disorganizer (an agent who reduces the structure of rules of interaction). This distinction in describing the type of disorganization provides a way to further dissect types of disorganization.

Type of Disorganization	Disorganization as a State	Disorganization as a Process	Agent Dependent	Agent Independent
Natural Disorganization	YES	NO	NO	YES
Structural Disorganization	NO	YES	YES	NO
Functional Disorganization	NO	YES	YES	NO

Table 1: Types of Disorganization

In summary, as depicted above (Table 1); based on current literature disorganization can be viewed from a state and process based point of view. The majority of research in the area has focused on a state based view of disorganization even though more recently process based research has picked up speed. The demarcation between the state and process based views provides a basis for studying disorganization in an organizational setting by providing a mechanism to categorize disorganization into types. These three types are natural, functional and structural disorganization. These types can further be analyzed based on the agent dependency for disorganization.

2.12 Next Steps

The research into disorganization has mainly been studied conceptually (Schlogl, 1972; Stacey, 1993; Abrahamson, 2002). However, there is a clear lack of empirical evidence supporting the theoretical claims (Groves and Sampson, 1989; Abrahamson, 2002). Therefore the next major step in the study of disorganization has to be from an empirical vantage point. One direct method for studying theorized causes, characteristics and consequences of disorganization is to simulate disorganization (Fioretti and Lomi, 2010; Cohen et al., 1972). Simulations which explore conditions of disorganization along with the mechanisms which trigger, sustain and resolve disorganization are interesting exploratory studies which could be carried out. As Gilbert (2008) and Secchi (2013) point out agent based modeling (ABM) is an ideal candidate for such a study. ABM provides both logistical and methodological advantages over equation based modeling and other modeling techniques (Gilbert, 2008; Bazghandi, 2012).

Along with simulations, further empirical studies need to be carried out in order to discern the validity of the theoretical claims pertaining to disorganization that has been put forth by modern scholars (Groves and Sampson, 1989). The study of measuring disorganization and uncovering correlations between various variables related to disorganization along with uncovering mediating and moderating effects is the next step towards developing a richer understanding of disorganization.

2.13 Conclusion

The aim of the literature review was to build an understanding of disorganization within organizations through analyzing the body of knowledge pertaining to disorganization which has amassed over the years. Moving towards this aim, the concept of disorganization was introduced. This was followed by a detailed exposition of disorganization which was broken down into sub categories for clarity. Through the discussion, conversations pertaining to limits of order, gaps in research and the implications of disorganization of theories of management were also discussed. The information unearthed through this discussion can be used as a basis for future research into disorganization within organizations and provides a basis for empirical studies of disorganization which is the next frontier in disorganization research.

Chapter 3: Simulation of the Effects of Disorganization on Goals and Problem Solving[3]

3.1 Introduction

This chapter presents a model of the occurrence of disorganization and its impact on individual goal setting and problem solving. In this work, I consider disorganization as defined in chapter two (section 2.11.2). Under this definition disorganization can be categorized into *natural (random increase of disorder in the system/organization)*, *structural* (the malleability of structural constraints within the system) and *functional* disorganization (flexibility of the rules of interaction among agents/employees and the flexibility in accessing resources). Every organization sets countless goals (Brown et al 2005) and each is perceived as having a given level of difficulty, some are relatively trivial, others appear to be very hard (Locke and Latham, 2013). Goals ought to be well defined and measurable (Locke and Latham, 1990) and this, historically, led to the idea that a well-organized structure associated with goals makes them manageable (Shenhav, 2002). This principle goes deep down to the roots of management (e.g., Taylor, 1911; Fayol, 1919) since it reflects the belief that goals (as problems to solve) should be clearly associated with employees and managers such that they become easier to achieve. In other words, it is the clarity of instructions and effective organizational structures that facilitates goal

[3] This chapter has was presented at the European Academy of Management (EURAM) conference (2015) and has been published: Herath et al., 2016

attainment (Chandler, 1932; Simon, 1947; Han et al., 2010; Panagopoulos et al., 2011). This is what classic or rational management theories claim (Scott, 2001). However, recent debates have questioned the effectiveness of organizational structure and highlighted the seemingly positive effects of disorganized work environments on work outcomes (Deci and Ryan, 1991; Amabile, 1996; Frost et al, 2010).

This chapter is a first attempt to investigate the effects of disorganization and goal attainment (framed as problem solving; see below). Even though some argue that disorganization may bring some benefits (Abrahamson and Freedman, 2006), the effect of disorganization on specific organizational processes and procedures have received limited attention. There is some ambiguity in what is meant by “disorganization” (Abrahamson, 2002; Abrahamson and Freedman, 2006) and this is why, in this chapter, it is used under the specific definition discussed in chapter two. Therefore this chapter focuses on goal achievement under conditions of natural, structural and functional disorganization.

The research presented in this chapter has two primary objectives. First, the chapter explores the effects of disorganization on goal achievement. In order to do that, I use an agent-based computational simulation model (ABM) that unveils the effects of disorganization and organization on employee’s access to problems and solutions in the light of available problem solving opportunities. The primary interest of the research is to compare the efficiency of both organization and disorganization in terms of achieving goals, namely problem solving, assuming that to "solve problems" a goal needs to be set beforehand. This is done considering how motivation fluctuates among employees when problems are solved. The second objective of the chapter is to contribute to building of a theory of disorganization (Abrahamson, 2002; Warglien and Masuch, 1996). Consequently the study aims to broaden the understanding of how disorganization affects organizations.

In the following sections, I first discuss the concept of disorganization, then introduce the components of the model, present some preliminary results, and discuss them in a concluding section.

3.2 Theoretical Framework

3.2.1 Individual Disorganization

This chapter builds on the theoretical framework discussed in chapter 2. For clarification purposes, it should be noted that in the context of this study the word "disorganization" does not automatically imply the antithesis of "organization". This means that for disorganization to occur, it is not required that the organized allocation of a given environment, resources, thoughts ought to be known. To make a simple example, when we see what seems to be a dis-organized desk, it does not mean that we have clear in mind how the same desk would be if organized. Moreover, disorganization can be also seen as an occurrence which takes place within a more organized or structured context.

There is a semantic level in the discussion that needs to be clarified before we can move forward. One may refer to disorganization and organization as ways of distributing, assembling and connecting resources, thoughts, and elements.

The word '*organization'* can also be referred to social structure as a way of pulling resources together in a limited and formal social environment (e.g., a company, the European Union). If the latter meaning is used, it is clear that dis-organization cannot be considered an antonym. The model discussed in this chapter focuses on the former set of meanings, where the mode of using or not using structure is the main focus. The way disorganization occurs in this model is within a given formal social structure. Hence, the two levels are nested. The traditional view of how an organization should work vouched for isolating the organization and its functions from external disturbances, or for trying to focus on a limited set of external influences only (Thompson, 1967). Over the years this approach has fallen out of favor given that every organization is heavily influenced by external factors such as market fluctuations. Furthermore, due to geographical barriers and technological advancements traditional hierarchical control over employees seems to be ineffective and more flexibility is required (De Vulpain, 2005). Another factor which heavily influences organizations is the technological development and the tendencies towards globalization (Jarvenpaa and Leidner, 1998). In adapting to the changes in the environment, new forms of organizing have emerged. These new forms of organizing are increasingly driven by advancements in technology that are sometimes managed via globally distributed virtual teams or via so-called "network organizations" (Nohria, 1994). Network organizations contain small and agile self-directed teams; these organizations usually utilize multiple forms of organizing where some teams can be highly organized while other teams can be self-governing and disorganized (De Vulpain 2005).

Given the hypothesized ability of disorganization to be managed (Chapter 2) to achieve better outcomes for an organization, understanding the levels of disorganization at which effective goals can be set is an important task. In this study, I start from the basic working definition of disorganization as introduced by Abrahamson (2002). This can be seen as the only attempt to define disorganization as an independent concept (for details see chapter 2). This particular definition was chosen because it provides significant detail and makes the concept easier to operationalize in a simulation. He posits that “[d]isorganization is the disorderly accumulation of varied entities in hierarchically ordered complex human structures” (p. 4). According to the aforementioned definition, disorderly accumulation refers to unintended aggregation of both nonphysical and physical components within an organization (varied entities in the definition). As discussed in chapter 2 the structure can be rigid (organized, hierarchy) or flexible (disorganized). These features can be re-phrased to indicate a reduction of structural constraints (structural disorganization) and rules of interaction that employees are subjected to (functional disorganization). The implication is that work does not seem to follow any clear pattern or rule.

3.3 Operationalizing the concept

In operationalizing the concept, the first decision was deciding on a modelling technique. Building on Chapter 1 (section 1.5) it was decided that ABM will be the most suitable modelling option compared to other econometric modelling techniques. Agent based modelling enables the representation and exploration of both the micro and macro complexes in social structures through precise narratives (Edmonds, 2007). In contrast the equation based modelling ABM provides the measurements of individual outcomes as well as aggregated outcomes of an observed system while equation based models largely only deal with aggregated outcomes. This allows ABMs to have a more natural representation of real world models while also enabling a modeller to model cognitive aspects of individuals into the simulation (Wilensky and Rand, 2015). When considering aspects of judging a sound model, ABM tends to be more cost effective in its effort and implementation compared to other modelling techniques. Another difference between ABM and EBM are in the capacity to grasp different stochastic aspects of the phenomena. ABM describes stochastic fluctuations while EBM describes the statistics of the fluctuations (Cecconi et al., 2010). In ABM an agent can encompass attributes and behaviors which are not visible to the larger system; this is not possible in EBM (Purunak et al., 1998). Therefore, ABMs provides a closer description of the real world (individuals acting in social system i.e. organization). Compared to EBM, ABMs also provides an easier demarcation between interaction space and physical space within a system (Purunak et al., 1998; Cecconi et al., 2010). In terms of this research given that the unit under discussion is an individual, ABM is the preferable option in terms of modelling. Taking the cumulative benefits of ABM over EBM in the context of this research ABM presents itself as the best modelling option.

In developing the simulation discussed in this chapter, the so-called “garbage can” model by Cohen et al. (1972) was taken as a starting point. The garbage can was the first attempt to model disorganization and organization and it defines a solution space in which participants, problems, solutions and opportunities are put together in a minimally structured environment. However, the technology used in the garbage can model is obsolete by today’s standards as shown in the modern agent-based simulation as updated by Fioretti and Lomi, (2008) who defined a mechanism to implement disorganization (anarchy) within the simulation. In the study discussed in this chapter, the modeling goes beyond that of Fioretti and Lomi, (2008) and introduces a new way of operationalizing disorganization with the inclusion of goal setting. This study focused more on natural, structural and functional disorganization which were not addressed in any of the previous studies. Adding such a categorization to the model provides new layers of analysis of the problem. However, it should be noted that this study does not radically change how model is developed; as such a change is not required. Instead this model add further granularity to the model by categorizing disorganization.

As already stated above, how disorganization impacts problem solving is the primary focus of the agent-based simulation presented in this chapter. This simulation attempts to compare disorganization and organization in terms of access to problems by employees under structural organization/disorganization using both hierarchy-based interactions and non-hierarchy-based interactions, matched with opportunities and solutions. These comparisons are needed in order to properly define the concept of disorganization. It further allows for an operationalization helping to understand what its imminent effects on the daily operations of a company are. In particular, this study focuses on the process of problem solving, involving individual abilities, motivations, available solutions, and problems.

Given that the primary aim of the model is to study the effects of disorganization on problem solving, it explores the impact of disorganization on decision efficiency using several elements that characterize problem solving, including the decision maker’s motivation, defined through goal setting theory. By modeling the effects of disorganization (as defined) on goal setting and task performance, an understanding of why disorganization occurs, and how it materializes can be gained. Ultimately, the ABM approach allows for an investigation of what emerges once disorganization happens.

3.3.1 Goal setting

One of the ways to better understand and study disorganization is that of associating it with a tangible and pervasive element of organizing (Warglien and Masuch, 1996). In this study, I claim that one such element is “goal setting” (Locke and Latham 1990; Locke and Latham 2013). In order for a goal to be achieved, workers need to make decisions and solve problems. In this chapter, the focus is not on how goals are actually "set" or in the individual or social decision making process leading to a shared understanding of prioritizing goals and identifying what they should look like. It is worth noting that some of these goals are ambiguous (Cohen and March, 1974), thus making it difficult to deal with them. Not all goals are straightforward and easily measurable, as the theory seems to recommend (Locke and Latham, 1990). If we consider elements of goal ambiguity, we may realize that more individuals dealing with the same goal may help defining the shared meaning it has for the organization, employees, and management (Cannon-Bowers and Salas, 2001). Moreover, the dynamic of advice giving and taking between members of a team and/or hierarchical levels (Bonaccio and Dalal, 2006) affects how people think and act on particular goals and tasks. These broader processes can also be described cognitively, providing an externally and socially distributed version of the goal setting process (Hutchins, 1995; Cowley and Vallee-Tourangeau, 2013). As distributed cognition theory posits in a goal based activity system the cognitive process is not only limited to an individual (Rogers and Ellis, 1994). Instead the process involves social and technological means and multiple actors distributed across space and time (Hodgkinson, 2008). Thus it is essential for the agents to have a clear idea of a common goal (Helfat and Peteraf, 2015). Therefore, enabling the work environment to be conducive for distrusted cognition is of utmost importance. This is why it is useful to approach solving problems related to goals using a less-organized (or disorganized) perspective.

Additionally, disorganization and goal setting share some common attributes. Both disorganization and goal setting occur at every hierarchical level of an organization (be it the mailroom or the boardroom). Furthermore, both disorganization and goal setting can be observed regardless of the reference point from which the observation is conducted (individual perspective, group perspective, organizational perspective). Additionally, goal setting and disorganization are inevitable attributes of any organization (Seijts and Latham, 2001). Moreover, setting goals acts as a platform for increasing employee motivation. Finally, the effects of disorganization on goal setting have not been studied before and this provided an added incentive and led to the decision to explore how the two variables interact together (Abrahamson and Freedman 2006).

Goal setting theory (Locke and Latham, 1990) was developed over a 25 year period based on 400 laboratory and field studies (Locke and Latham, 2013). More recent studies have looked at components of goal setting theory as learning goals and individual efficacy (Donovan and Williams, 2003; Seijts and Latham, 2001; Drach-Zahavy and Erez, 2002; Wiese and Freund, 2005). The basic premises of the theory state that hard and clearly defined goals lead to better task performance than vague (less defined) or easy goals if the individual has the efficacy, commitment and does not have other conflicting goals (Locke and Latham, 1990).

The aforementioned relationship between goal difficulty and task performance has been well established both conceptually (Locke and Latham, 1990; Locke and Latham, 2013) and empirically, where researchers observed that when a goal is sufficiently difficult (not overwhelmingly difficult) employees tend to be more motivated at achieving that goal (Donovan and Williams, 2003). The studies also show that difficult goals tend to provide employees with a boost in intrinsic motivation especially if the rules of how to engage the goal are clear and if the employees do not have conflicting goals (Seijts and Latham, 2001). Furthermore, Bandura (1997) and Brown et al (2005) found that self-efficacy, past performance and various external influences affect the way goals are set. Even though the relationship between goal difficulty and performance is well understood, the external environmental or social effects of disorganized work environments on goal setting have not garnered the same attention (Locke and Latham, 2013). In the simulation model discussed in this chapter a goal is considered a prerequisite for a problem to be solved. This means that when a problem is solved a goal has been achieved.

Nevertheless, as already stated above, one of the impacts of disorganization on goals is that they can become ambiguous (Cohen and March, 1974). Of course, there are many ways goals can be perceived that way. For example, a goal can be perceived differently from employee to employee, be defined independent of the hierarchical level(s) in which it is first defined, and its achievement may be judged differently due to the goal being ill-defined (i.e., ambiguous) in the first place.

3.4 The Model

I explore the effects of disorganization on goal setting and task performance using agent based modeling (Fioretti, 2013). ABMs can be seen as a direct solution for understanding complexities involved in an organizational environment (Miller and Lin, 2010). ABM can be used to simulate various organizational dynamics in a simple yet detailed manner (Lomi and Harrison, 2012; Secchi 2013). The primary advantage ABM has over its alternatives is the ability to be more flexible and adaptable (Gilbert and Terna, 2000), characteristics that have increased its use among contemporary scholars (Gilbert, 2008).

Complementing the flexibility of ABM to study disorganization is the fact that this tool has already been used to model effects of disorganization in decision making. Fioretti and Lomi, (2008) used an ABM to simulate the garbage can model (Cohen et al., 1972) of decision making. In developing the model for studying effects of disorganization on goal setting and task performance, a similar approach to that of Lomi and Harrison (2012) is adopted. In fact, a set of rules is derived from the underlying theory which can then be modeled into parameters. Thus the work of Fioretti and Lomi (2008) and Lomi and Harrison (2012) can be used as a foundation for the research proposed here. These rules were modeled using conditional statements.

The two main scenarios are modeled as "organization" and "disorganization." Hierarchy (organization) represents the structured working environment with rigid rules, regulations and operational procedures where agents can only move based on sufficient conditions. Disorganization (natural, structural and function), represents the loosely structured work environment where agents are fully autonomous and free to move.

The intention of this exploratory work is to assess whether some theoretical assumptions hold and to assess under what circumstances they do hold. ABM allows conducting more accurate theoretical refinements before getting to the testing phase. Moreover, this class of models is particularly well suited to represent complex adaptive systems, such as organizational problem solving dynamics.

3.4.1 Space and agents

The world in which the agents reside is three dimensional. The dimensionality of the simulation space allows each agent to move along the x, y, and z axes. A three dimensional simulation space is used instead of a two dimensional simulation space in order to give more variability to agent movements.

The model consists of 4 agents which have a set of variables defined under them. Table 2 shows agent types and their attributes (parameters in the simulation) while Table 3 shows parameters, values, and a short description of what they represent.

Agent	Attributes
Employee (E)	Efficacy (e) , Ability (a), Motivation (m) , level (l)

Problem (P)	Difficulty (d) , level (l)
Solution (S)	Efficiency, level (l)
Opportunity (O)	Level (l)

Table 2: Agent and Attributes

As shows in Table 3, Independent of its type, each agent is associated with a level that is used to specify where each agent is situated within the organizational hierarchy. These levels are defined by numbers from 0 to 4. The number '0' represents the lowest tier of the hierarchy (e.g., mailroom) while the number '4' represents the highest level (i.e. boardroom).

The agent employee[4] represents the typical worker within a given organization. Efficacy, ability, and motivation are characteristics of each employee and are attributed through a random normal distribution with a mean of 0 and standard deviation of 1.

The problem agent represents both physical and non-physical problems which arise within an organization (e.g., unruly employees, broken computers, delayed projects, low sales, and angry customers). This agent in the context of the model is used as a placeholder to represent all the multitude of problems an organization faces. Each problem has a difficulty assigned to it through a random normal distribution with a mean of 0 and standard deviation of 1. The

[4] The *employee* agent is used to refer to any employee within the organization from the lowest level (i.e. mail room) to highest level (i.e. boardroom)

difficulty of a problem represents the inherent complexity (or simplicity) of any given problem and is used in the decision making process. A problem is perceived more or less difficult depending on how this inherent complexity matches with an employee’s abilities, efficacy, motivation, solutions, and opportunities. Such matching reflects problem difficulty relative to each agent-employee.

The solution agent represents both physical and non-physical options available (e.g., repairman, various tools, will power, collective action, political capital) which can be used to solve problems. The solution agent acts as a placeholder to represent all the various solutions available within a given organization. Each solution has an efficiency assigned to it through a random normal distribution with a mean of 0 and standard deviation of 1.

The opportunity agent is used to represent the occasion when a problem can be solved and when solutions are available. This variable takes into account the fact that in any given organization the opportunity to solve problems arise and cease to exists, thus the opportunities need to be grabbed once presented. A given opportunity does not have any attribute which is unique to it but shares the level attribute with all the other agent types.

Parameters	Values	Description
Levels	0,1,2,3,4	Each agent is assigned a hierarchical level randomly. This parameter allows the creation of a hierarchy with the model.
Efficacy	N ≈ (0, 1)	Unique to an employee. Represents an employee’s capability in solving problems

Ability	N ≈ (0, 1)	Unique to an employee. Represents an employee’s level of skill and competency in solving problems
Motivation	N ≈ (0, 1)	Represent an employee’s intrinsic and extrinsic motivation.
Problem difficulty	N ≈ (0, 1)	Represents the inherent level of complexity or simplicity of the problem.
Solution Efficiency	N ≈ (0, 1)	Represents the suitability of available resources to be used for problem solving.
Range	1 – 10	The range determines the amount of patches an agent will scan. i.e., if the range is set at 5 an agent will scan 5 patches around itself at every step. This reflects the real world range an individual has in searching for resources. This is used to model functional disorganization. For example an individual could be given a small range (i.e. within the department) to find a solution. On the other hand the individual can be given a large range (i.e. inter departmental access).
Similar Wanted	0.00 – 1.00	Under the organization condition, the similar wanted parameter determines the percentage of agents of the same hierarchical level that a given agent is satisfied with. I.e., when similar wanted is set to 70% an agent will be satisfied if agents in range were of similar level 70% of the time.

Table 3: Model Parameters

3.4.2 Movement

Movement in the model represents the real-world movement of agents within an organization. The orientation of a given agent (the direction which they are moving towards) depends on its type. Once an agent turns to a random direction it scans its surroundings and moves toward other agents within its range or randomly, depending on the following rules:

1. Problems move freely (i.e., randomly) within the solution space. Upon every step a given problem turns to a random angle and moves a patch before repeating the procedure ad infinitum until the simulation is stopped or the problem is solved in which case it exits the solution space.
2. Solutions tend to move around problems. In this context a solution represents resources available for solving a problem. We assume that each problem has set of resources assigned to it. For example the marketing department having marketing personal, processes and procedures, therefore a problem in the marketing department has marketing resources around it at a given moment. The task of the employee then is to determine what resources to use and what to avoid and also determine how to go about solving the problem. The solution agent parallels the resources available in the real world, both physical and non-physical. A given moves towards the maximum valued problem in range mimicking resources being assigned to problems in an organization.

3. Opportunities represent the window of time and circumstance where a given problem can be solved. In the real world some problems can only be solved at an opportune time or place thus this agent represents the reality of the window of opportunity. Here too, we assume that each problem has an opportunity to be solved. In a real world setting this would be equivalent to time being set aside to engage a given problem. A given opportunity therefore moves toward a problem mimicking a window of time being assigned to a given problem.
4. Employees within the model are fully mobile and move randomly in the simulation space. This represents an organization where employees tend to move around and are not stationary. Even if an employee is stationed to a physical location they have the opportunity to handle multiple problems and move around their designated physical location. Employees move towards problems at any given time. A given employee scans its surroundings and moves towards the maximum valued problem in range.

In order to impose the conditions of both "organization" and "disorganization" within the solution space, various movements based on a set of rules have been developed. First, once "disorganization" is switched-on all the agents within the solution space move with complete autonomy (structural disorganization) and each agent turns to a random direction and moves forward freely. Under this condition agents are free to interact with one another without any restrictions. This form of movement represents a '*structurally disorganized organization*' where employees, solutions, opportunities and problems move freely within the organization and interact without any restrictions. All the single agent movement conditions are applied under this setting. The distance a given agent travels under the disorganization setting is determined by the ‘*range*’ parameter which is an initial condition.

In contrast, when the ‘*organization*’ is switched on the agents are only allowed to move to a certain set of other agents within the solution space. The condition of ‘*organization*’ is designed to represent the hierarchical nature of a real world organization where for example a problem in the mail room tends to be handled by an employee from the mailroom rather than an executive from the boardroom. This structural restriction is implemented through the use of the “level” variable of each agent. The algorithm for hierarchical movement is as follows:

$$E_l \neq P_l \text{ OR } E_l \neq S_l \text{ OR } E_l \neq O_l$$

In the above algorithm let ‘E’ be employee, ’‘P’ be problem, ‘S’ be solution and ‘O’ be opportunity that are available at a given ‘level,’ ‘l.’ The employee’s hierarchical level is checked against the hierarchical level of the solution, problem, and the opportunity so that the agents are dispersed without any interaction if the levels are not equal. In order to implement the aforementioned algorithm fitting a real world scenario some inter-level interactions were allowed. The extent to which the inter-level employees interact is dependent on the randomly defined position they find themselves in. In a real world scenario employees on a higher level might solve problems appearing in lower levels, eventually.

Therefore, in order to implement a more practical hierarchical rule, the so-called '*segregation*' algorithm is used (Wilensky, 1997), based on Schelling's racial segregation model (Shelling, 1969, 1971). The purpose of the segregation algorithm is to separate agents in a way that agents with similar levels cluster together. The following pseudocode summarizes the functionality of this operation.

```
IF [
        (Similar agents percentage in the surrounding range >= Percentage of
        similar agents wanted) [
                Agent is Happy and remains on the same spot]
ELSE
        Agent finds a new spot
]
```

Pseudocode 1: Segregation Model

The aforementioned operation continues until the desired level (which can be specified by the researcher) of happiness among the agents are achieved. This clustering allows agents with different hierarchical levels to interact to a small extent. For example, if the segregation is set to 70%, this implies that 70% of the times agents will only interact with other agents who have the same level and they tend to interact with agents from other levels 30% of the times.

3.4.3 Decision Rules

The same decision making logic is used both when movement is disorganized and organized. A problem is solved when a participant has sufficient ability (a), efficacy (e), motivation (m) and a sufficiently efficient (Sme) solution such that their product is greater or equal to the difficulty of the problem. This is called a 'completed solution' in the model. The following pseudocode outlines the operation.

```
IF [
((Collective value of a given employee's attributes + most efficient solution in
range) ≥ (The difficulty of the problem in range)) [
                Problem is solved;
                Motivation Increases;
        ]
ELSE
        Agents disperse;
]
```

Pseudocode 2: Decision Making

Completed solutions take place when at least one participant, one opportunity, one solution, one problem are on the same simulated place (the so-called 'patch'). The sum of the abilities (including motivation) of the participants on the patch, multiplied by the efficiency of the most efficient solution on the patch, is greater or equal to the sum of the difficulties of the problems on the patch (Equation 1).

$$E(a*m*e) + Sme\ (ef) \geq P(d) \qquad (1)$$

Most often, completed solutions occur when just one participant, one goal opportunity, one solution and one problem happen to be on the same patch and the ability of the participant, multiplied by the efficiency of the solution, is greater or equal to the difficulty of the problem as shown succinctly in Equation 1.

When the difficulty of a given problem is greater than the product of the employee efficacy, ability, motivation and the efficiency of the solution in range no decision is made (Equation 2). If that is the case then, all agents immediately disperse.

$$E(a*m*e) + \mathrm{S}me\ (ef) < P(d) \tag{2}$$

3.4.4 Motivation

For the purpose of the simulation it is assumed that in order for a problem to be solved a goal has to be set by an employee. It is assumed that setting a goal is only possible if an employee is sufficiently motivated. It is assumed as a precondition that the external rewards and incentives are present within the model which provides the necessary extrinsic motivation. It is also assumed that employees are intrinsically motivated by the interest and the enjoyment of the tasks at hand to some extent. The levels of motivation among employees are randomly assigned among the employee population within the simulation.

In line with motivation theories (e.g. self-determination theory) I assume that the experience of successfully solving a problem has a positive effect on motivation (Deci and Ryan, 1991; Steel and Konig, 2006). An employee can set themselves either a “hard” or an “easy” goal. Depending on the nature of the goal (hard or easy) the employee’s motivation is increased as described in the following pseudocode.

When a Problem is solved:

```
IF [
        ((Problem Complexity)  ≥ (2 * Employee Capability)) [
                Motivation Increases by 2
        ]
ELSE
                Motivation Increases by 1
]
```

Pseudocode 3: Motivation

In formalizing pseudocode above, A hard goal is set if the following condition is satisfied:

$$2*(E\ (a*m*e)) \leq P\ (d) \qquad (3)$$

Where 'E' is employee, 'a' ability, 'm' motivation, and 'e' efficacy. 'P denotes problem while "d" denotes the difficulty of the problem. As Equation 3 depicts, if a problem's difficulty is greater than or equal to two times the product of an employee's ability, motivation and efficacy then the problem can be seen as a difficult problem to be solved. Thus an employee in such a predicament has to complete a hard goal. The term "hard" here implies that the problem a given employee is trying to solve is a very difficult one (i.e., 2 times one's own capabilities). Even though the problem might be hard it can still be solved using a highly efficient solution, where the combined value of both the employee's attributes and the solution's efficiency will be adequate to solve the problem at hand. In such a case where a "hard" problem is solved, the employee's motivation increases by a predefined value (i.e., 2).

On the other hand, if the product of the employee’s attributes is greater than the problem’s difficulty then the problem can be easily solved once a solution is utilized.

$$2(E\,(a*m*e)) > P\,(d) \qquad (4)$$

Therefore in a situation where the above condition (Equation 4) is satisfied, where two times the product of an employee’s attributes are greater than a given problems difficulty a problem is classified as an ‘easy’ problem. This implies that the employee does not have to set a ‘hard’ goal. In this case the employee’s motivation does not increase as much compared to a ‘hard problem’ but does increase slightly (i.e., 1).

3.5 Preliminary Testing

Upon completion, the model was subjected to tests in order to determine whether the simulation was working as expected and if the results produced were consistent over multiple runs. The tests were divided into two categories. The (i) organized movement test and the (ii) disorganized movement test.

In order to test the (i) organized movement within the model both the segregation algorithm which enforces the hierarchical dynamics to the simulation and the decision making of the overall model had to be considered. A time limit of 5000 steps was imposed on each test and 10 runs were carried out to check the consistency of the results obtained. The runs of the simulation were used to check if the simulation did not halt, segregation among agents happened according to specified percentages, if the problems were solved and were terminated and if the overall motivation increased.

In the (ii) disorganized movement test only the decision making capability of the model had to be considered. In order to compare results between disorganized movement and organized movement these tests were also given a time limit of 5000 steps. A total of 10 runs were carried out. The runs under the ‘*disorganization*’ condition was used to check if the simulation did not halt, if the random movement conditions worked, if the problems were solved and were terminated and if the overall motivation increased.

3.5.1 Preliminary Findings

At any given instance the employees are divided into five employee types (levels) with a default distribution which is: low level workers (50%), supervisors (25%), managers (10%), middle management (10%) and top management (5%). The default percentages tend to reflect the most common composition of employees within a standard organization.

The range parameter determines the number of patches a given agent will scan during a single step (how functionally disorganized the system is?). The scanning allows an agent to acquire some knowledge about its soundings namely if any other agent is present in the vicinity. Using this knowledge the agent can either move towards an agent or move away from an agent accordingly. It was initially set to 5.

Upon conducting 20 runs (10 runs per condition) we can draw some tentative and preliminary results. The following table presents the findings obtained through running the simulation in the “disorganized” movement condition under a specific set of initial conditions. The initial number of problems, employees, solutions and opportunities were set to 100 at the start of the simulation.

Test Number	Number Completed	Completed Percentage	MMAS	MMAE	Range
1	34/100	34%	0.73	14.05	5
2	42/100	42%	0.80	20.79	5
3	51/100	51%	0.79	58.62	5
4	47/100	47%	0.64	42.65	5
5	48/100	48%	0.73	33.68	5
6	53/100	53%	0.76	89.20	5
7	42/100	42%	0.74	36.94	5
8	42/100	42%	0.74	25.70	5
9	45/100	45%	0.90	59.53	5
10	55/100	55%	0.75	107.35	5
Total	[redacted]		7.59	488.50	5
Average	45.9%		0.75	0.76	48.85
	Note: MMAS : Mean Motivation at Start / MMAE: Mean Motivation At End				

Table 4: ‘Disorganization’ Results

Through the results obtained (Table 4) it can be observed that under the “disorganization” condition (natural, structural and functional) i.e., where all agents interact freely—46% of problems are solved when the model is run for 5000 steps. On average, it takes around 10,000 steps for 95% of the problems to be solved under this condition. However, the number of problems solved decreases significantly when running the simulation under '*organization*' movement condition (Table 5).

Under the '*organization*' condition, the percent of similarity is set to 70% which means that a given agent will only interact with other agents from the same level as itself 70% percent of the time while engaging with agents with other hierarchical levels 30% of the time.

Test Number	Number Completed	Percentage Completed	MMAS	MMAE	SW	Range
1	7/100	7%	0.81	1.44	70%	5
2	11/100	11%	0.91	2.36	70%	5
3	12/100	12%	2.02	0.77	70%	5
4	12/100	12%	0.70	2.01	70%	5
5	2/100	2%	0.81	0.82	70%	5
6	17/100	17%	0.67	2.32	70%	5
7	29/100	29%	0.82	7.35	70%	5
8	38/100	38%	0.82	15.96	70%	5
9	8/100	8%	0.79	1.70	70%	5
10	36/100	36%	0.73	12.80	70%	5
Total	[redacted]	[redacted]	9.08	47.52	70%	5
Average	17.2%		0.9081	0.91	4.75	5
Note: MMAS : Mean Motivation at Start / MMAE: Mean Motivation At End						

Table 5: 'Organization' Results

Table 5 shows that, on average, under the ‘*organization*’ condition 17% of problems are solved when the simulation model runs for 5000 steps. This is a 29%-points drop in efficiency compared to the disorganized movement condition. This drop in efficiency is anticipated given the fact that under the ‘*organization*’ condition agents are mostly expected to only interact with other agents on the same level. Furthermore the range and SW (Similar Wanted) parameters also affect the overall efficiency of the model. The tests conducted above were used to check the accuracy of the simulation. Given the vast number permutations and combinations which can be set through the simulation further testing was required in order to gauge an understanding of the models behavior under a range of initial conditions.

3.6 Extended Experimentation

In extending the experimentation from a preliminary level to a full scale, the simulation model was subjected to further comprehensive experiments in order to determine if the simulation was working as expected, if the proper results were being produced and if the results produced were consistent over multiple runs. The tests were divided into two categories namely the ‘*organized movement*’ experiments and the ‘*disorganized movement*’ experiments. Given the large number of simulation parameters and the variations of values available it was imperative to select a specific set of parameters for this particular study. Upon considering the options available I decided to focus the testing for this particular chapter on opportunities for solving problems under organized conditions as well as the effect of the range of interaction under both the environmental conditions.

Varying Parameters	Organization	Disorganization
Range	[3; 5; 7; 9; 11]	[3; 5; 7; 9; 11]
Initial Number of Opportunities	[50; 100; 200]	[50; 100; 200]
Initial Number of Solutions	[50; 100; 200]	[50; 100; 200]
Initial Number of Problems	[100; 200; 500]	[100; 200; 500]
Initial Number of Employees	[100]	[100]
Similar Wanted	[0.8]	[Doesn’t apply]
Hierarchical Division of Labor		
Hierarchical Levels	100 Workers	100 Workers
Level 0	[50]	[50]
Level 1	[25]	[25]
Level 2	[10]	[10]
Level 3	[10]	[10]
Level 4	[5]	[5]

Table 6: Subset of Parameter Variations Selected

Utilizing the parameter variations depicted in Table 6 both the organized and disorganized movement settings were experimented upon through the simulation. The parameters were selected to represent a conventional small and medium sized organization consisting on of 100 employees with a traditional hierarchy with most workers being in the lowest level of the organization. The problems were varying from 100 to 500 as some businesses have more tasks as opposed to others. Under the organized conditions the similar wanted was set to 80%. This represents assumption that a normal organization (Abrahamson, 2002) where employees of the same hierarchical level tend to work largely with other employees of the same level (i.e. employees in the marketing department works mostly with other employees within the marketing department). In such a condition 8 out of 10 employees a given individual is interacting will be in the same position in the organization as they are as in normal organization. These parameter values therefore do not cover all possible organizations. However provides a starting point based on a conventional organization which can then be further improved upon in future studies. At any given instance the employees are divided into five employee types (levels) with a default distribution which is: low level workers (50%), supervisors (25%), managers (10%), middle management (10%) and top management (5%). The default percentages tend to reflect a paradigmatic example of the composition of employees within a standard organization.

The range parameter is used for imposing functional disorganization and determines the number of patches a given agent will scan during a single step. The scanning allows an agent to acquire some knowledge about its surroundings, namely if any other agent is present in the vicinity. Using this knowledge the agent can either move towards an agent or move away from an agent accordingly. Therefore, range represents the way workers socialize with those close to them more often than to those far away. The vicinity is to be intended as working closeness, as it is within people in the same department.

A time limit of 1620 steps for each run of the simulation was imposed on each experiment and upon conducting a power analysis (Secchi and Seri, 2016), 20 repetitions of the experiments were carried out to check the consistency of the results obtained. The 1638 steps were decided upon after taking into consideration an employee's normal year of work within the organization. Therefore, 1 step is equivalent to 1 hour. On average the actual work time of a worker working for 8 hours will be around 6.5 hours. The remaining 1.5 hours will be utilized for lunch and other mundane tasks. In a usual month the total working days is around 21 days after deducting weekends and 1 public holiday. Furthermore, on average an organization works throughout the years (12 months). Therefore, 6.5 hours a day for 22 days a month within 12 months approximates to 1638 hours.

3.7 Full Study Findings

Table 7 below summarizes the findings of the simulation experiments in the tabulated manner. The table shows if a difference between the organized and disorganized movement conditions was identified and if the results were of any interest or not.

y x	Range	Opportunities	Problems	Solutions

Range	-				
Opportunities	Some difference detected	-			
Problems	Some difference detected	No difference detected	-		
Solutions	Some difference detected	No difference detected	No difference detected	-	

Table 7: Results breakdown

As shown in Table 7 the results indicate a clear difference in the problem solving efficiency of the different configuration of parameters. These differences were observed using conditional plots which allowed us to visualize the number of problems solved in a given period of time under the varying parameters reported in Table 7. ‘Some difference detected’ means that when analyzing the results a clear increase or decrease in the number of problems solved was observed under one setting or both settings (organization and disorganization). In contrast “no difference detected” means there was no observable difference in the number of problems solved.

When analyzing the results of the simulation our primary focus was on investigating the efficiency of problem solving under both the organized and disorganized settings. In doing so, we compared the number of problems solved under both conditions within a given period of time. Furthermore, upon analyzing the plots I discovered that the results were consistent under most conditions. Figure 9 depicts the number of problems solved given time (i.e., “steps” in the simulation) under ‘*organization*’. Figure 9 depicts results obtained when range was 7, the initial number of employees, problems, solutions and opportunities were 100. The red line in Figure 9 is the best fitting regression line for the represented data (IV: range, DV: problems solved). I use this to estimate the average effect of a given set of conditions in the simulation. The two horizontal lines (gray) indicate the values of *y* (i.e., problem solved) corresponding to 1000 and 1500 time steps.

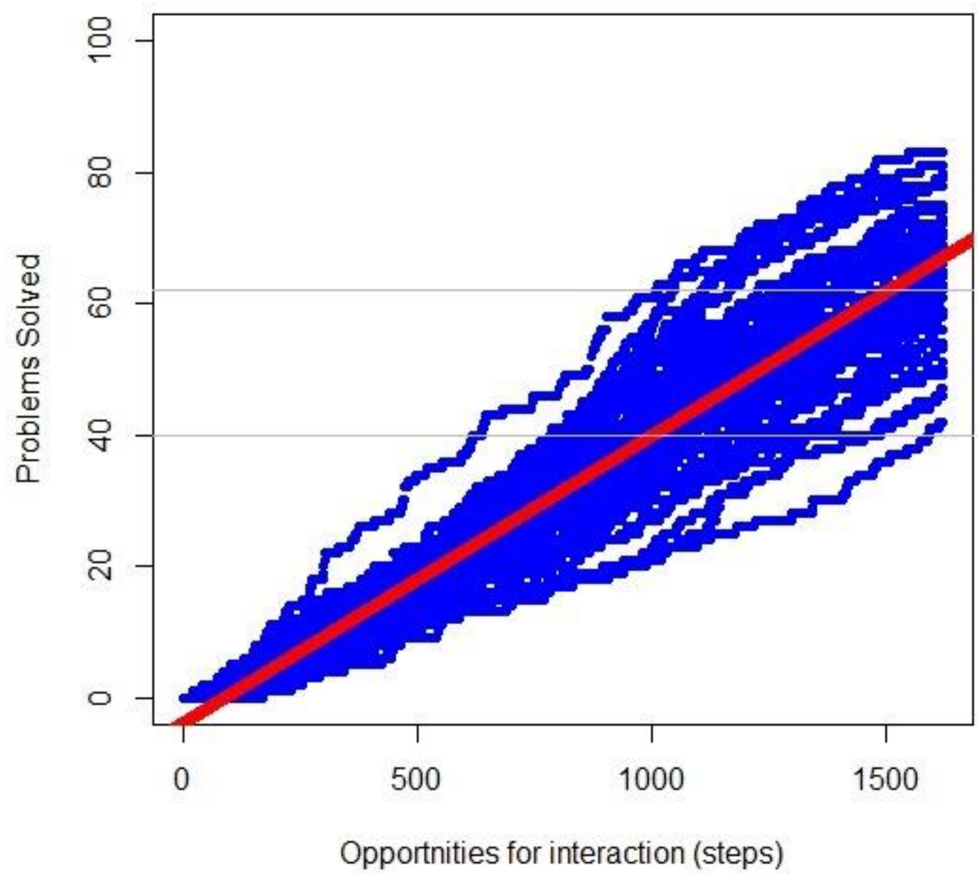

Figure 9: Number of Problems Solved at Range 7, Organization Setting

Figure 9 shows that under the '*organization*' setting, 40 problems were solved in the first 1000 steps (lower horizontal gray line intersecting the regression red line) while 62 problems were solved (upper horizontal gray line intersecting the regression line) in 1500 steps. I also found the mean motivation in this configuration of parameters was 76.65. Next, I plotted the number of problems solved under the same parameter conditions for the 'dis*organization*' setting (Figure 10).

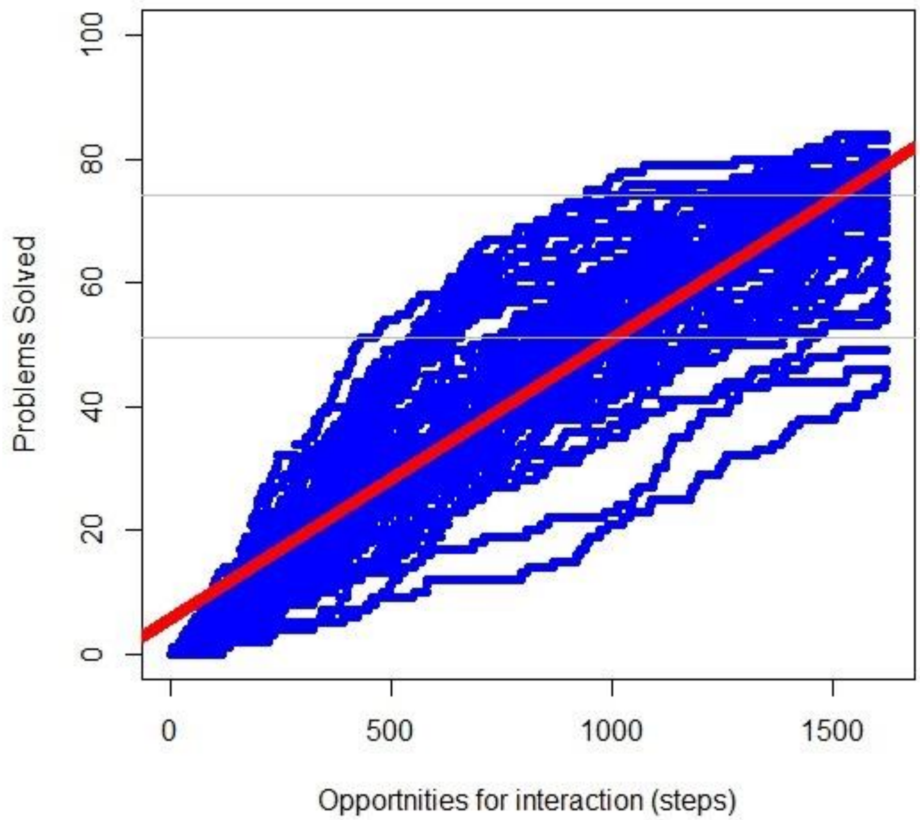

Figure 10: Number of Problems Solved at Range 7, Disorganization Setting

Figure 10 shows that 51 problems out of 100 were solved in the first 1000 steps while 74 were solved after 1500 step. The mean motivation in this particular set of conditions was 183.27. From these results, it is apparent that the 'dis*organization*' setting is generally more efficient than the '*organization*' setting, also reflected in the higher motivation. However, through further analysis of the data I found out that this was not always the case. Through analyzing both data of the organized and the disorganized setting it was observed that the range parameter had a noteworthy effect on the problem solving efficiency while the other parameters did not. These results are further dissected and discussed in the sections below.

In studying the results produced under the organization setting I discovered that the "range" parameter produced some noteworthy effects. Figure 11 graphically represents these observations.

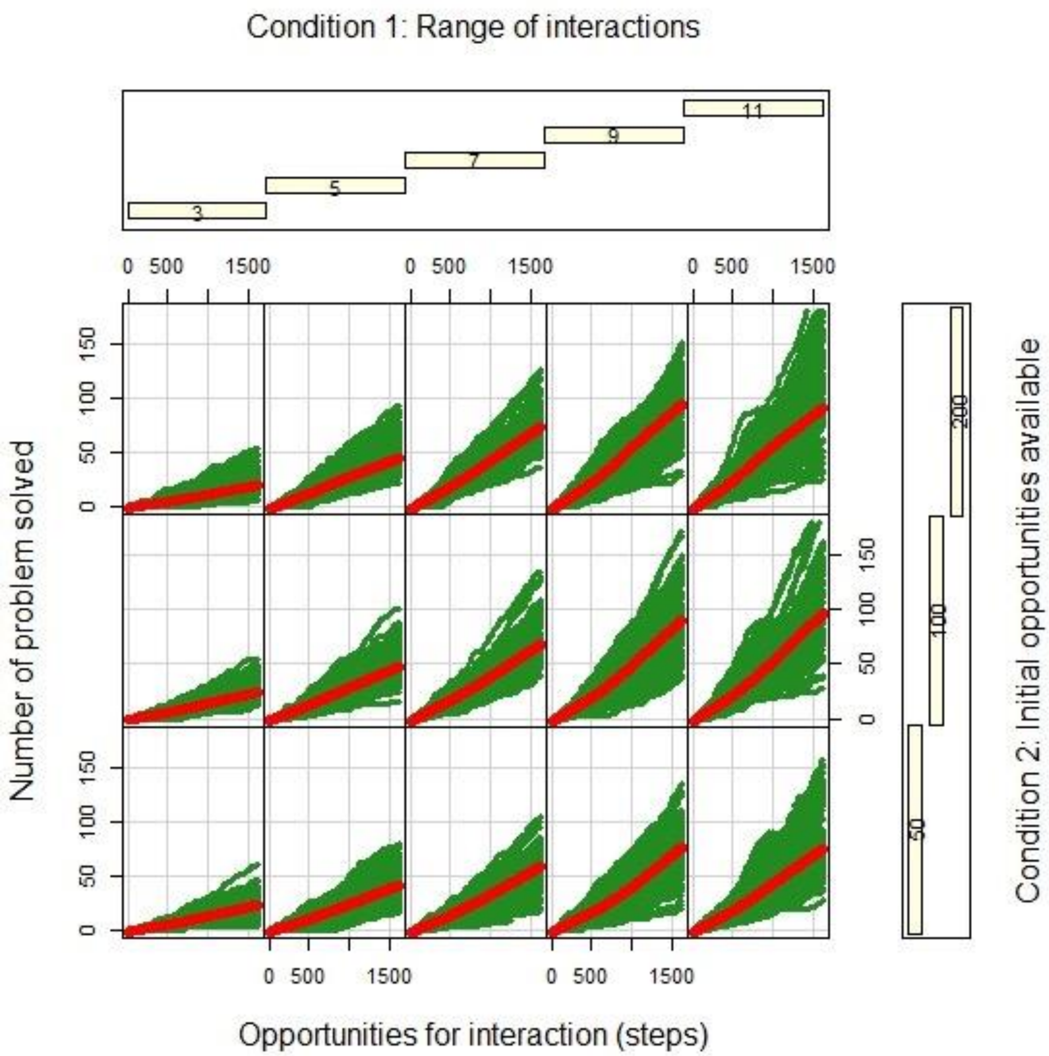

Figure 11: Conditional Plot, Effects of Range and Opportunities on Problem Solved, Given time Under Organization

The number of problems solved in 1638 steps (opportunities for interaction) and its variations given the different range, i.e. the extent to which each agent reaches out to less (range = 3) or more (range = 11) of the other agents, and the number of initial opportunities available. The range parameter represents the number of collaborations/interactions in a real world context an individual is allowed. Range is concerned with the level of freedom given to an individual to seek for resources. This represents a form of horizontal disorganization. Usually disorganization is imposed vertically where individuals are given access to higher or lower hierarchical levels vertically. Using the range parameter, the level of flexibility provided to employees in accessing resources on the same hierarchical level can be controlled. For example 'low' range would represent an employee only allowed to seek for resources on the same department, while a high range would constitute an employee been given access to other departments (on the same hierarchical level). From the angle of the curve we can observe that the number of problems solved within a given amount of time increases with the higher values of the range parameter. Further analysis on these results also showed that the lower the number of opportunities compared to the number of problems, the lower the number of problems solved. However, when the initial number of opportunities is equal to the initial number of problems there was no effect on the efficiency of problem solving. In summary the above figure shows that range plays a significant role in the efficiency of problem solving under the organization setting. These results were consistent when range was plotted against the initial number of problems and solutions.

As with the organized state, the range parameter played a vital role in the disorganization setting. Figure 12 shows the number of problems solved within 1638 steps under varying ranges and varying initial opportunities. As with the organization setting the disorganization setting seems to be highly affected by the range parameter. However, what is surprising is the fact that under a low range of 3 almost no problem gets solved. This is in stark contrast to the results of the organization setting where, at a range of 3, around 25 problems were solved. However, as soon as the range increases under the disorganization setting the problem solving efficiency leapfrogs that of the organization setting as can be observed when comparing Figure 11 and Figure 12.

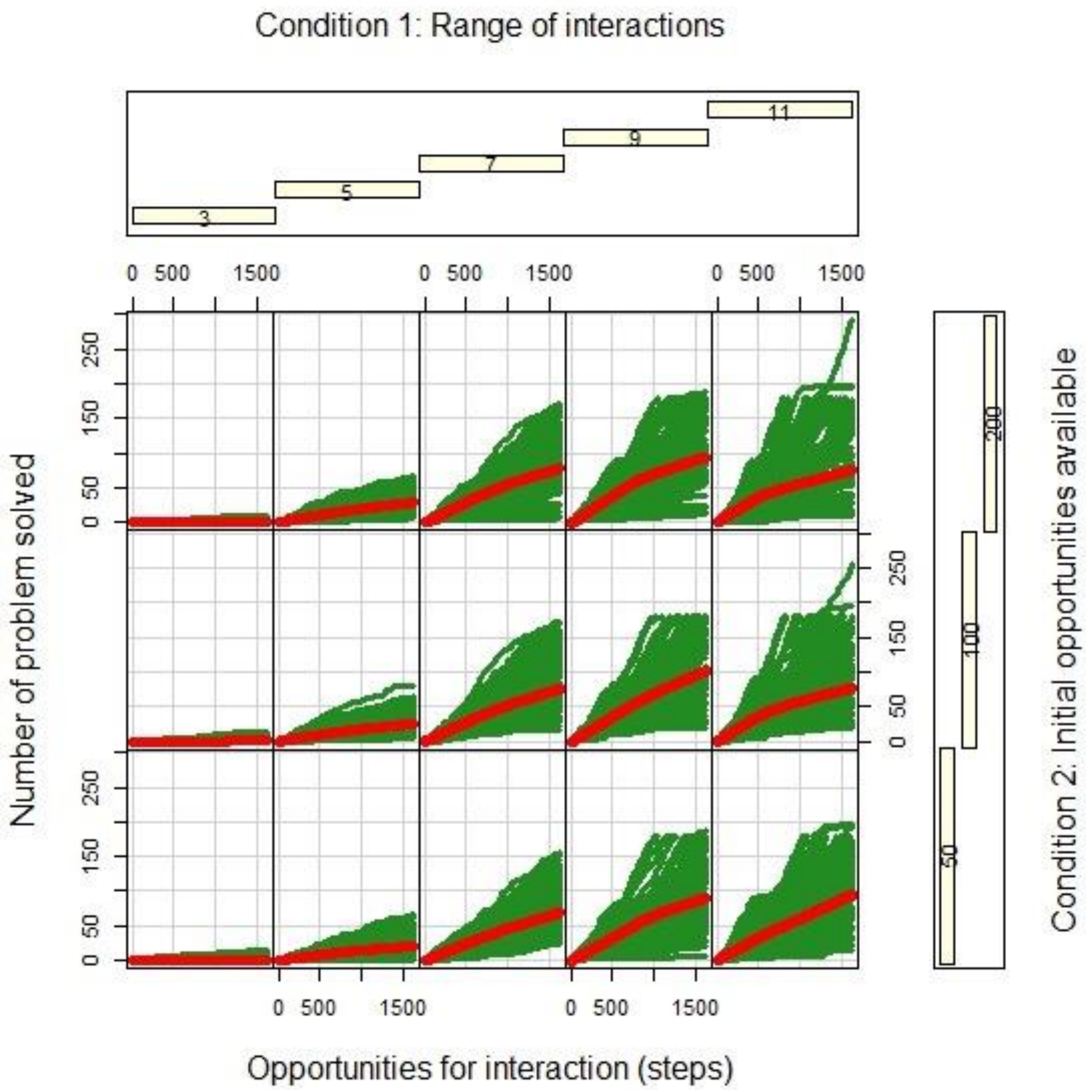

Figure 12: Conditional Plot, Effects of Range and Opportunities on Problem Solved, Given Time under Disorganization

3.8 Discussion and Conclusions

Results obtained from the simulation exemplify that, compared to the ‘*organization*’ setting the ‘dis*organization*’ setting offers a better structural setup for problem resolution only under certain conditions. Disorganization may provide swifter access to problems, opportunities and solutions when employees have enough “range” (given more horizontal freedom, namely the ability to freely seek solutions on their hierarchical level). However, a more organized setting guarantees that certain problems get solved even when the ‘*range*’ is at its minimum (range = 3 in Figure 3). This rather surprising result shows that disorganization imposed vertically (freedom of access to resources [mobility] between hierarchical levels) may not be enough for increasing problem solving efficiency. In such an instance organization seems to be a better option. This is mainly due to the fact that in a situation where an individual is given enough vertical mobility (across hierarchical levels) but not enough horizontal mobility (within the same hierarchical level) the individual could be ill equipped to best utilize the resources found on *other* hierarchical levels due to the lack of mobility they experience on their *own* hierarchical level. Therefore when there is low horizontal freedom (range) also having low vertical freedom (mobility across hierarchical levels) is the better option. In such an instance the employee can focus on how to best utilize the resources found in the low range rather than expending time and effort in focusing on how to use resources gathered from other hierarchical levels in the limited low range available to them. This, however, is true only when the horizontal mobility (range) is low. When the range expands, increasing disorganization (vertical mobility) clearly is the better option. Therefore for optimal efficiency vertical disorganization along with sufficient range (horizontal disorganization) is seem to be the best option.

These results demonstrate that disorganization may not be entirely disadvantageous to an organization, in contrast to views advocated by rational management theorists (Scott, 2001). However, results also show that disorganization does require wider range for the employees to work in, especially when the solutions and opportunities available within the organization are very limited. This seems to suggest that disorganization without proper opportunities or solutions available may not render any benefits to the organization. The result signifies the importance of functional disorganization and the socialization process (i.e. the parameter ‘range’ in the simulation); an employee can scan around him or herself, for the efficiency of problem solving. Findings also show that disorganization (access to problems, opportunities and solutions without any structural restrictions) may not always beneficial, if employees are not able to socialize on a wider range in the organization. Although our results don’t provide direct evidence, they seem to indicate that it is particularly important for disorganization to be matched with a more socially-related (or shared) distribution of responsibilities. It is the organization as a social environment for cooperation that favors disorganized (or unstructured) solutions.

Primarily, results produced from the data analysis of the model indicate that disorganization does indeed create an environment conducive for efficient problem solving, given that individuals have appropriate freedom to search for opportunities and solutions. Although more specific, this is still consistent with the results obtained by Cohen et al. (1972) and Fioretti and Lomi (2008) who affirmed that disorganization is generally a more efficient condition than organization in decision making at all levels of the organization. These findings further lend support to the assertions made by Abrahamson and Freedman (2006) that disorganization may be beneficial to problem solving.

Secondly, results exemplify that a rigid organizational structure (lack of natural and structural disorganization) and rules of interaction (lack of functional disorganization) may be disadvantageous to problem solving due to restrictions on how agents engage with each other and solve problems. On the one hand, the model also points out that sometimes opportunities and solutions are accessible to workers that are not directly associated to a particular problem, thus natural, structural and functional disorganization allows such indirect associations and makes problems solved more efficiently for organizations. This may be the case of an IT company where software engineers are free to look for solutions to their problems in places where, in a hierarchical structure, they would not be allowed to look for them (e.g., in the legal, HR departments, or operations). On the other hand, the organizational setting allows some problems to be solved even when people do not seem to be actively looking for opportunities and solutions available. This may be the case of a company that needs to guarantee that the minimum amount of problems get solved on a daily basis. The national post, for example, cannot possibly allow that a minimal amount of problems do not get solved on a daily basis. These businesses are usually organized very rigidly.

Thirdly, making agents liberally move in the workplace under natural, structural and functional disorganization means that the employee’s abilities are more probable to be matched with the ’correct’ opportunity, problem, or solution. The worker that is ’trapped’ to one hierarchical level may see his/her particular abilities go unused because they do not match any problem to be resolved. There is scope in workers allotting themselves to problems and picking and choosing the correct opportunities to act and the correct solutions to use through the reduction of structural constraints and rules of engagement, the disorganization condition increases the amount of personal discretion available to employees. Personal discretion is defined as the degree to which a task affords substantial freedom, independence, and choice to persons, in determining the processes to be used in carrying out a given task (Hackman & Oldham, 1980). The findings further show that under the disorganization setting the workers have increased individual discretion in the problem resolution process. This also means that different agents/workers ‘see’ and apply diverse solutions to problems, increasing the probability that it gets solved. This also adds to the level of motivation among employees. Furthermore, given that employees have increased autonomy they are able to self-determine which opportunities they engage with. This fulfillment of their self-determined aim generates positive feedback and increases their intrinsic motivation.

Fourthly, contemporary organizations are predominantly made up by teams; some teams often compete with each other to accomplish heterogeneous or near heterogeneous tasks. An out-group looking at another team might undervalue or overvalue the competencies of its rival team which leads to false judgments, perceptions and expectations (Cohen and March, 1974; Hogg et al., 2012; Hackett and Parker, 2016). In order to circumvent unnecessary and unfair judgment based on biased reasoning, a disorganized decision making process and problem resolution process which involves actors from several groups can be utilized. The results further indicate that decreasing rigid rules of interaction does contribute to a larger number of problems being solved. This decreasing of the rules of interaction ensures that the worker who was previously unable to interact with others due to rigid structures can now do so with comparative ease. Agents in the model can be interpreted as teams of individuals, if one gives that interpretation to it. From our findings, we are not able to define whether individual and team problem solving is affected by organization or disorganization. However, this is clearly an interesting area to move this research further.

Fifth, the results indicate that, when the opportunities for solving problems are less than the problems available within the workplace employees seem to not be able to solve as many problems as when enough opportunities are present. This lends some support to the idea that it is important to create problem solving opportunities in organizations. Which may mean that in order to have effective problem solving, managers must provide employees opportunities to engage with problems and find relevant solutions. These "opportunities to engage" work as motivating factors for the employee (Blumberg and Pringle, 1982). This links directly to the ability, motivation and opportunity theory (AMO). AMO theory posits a relationship between motivation, ability and opportunity (Kanfer, 1990). Where an employee's ability is enhanced, the motivation of the employee increases thus creating more opportunities for the employee to contribute to the organization (Gruen et al., 2005). Likewise when the motivation of an employee is increased, the employee is more inclined to enhance their abilities (Kehoe and Wright, 2013). Therefore, as the simulation results indicated that it may be vital that managers create goals and provide sufficient access (through disorganization) to resources for employees which lead to increased motivation of employees. Establishing such a cycle (motivation – ability – opportunity) is essential for increasing efficiency within the organization (Gould-Williams, 2016).

Finally, findings show that the average motivation among employees is greater under disorganization in comparison to motivation levels under organization. This difference in motivation levels can be credited to the higher number of problems solved under disorganization compared to organization. Under the lack of disorganization (natural, structural and functional) employees maybe limited and lack suppleness to solve problems that suit their abilities. This limitation was observed while running the simulation and the results confirm that lack of "elbow room" decreases an employee's efficiency as exposited by Crozier (1969) and further supports the evidence on the positive effects of autonomy (Spector, 1986; Gagné & Deci, 2005). However, under disorganization employees are more autonomous and have more freedom of choice both in the problems and the solutions available to solve those problems.

3.8.1 Limitations and Prospects for Further Research

One limitation of the model as it currently stands is its resemblance to the real world. The model does mimic the basic problem solving process within a work environment however the dynamics it encapsulates is currently limited. In future iterations increasing the number of model parameters and introducing group problem solving, goal prioritization and multiple problem engagement will alleviate the current limitation to greater degree. Plus, introducing concepts such as promotions and demotions for employees along with training are some further research which can be carried out on the model. Introducing multiple types of problems, solutions and opportunities and goals (i.e. stationary and mobile) are also future enhancements which will increase the simulations link to the real world. Furthermore, in order for the model to function as it is I currently use some underlying assumptions. One such assumption is that when a problem is solved a goal gets achieved. The assumption then implies that a goal was set at the point of engaging the problem (i.e. the goal of solving the problem). This assumption currently is not directly operationalized within the simulation, thus can be viewed as a limitation. This limitation can also be tackled in future iterations of the model where the process of goal setting can be made more explicit within the simulation with a number of malleable parameters which will enable the experimentation of multiple settings. In addition, currently I employ a unified value of a given agent in the decision making process. For example, when an employee meets and problem the model multiplies the employee's efficacy, ability and motivation and comes up with a single value. This process does not create any issues when considering the problem solving efficiency. However, it does make it difficult to analyze one particular aspect of an employee's attributes (i.e. efficacy) which is a limitation of the current set up. In the current analysis the data has been analyzed purely through comparison of problems solved under each condition and through visualization of the data (fitting a line) produced by the simulation experiments. A power analysis was performed to understand the number of runs required. This approach cumulatively does provide a clear method of seeing the problem solving efficiency in both the disorganization and organization conditions. The primary objective of the simulation in this chapter was to determine whether an effect of disorganization on task performance was possible in the first place instead of how steadily it would manifest in the simulation. Probably a simple panel regression could have been performed to have a more precise understanding of the impact of the conditions on the dependent variable (i.e. number of problem solved). However, given the *‘search for existence*’ of the effect, this was not deemed necessary and it would have not added much to the interpretation of findings. This is a common approach in simulation experiments. However, a more formal statistical analysis of the data would also be a way forward in further solidifying the findings of the simulations. Nevertheless, the current method utilized in comparing the data does provide accurate differences in the number of problems solved under each condition (disorganization/organization). Without a statistical technique utilized the method in which one can discern if an effect is significant is to run the simulation and compare the effect on the outcomes variable (problems solved) in real time by switching (on or off) each of the independent conditions (disorganization/organization). Nevertheless, a statistical technique would provide some added value to such an analysis when considering how steadily the effect manifests over time, especially if the analysis is to then be compared with real world data. This is one of the future projects coming out of this work discussed here. In future expansions of the model discussed in this chapter could be subjected to sensitivity analysis to further fine tune the parameters. Statistical analysis such as simple analysis of variance or various forms of regression techniques (i.e. cross-section on the final state), panel regression or survival analysis (to study the likelihood of phenomenon) can also be performed. Finally, when experimenting on the simulation I am currently employing a subset of all the parameter ranges. Thus, there are parameter variations which have not been tested yet. In future iterations the remaining variants can be experimented. When the aforementioned limitations are addressed using the future research enhancements also discussed above the model will be more accurate that it is now, it will also generate valuable new data which could hold some interesting results about disorganization and problem solving as a whole.

3.8.2 Conclusions

The objective of the simulation model was to utilize the unique functional and technical capabilities offered by agent-based modeling to simulate an organizational work environment and its dynamics with regard to problem solving, goals and motivation. The model was constructed to simulate two distinct movement and interaction patters one reflecting organization (rigid structural constraints and tightly controlled rules of interaction) and the other reflecting disorganization (reduction of structural constraints and rules of interaction). Through the execution and subsequent data analysis it was discovered that neither full disorganization nor full organization are ideal for solving problems in an work setting. Instead, I observed that disorganization seems to be a more efficient condition for problem solving, especially when the range parameter was high. In this case employees are given unrestricted access to problems, opportunities and solutions (i.e. disorganization). It was further discovered that in a state where 70% of organization and 30% disorganization were maintained provided the most efficient problem solving in the experiments conducted. Thus, overall results highlight the importance of structuring work but simultaneously leaving room for employees to thrive. The next step in extending the research discussed in this chapter is to extend disorganization to a team level. This chapter explores how disorganization affects individuals and their motivation. The next chapter presents study which extends the model to incorporate teams working together to solve problems. At a team level, the role of motivation can be different due to the fact that a team could contain both highly motivated and significantly demotivated individuals. Furthemore, the model in this chapter was self-contained and the initial conditions were determined through a purely theoretical mechanism. The next step therefore will be to extend to model to a state where the initial conditions are determined by both theory and empirical data. Therefore in the next chapter the effect of disorganization on the team dynamics is systematically explored using empirical data.

Chapter 4: Team Problem Solving and Motivation under Disorganization[5]

4.1 Introduction

In modern organizations, teams are an essential component in providing higher manpower (Huckman and Staats, 2013); the capacity to engage with problems from multiple angles (Zeilstra, 2003) and, at times, allowing also for democratized decision making processes (Gradstein et al., 1990; Coopman, 2001). The levels of productivity among teams differs for a multitude of reasons (Sengupta and Jacobs, 2004) with some being more flexible in their decision making than others (Christensen and Knudsen, 2008). The environment in which a team resides and how it is structured plays a crucial role in team performance and their ability to engage in problem solving (Heckscher and Donnellon 1994; Tongo and Curseu, 2015; Fraser and Hvolby, 2010). Therefore, developing an understanding of how teams can be structured in order to exploit team dynamics and enhance problem solving among team members is important for managers. Additionally, it helps to improve corporate performance. In rigidly structured organizations, teams tend to mirror the organizations' inflexible structure (Coopman, 2001); whereas in less rigidly structured organizations, teams tend to be less structured (March, 1991; Coopman, 2001). Consequently, managers forming teams need to understand

[5] This chapters has been presented at the European Academy of Management (EURAM) conference (2016) and has been accepted for publication in the journal *Team Performance Management* (Herath et al., 2017).

what type of working environment will maximize team performance and problem solving..

Traditionally, management accepted “order” (used, as explained above, synonymously with control and rigid organization structure) to be a necessary condition for a productive team. Researchers and managers alike assumed that increasing order within organizations and teams would lead to increased productivity (Taylor, 1911; March, 1991). However, as discussed in chapter 2 researchers in the 1960’s began to question this assumption and found that this was not always the case (Crozier, 1969). Accordingly, a mechanism to reduce highly ordered and (overly) complex organizations was needed (Abrahamson and Freedman, 2006). This process of reducing highly structured organizations became the precursor to the concept of ‘disorganization management’.

‘Disorganization’ is the reduction of organizational protocols and structure; thus, enabling flexibility and better access to resources among the workforce (Merton, 1968; Crozier, 1969). Given the complexity of contemporary business life (e.g., the interplay between a vast network of suppliers, intermediaries, customers and stakeholders) and the environment (e.g., continually changing social, political, economic and technological forces) in which businesses operate, disorganization is bound to occur to some degree (Bridges, 2009; Sellen and Harper, 2003). This situation provides opportunities to proactively leverage the potential benefits of disorganized work environments on teams instead of simply reacting to emerging disorganization.

Organizational teams can be structured in a multitude of ways. Non-profit organizations act as good examples of observing the aforementioned variation as they often rely heavily on volunteers. Teams of volunteers can be highly ordered (i.e. neighborhood watch) while other teams can be highly disorganized naturally, structurally and functionally (i.e. informal volunteering for example helping a friend). This varying degree of disorganization in volunteering offers an ideal setting to study disorganization.

Additionally, teams differ in their baseline characteristics (e.g., different motivation levels, mix of gender). Motivation is a key factor that contributes to an individual’s performance (Andersen, 2009). When working in a team, the individual motivations of each team member shape how the team performs overall. When a team performs well, the motivation of the individual team members goes up, yet when a team performs badly the motivation decreases affecting the overall motivation and performance level of the team. Hence, this study examines changes of motivation when teams engage in problem solving under disorganization using agent-based modeling (ABM). This technique has proven to be an effective tool for studying organizational behavior topics (Secchi, 2015).

The study proceeds as follows: First, I begin with the theoretical background that underpins the framework of the model. Second, I discuss how ABM was used with empirical data to capture varying baseline characteristics of teams that enabled the simulation of wide varieties of scenarios while bringing the model closer to reality. Third, I present the results. The final section discusses the implications of the findings and the limitations of the study.

4.2 Theoretical Framework

The proposed model combines the two elements of disorganization and motivation to explore their impact on teams. I first look at disorganization from two viewpoints. These approaches are the process-oriented view and the state-oriented view of disorganization (Chapter 2). Then, drawing on what outlined in Chapter 2, I categorize disorganization into three types: natural, structural and functional. Finally, I introduce the concept of Public Service Motivation (PSM: Perry and Wise, 1990; Perry, 1996) in order to operationalize motivation within the model.

4.2.1 Team Disorganization

Following up from chapter 3, research has shown that managers are not devoid of the ability to manage disorganization (Warglien and Masuch, 1996; Abrahamson and Freedman, 2006; Freeland, 2002). Managing in this context does not imply structuring or ordering; rather it points to the idea that disorganization can be optimized and utilized on an ad hoc basis within a more organized setting (Abrahamson and Freedman, 2006). The application of disorganized mechanisms and procedures (e.g. in decision making or in innovating) can be construed as disorganization management (Chapter 2). As discussed in chapter 2 we can categorize the study into two types based on how disorganization comes about: states and process. Disorganization as a process is observable in teams (Foss, 2003; Aldrich, 1972; Rivkin and Siggelkow, 2002). For instance, Foss (2003) looked at ‘Oticon’ an organization which pioneered disorganization as a process by introducing flexible rules, collective decision making, cross functional teams and increased employee autonomy (components of disorganization) to achieve a substantial increase in organizational performance. In this study, I am primarily focusing on disorganization as a process as this approach allows us to model the process of inducing disorganization within an organization.

Building on our understanding of disorganization from a process-oriented viewpoint, as discussed in chapter 2 disorganization consists of three distinct types: (1) *natural*, (2) *structural* and (3) *functional* disorganization. All these three types are modeled in this chapter.

4.2.2 Motivation

In order to understand motivation and the underlying attitudes in the volunteering context, we refer to concept of Public Service Motivation (PSM; Perry and Wise, 1990). PSM has been described as “an individual’s orientation to delivering service to people with the purpose of doing good for others and society” (Perry and Hondeghem, 2008, p. 6). It allows researchers to examine rational, norm-based and affective motives through attitudes towards attraction to policy making , self-sacrifice , commitment to public interest , compassion , and also occasionally civic duty and social justice (Perry, 1996). A decisive component of PSM is its strong focus on pro-social behavior and commitment to the public good (Grant, 2008). As such, it is ideally suited to capture motivation of volunteers. PSM studies, while predominately conducted in an environment that could be deemed as highly organized (i.e. public sector and government institutions), have increasingly explored PSM of volunteers (Houston, 2006; Coursey et al., 2011) which could be seen as less bureaucratic. Volunteering work at a local level could be considered a loosely ordered activity (no strict hierarchy) without well-defined lines of authority because local non-profits often lack a formal volunteer coordination manager. As with any work environment, if the individual does not share values and agrees with the mission of organization then this lack of person-organization fit (P-O fit) can negatively influence the motivation performance link (Wright & Pandey, 2008).

4.3 Establishing a disorganization continuum of volunteer organizations

Volunteer organizations could be ranked according to levels of disorganization (natural, structural and functional) present in their teams. The categorization of the organizational types is based on volunteering literature (Bode, 2006). Such a classification can be understood as an organization-disorganization continuum with highly structured organizations as one extreme and complete disorganization as the other extreme. The literature suggests (Bode, 2006; Hustinx, 2008; Salmon and Sokolowski 2001), that small local volunteer organizations (i.e. local student volunteer groups) tend to be less formally structured and less regulated by rules and routines. In contrast, comparatively larger international volunteer organizations (i.e. Doctors without borders) require a higher level of structure for their global scale operations. Thus, the continuum positions local, small-scale volunteer organizations with relatively disorganized working conditions on one pole, while the opposite pole depicts international large-scale volunteer organizations with highly organized working conditions[6].

For the purpose of the model discussed in this chapter, I have used the literature as a guideline to place the organization on the proposed disorganization continuum. I use the task of fundraising as the main problem each team faces. Using fundraising as a task eliminates the need to focus too much attention on the type of volunteering or the context, as it is a common problem faced by volunteer organization in all contexts. Nevertheless, there are limitations to this approach where a context specific model would provide further insight in the effects of disorganization. However, the model discussed in this chapter can be used as a starting point.

[6] The literature does not suggest that this is always the case and emphasizes the importance of context and the type of volunteering as determinants of the volunteer organization is highly structured or not.

Figure 13: Disorganization Continuum

Following the continuum depicted in Figure 13, I model the teams attributing different baseline characteristics to each team according to their position on the continuum. This approach enables us to consider the level of disorganization in those volunteering teams relative to each other.

4.4 Method

In modeling problem solving and motivation under disorganization, I combined agent based modeling and survey data. Survey data subsequently was used to define values of some team member (i.e. volunteer) attributes in the agent-based model. The three attributes that fed from the data collection into the model are volunteer intensity (the individual's perception of effort exerted), PSM (motivation) and P-O fit.

We surveyed individuals who volunteer in the Southwest region of the UK. In November 2014, an email was sent from a community volunteering center to 433 people who had expressed an interest in volunteering and 180 actively volunteering individuals inviting them to take part in a web-based survey. After checking unengaged responses and duplication of surveys, we were left with

226 surveys, with respondents age 15 to 90, 61.9% female, 43.4% baby boomers, 43.8% volunteering weekly with 46.9% without children.

4.5 An ABM of Disorganization and Team Performance

Using real world data, I simulate the effects of disorganization on team problem solving and motivation using ABM. As discussed in chapter 1 and chapter 3, ABM has been used to model and simulate effects of disorganization in decision-making and found that "the 'disorganization' condition provides a better structural environment for employees to solve problems rather than under the 'organization' condition" (Herath et al., 2016, p. 77). The modeling rules used for the simulation presented in this chapter build on the work of Herath *et al.* (2015), Fioretti and Lomi (2008) and Lomi and Harrison (2012) and extend previous work to the team level. This model is a modification of the model discussed in chapter 3 and extends the model to a team level. This model contains five teams, each consisting of seven members competing to solve freely moving problems at the right opportunity, using resources available in the vicinity. The teams operate under to two primary conditions which are *organization* and *disorganization* (when organization is switched off).

4.5.1 Space and agents

The model contains four agents which have a set of individual characteristics (attributes) moving within a three dimensional space. First, I model the *volunteer* (V) agent with the attributes ability (a), efficacy (efc), intensity (e), PSM, P-O fit and level. Second, the *problem* (P) agent is characterized by the attributes *complexity (comp)* and *level (l)*. The problem agent represents any problem faced by volunteers on a day-to-day basis. In the simulation, the volunteers (V) will try to solve these problems (P). Third, the *solution* (S) agent is described by *efficiency (ef)*, and level *(l)*. The solution (S) agent is introduced into the model as a representation of resources available for tackling the problems (P). The solution agent is broadly defined to encapsulate any resource available for volunteers (V) in solving problems (P). Fourth, the opportunity (O) agent only has one attribute: the *level (l)*. The opportunity (O) agent is used to represent the window of opportunity (i.e. the available amount of time to come up with a solution to a problem) a given volunteer (V) or team has in order to use to solutions (resources) (S) to solve the problems (P). Every agent in the model is assigned a *level*. There are five levels in total (0 to 4). The level is used to indicate at which position in the organizational hierarchy that particular agent operates. The position in the organizational hierarchy represented by the level (*l*) is used to depict the point at which a given agent is situated in the organization. For example, a volunteer in the mailroom is in a lower hierarchical position than a volunteer in senior management. For example, with regard to the volunteer agent, the lowest tier of the organization (0) represents i.e. local volunteers while the highest tier (4) represents i.e. the senior management of the charity. The variables and their parameters for this particular study (team based) are identical in nature to the individual study discussed in chapter 3 but the variable for this study has been operationalized in a manner which exhibits team behavior. This is done in order to extend the individual study to a team level which enables consistency of results. Extending the study in chapter 3 into a team level enables the observation of team level dynamics which could not be observed in the previous study. The study in this chapter also provides insight into whether the results observed in the individual study is consistent when extended to a team level. It also provides a mechanism to observe if added emergent phenomena occur which were not present in the individual study. Furthermore, extending the individual study (chapter 3) into a team level study the major difference is the behavior of each volunteer. In the individual study each employee (synonymous with the volunteer agent) seeks problems and solutions in isolation. In this team level study, the volunteer does not seek problems and solutions in isolation; instead each team in the model is designated a separate color and volunteers of the same color congregate together and seek problems, solutions and opportunities as one unit. Table 8 summarizes the value parameters.

Parameters	Values	Description
Levels	0,1,2,3,4	Each agent is randomly assigned a hierarchical level. This parameter allows the creation of a hierarchy within the model. Each team consists of volunteers belonging to various hierarchical levels, thus where a team resides in the organizational hierarchy is determined by averaging the volunteer hierarchy levels belonging to each team
Efficacy	N ≈ (0, 1)	Unique to an employee. Represents an employee’s capability in solving problems
Ability	N ≈ (0, 1)	Unique to an employee. Represents an employee’s level of skill and competency in solving problems

Intensity (effort)	N ≈ (0, *n*)	This attribute was modelled based on the empirical data gathered. Standard deviations for teams 1 to 5 are as follows 1) Religious: 0.90 2) Youth: 1.19 3) Cultural: 1.15 4) Healthcare: 0.94 5) Civic: 0.67
PSM	N ≈ (0, *n*)	This attribute was modelled based on the empirical data gathered. Standard deviations for teams 1 to 5 are as follows 1) Religious: 0.29 2) Youth: 0.55 3) Cultural: 0.47 4) Healthcare: 0.55 5) Civic: 0.62
P-O fit	N ≈ (0, *n*)	This attribute was modelled based on the empirical data gathered. Standard deviations for teams 1 to 5 are as follows 1) Religious: 0.67 2) Youth: 0.53 3) Cultural: 0.55 4) Healthcare: 0.65 5) Civic: 0.50
Problem Complexity	N ≈ (-5 to 5, -5 to 5)	Represents the inherent level of complexity of the problem.
Solution Efficiency	N ≈ (0, 1)	Represents the suitability of available resources to be used for problem solving.
Range	1 – 15	This parameter enables the operationalization of functional disorganization within the model. The range determines the amount of patches an agent will scan. i.e., if the range is set at 5 an agent will scan 5 patches around itself at every step.

Table 8: Parameters and Values

(Source: adapted from the individual study (chapter 3; Herath et al., 2016, p.71)

The 'Volunteer' agent is used to represent a member within a volunteer team belonging to a non-profit organization. There are five teams of volunteers with each team representing a different organization. Each volunteer acts as a team member with the other volunteers of the same team (breed). *Effort (volunteer intensity), PSM* and *P-O Fit* are characteristics of each volunteer and are attributed through the data gathered. The ‘problem’ agent represents the common fundraising task faced by all volunteer organizations. Each problem has a *complexity (*random normal distribution) with an adjustable mean and standard deviation ranging between -5.0 and 5.0. This range was chosen in order to model a wide array of complexities mirroring a real world setting. The *complexity* attribute is used to capture the inherent structural and procedural intricacies associated with a problem. Therefore, a problem can be considered more or less difficult based on how a given problem’s complexity matches with the volunteer team’s attributes, opportunities and solutions. The ‘solution’ agent characterizes both physical and non-physical options available (e.g., resources, finances, political capital etc.) which can be utilized to resolve problems. An *Efficiency* value is assigned to every solution (Random normal distribution; Mean 0, Standard deviation 1). In organizations (non-profit or otherwise) there are opportune times for when a problem can be engaged and when resources (solution) are present, in encapsulating these windows of opportunity the ‘opportunity’ agent was created. Each team has a designated team leader and can have up to seven members at full capacity (including the leader).

4.5.2 Movement

Agent	**Movement Rules**
Problems	At each step the agent moves forward one patch at a random angle. This stochastic movement depicts the

	accumulation and dispersion of entities in line with natural disorganization discussed in chapter 2. When a problem is resolved it dies within the model.
Solutions	Upon scanning the surroundings as specified by the ‘range’ parameter the agent moves towards the nearest problem. This mimics resources being assigned to a problem.
Opportunities	Upon scanning the surroundings as specified by the ‘range’ parameter the agent moves towards the nearest problem. This mimics the opportunity being created (given a specific window of time) for the problem to be solved.
Volunteers	Each individual agent is fully mobile. Each volunteer team (breed) moves as one unit within the solution space. Volunteer teams move towards problems in ‘range’ at any given time.

Table 9: Movement Conditions

Under disorganization (i.e. organization is “switched-off”) the teams move without restrictions in accordance to movement conditions (Table 9). This can be seen as structural disorganization at play. Instead, under organization (i.e. “switched on”) the teams are only allowed to move to a certain set of other agents based on the hierarchical levels (level variable). This encapsulates the structural and functional limitations within real-world work settings. For example, a problem in a door-to-door fundraising setting tends to be handled by a volunteer rather than by a senior manager of the non-profit organization.

In order to understand how volunteers are given access to resourcing, the model under the 'organization' condition utilizes three settings: '*Same Access*', '*Higher Access*' and '*Lower Access*'. Algorithm 1 (Same Access) is used to allow volunteer teams to only access problems, solutions and opportunities at their own hierarchical level. Algorithm 2 (Higher Access) is used to allow volunteer team to access problems, solutions and opportunities at a higher hierarchical levels other than their own level and Algorithm 3 (Lower Access) allows volunteer teams to access problems, solutions and opportunities on their own level and at levels below them. The following pseudocode depicts how each of these conditions are operationalized.

Same Access:

```
IF [
(Agent's Hierarchical level is ≠ Neighboring Agents level) [
                Agents moves away
        ]
ELSE
                Agents engage
]
```

Higher Access:

```
IF [
(Agent's Hierarchical level is ≤ Neighboring Agents level) [
                Agents engage
        ]
ELSE
                Agents moves away
```

]

Lower Access:

```
IF [
(Agent's Hierarchical level is ≥ Neighboring Agents level) {
                Agents engage
        ]
ELSE
                Agents moves away
]
```

Pseudocode 1: Access Levels

These three algorithms can be further unpacked using the following example. Imagine a product design company that has four hierarchical levels in the design department: design interns, junior designers, senior designers and expert consultants. Algorithm 1 specifies a situation where a junior designer team will only have access to problems, resources and solutions in the department of product design assigned to them. Algorithm 2 equates to the junior designers team being given access to resources available to senior designer teams or access to an expert consultant team or their resources in the company (Higher Access). Algorithm 3 equates to a situation the junior designer team being given access to design intern resources (Lower Access). These three algorithms can be utilized to simulate movement in any organization with hierarchical levels in the public or private sector.

The algorithm of the ‘Same Access’ is as follows:

$$V_l \neq P_l \text{ OR } V_l \neq S_l \text{ OR } V_l \neq O_l \tag{1}$$

In equation 1 let ‘V’ be volunteer, ‘P’ be problem, ‘S’ be solution and ‘O’ be opportunity that are available at a given 'level,' 'l.' The volunteer's hierarchical level is checked against the hierarchical level of the solution, problem, and the opportunity. If the condition depicted in equation 1, is satisfied the agents disperse. The above organization condition is the most restrictive of the three conditions. In order to implement the aforementioned algorithm fitting a real world scenario I allow for cross-level interactions. I distinguish two types of cross-level interactions: (a) higher access and (b) lower access.

$$V_l \leq P_l \text{ OR } V_l \leq S_l \text{ OR } V_l \leq O_l \tag{2}$$

The extent to which the volunteers interact across levels is dependent on the randomly defined position they find themselves in. In a real world scenario, volunteers on a higher level might solve problems appearing in lower levels, eventually. Therefore, in order to implement a more practical hierarchical rule the algorithm was modified as follows.

$$V_l \geq P_l \text{ OR } V_l \geq S_l \text{ OR } V_l \geq O_l \tag{3}$$

The algorithm in equation 3 enables volunteers from higher levels to solve problems below their level, but still maintains the strict rule that no volunteer can interact with agents above their level.

4.5.3 Decision rules

Given that the simulation involves volunteer teams, in order to model how a team engages with problems each team is assigned a combined team capability score (Tc). This is the primary difference between the individual study (chapter 3) and the study discussed in this chapter. In this instance the model deals with multiple individuals working together as a team thus extending the individual level dynamics to a broader team level. As shown in equation 4 this is the summation of the attributes PSM (m), P-O fit (p), Effort (e) of all team members. I assume that team capability is the sum aggregate of individual capability. This is done by aggregating the value of PSM (m), P-O fit (p) and Effort (e) of each individual (i) volunteer in the team as displayed in equation 4 below into an overall team capability score.

$$T_c \equiv \sum_{i=1}^{n} (Ve_i + Vm_i + Vp_i) \qquad (4)$$

Using the team capability score, problem solving was modeled next. Once opportunities, participants, problems and solutions meet at the same place (patch)- the problem solving algorithm begins. A problem is solved when a team used solutions where the right opportunity arose. This means a problem will be solved when a team, problem, solution and opportunity come together. Equations 5 shows that for a problem to be solved, a team should find a sufficiently efficient solution (each solution has an efficiency attribute *Sme*). If the team capability score is multiplied with the solution efficiency score and is greater than *a* or equal to *a* given problems complexity (P*comp*) that problem would be solved. This equation depicts how a team can use resources (solutions) to solve a problem at the right opportunity in an organizational setting (See equation 5).

$$T_c * S_{me}(ef) \geq P_{comp} \tag{5}$$

In the event where the problem's complexity value is higher than the combined value of the team's capability and solution efficiency- that problem will not be solved replicating a situation where a team fails to solve a problem (see equation 6).

$$T_c * S_{me}(ef) < P_{comp} \tag{6}$$

4.5.4 Motivation

In line with motivation theory, when a problem is solved in the decision making phase of the model, team motivation of volunteers increases. In order to simulate the team's increased motivation when they solve a problem, I utilize a motivation attribute. Each volunteer has this attribute and it is updated when a problem is solved. When a problem is not solved the team faces deflation and demotivation. This is reflected by decreasing the values of the motivation attribute of each team member. Equation (7) and (8) show how these motivation increases and decreases are carried out.

When a problem is abandoned the motivation of the volunteer team reduces. The levels of motivation among volunteers are assigned through the data gathered. I employ the same logic used for the individual study discussed in chapter 3 to distinguish between hard and easy problems as displayed in equations (7) and (8).

$$2*Tc \leq P\ (comp) \tag{7}$$

$$2*Tc > P\ (comp) \tag{8}$$

Please note that very challenging problems can be solved when teams generate highly efficient solutions. I modelled such situations as simultaneously going along with a 20% increase in motivation levels. In contrast, easy problems trigger much smaller increases of motivation (10%) when being solved. Furthermore, in situations where the team cannot solve a problem even after utilizing a solution, problem abandonment occurs (6) and the team motivation decreases (i.e.10%).

4.7 Computational Experiments

Given the large number of simulation parameters and the variations of values available, it was imperative to select a specific set of parameters for this particular study. Table 10 depicts the parameter used for the simulation experiments.

Varying Parameters	Values
Initial Number of Volunteers – Team 1, 2, 3, 4 and 5	[7]

Organization	[TRUE:FALSE]
Range	[3; 6]
Initial Number of Opportunities	[100]
Initial Number of Solutions	[100]
Initial Number of Problems	[100]
Mean Problem Complexity	[-4; 0; 4]
Standard Deviation of Problem Complexity	[0.6]
Access Condition	[Lower: Same: Higher]

Table 10: Parameter Variations

As with the individual study discussed in chapter 3, this study also required a selection of parameters for the experimentation. This subset as with the one in chapter 3 presents starting point for analysis based on a typical small and medium sized volunteer organization. In doing this subsect of parameters selected represent a small and medium sized volunteer organization with each team consisting of 7 members (as typical in the data gathered 4.2.2). In enabling functional organization the range have two values 3 and 6 which enable the analysis of the impact of increasing or decreasing of functional disorganization on task performance. All access conditions are also used in the experiment in order to see the effect of varying levels of structural disorganization on the task performance.

The range parameter enables the agent to screen its environment, i.e. the number of patches the agent can see. This allows the agent to decide whether to move in a certain direction (e.g. towards other agents located within the range). Therefore, range represents the way workers socialize with those close to them more often than to those far away. The vicinity is to be intended as working closeness, as it is within people in the same team/department.

A time limit of 1000 steps for each run of the simulation was imposed on each experiment and, after conducting power analysis (Secchi and Seri, 2014), it was determined 15 repetitions of the experiments were needed to check the consistency of the results obtained. Each step signifies an opportunity of a volunteer team to interact with problems. On each run teams are given 1000 opportunities to interact with problems. These 1000 opportunities are units of simulated time known as ticks, which give the opportunity to study problem solving dynamics of the volunteer teams over time.

4.8 Findings

The analysis showed that more problems are solved under the disorganization (natural, structural and functional) condition than under two of the three organization conditions (same access and lower access) while under higher access the number of problems getting solved are almost identical to the number solved under disorganization.

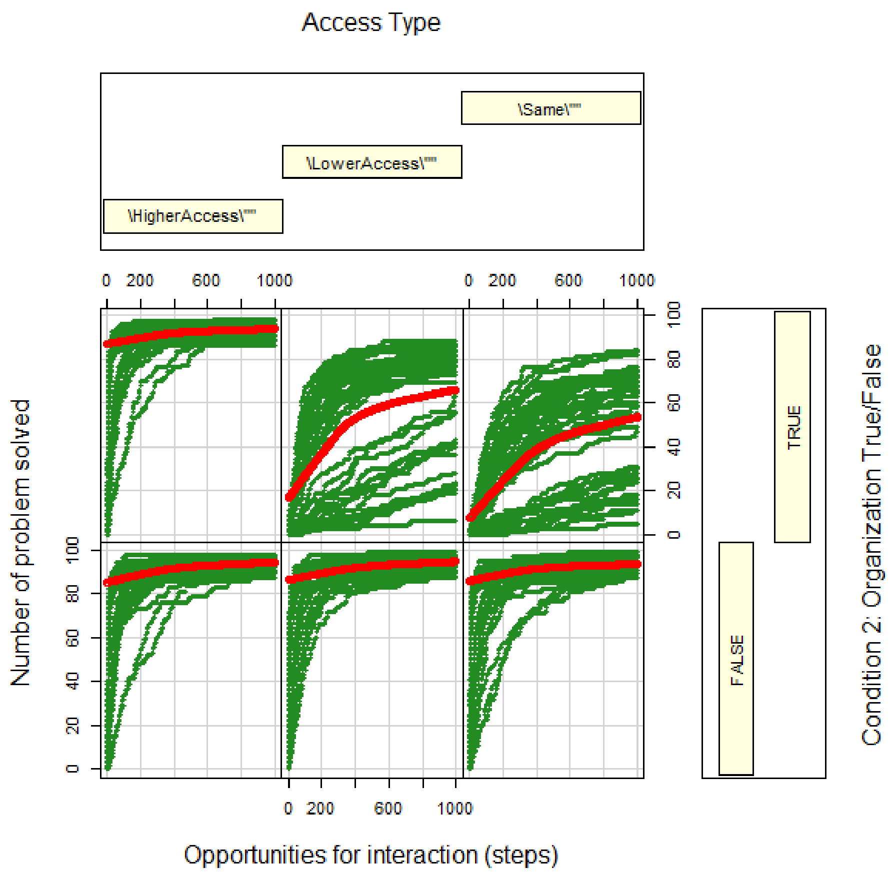

Figure 14: Problems Solved under Organization, Depending on Access Type

These results were consistent among all variations of the parameters (range, problem complexity). However, the results showed that higher access (access to resources on the same hierarchical level and above) outperformed the same access and lower access conditions. Same access was the most restrictive condition (very low structural disorganization) and showed the lowest number of problems solved, as expected. While lower access did perform better than same access, it could not match the problem solving efficiency of the higher access condition.

The reason for these variations can be found in how each of these organizational conditions are designed. Under higher access, the volunteer teams are able to access resources on their own average hierarchical level while also having access to resources above their average hierarchical level. In this case, the resources found on the higher levels of the hierarchy tend to be of better quality that the resources found on the same level. This is reflected in the real world where teams consisting of people who hold higher positions than teams consisting of individuals with lower positions have access to a wider range of resources that also tend to be of higher quality. On the other hand, the lower access condition still provides the teams with the opportunity to access resources from a level other than their average level, but only if the resources are below their hierarchical level. This is the most common case in many organizations. In contrast to resources above a team’s average level, the resources found below the team’s average level tend to be lower in quality than the resources found in the same level. Therefore, the problem solving efficiency is lower than the higher access condition. However, the lower access condition still has a higher problem solving efficiency than the same access condition. This is because even though the resources found under the lower access condition are generally of lower quality, the teams still have a wider range of resources to work with than having only access to resources on their same level. Consequently, the results seem to indicate it might be important that when having an organized work environment adequate access to resources it provided to employees.

Furthermore, the results showed that when problems increase in complexity problem solving efficiency of teams go down under organization, while under disorganization the efficiency remains at high levels even if the problem complexity rises.

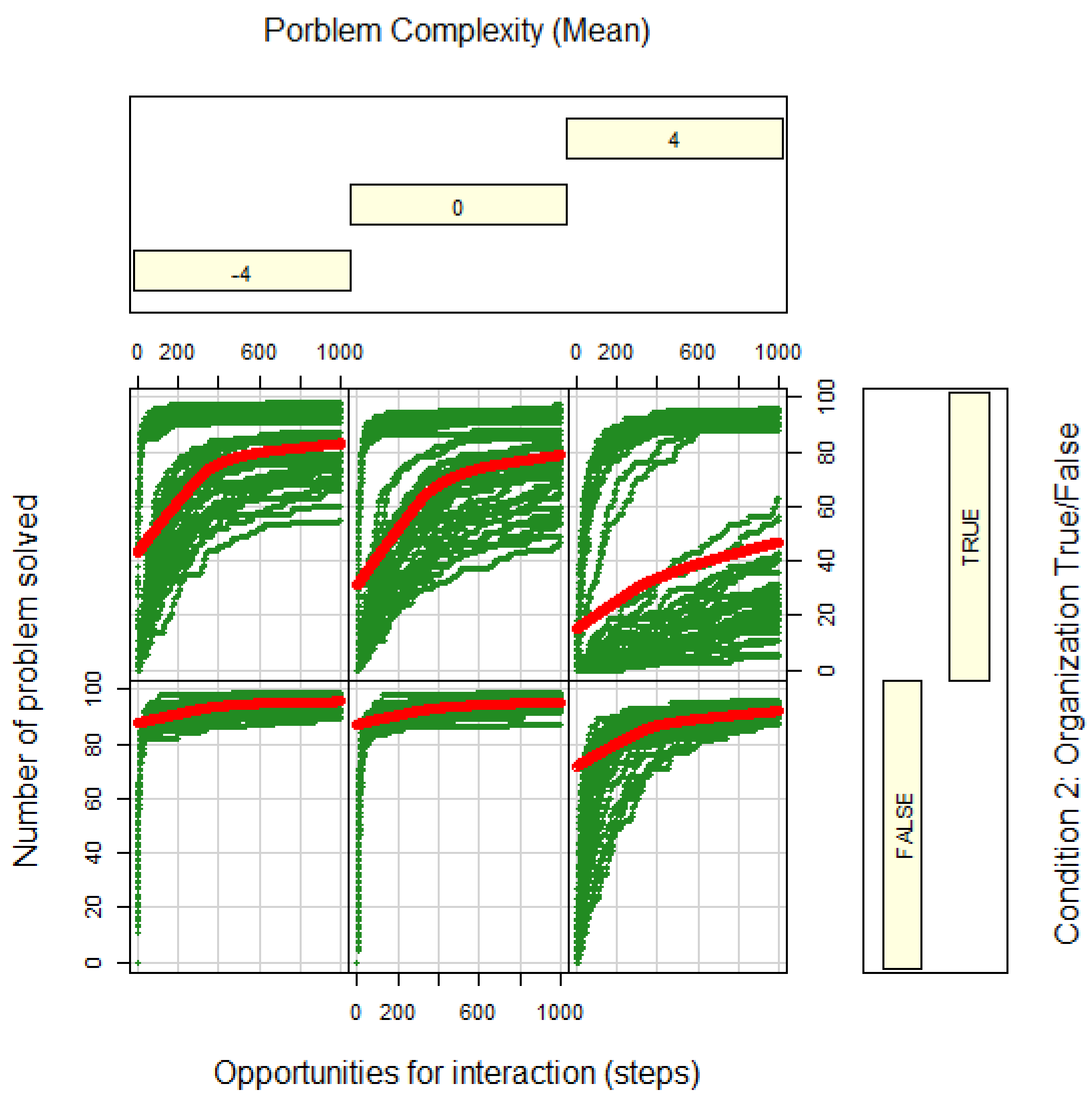

Figure 15: Problem Solved under Organization, by mean problem complexity

The results depicted in Figure 15 seem to exemplify that disorganization is a better condition for solving highly complex problems. Additionally, the range parameter (functional disorganization) seems to play a major role in the number of problems solved under both the organization and disorganization condition. The optimal range seems to be six while anything lower makes the teams perform slower (as the team members do not have enough range (functional disorganization) to seek out resources) while anything larger makes the team members confused as to which problems to engage (as there is too much information for the team to handle).

Ultimately, results linking motivation and problem solving efficiency appear to be varied. On the one hand, results displayed in Table 11 show that the teams with the higher combination of PSM, Intensity and PO Fit tend to solve the highest number of problems. On the other hand, the religious volunteering team weakens this result as it deviates from this pattern. It should be noted that the results were consistent over time for all the experiments conducted.

Teams (1 – 5)	**Standard Deviation of Parameters (Mean = 0)**			**Number of Problems Solved after 1000 steps, Range 6**			
				Organization			**Disorganization**
	PSM	**Intensity**	**PO FIT**	**LA**	**Same**	**HA**	
Religious	0.2950209	0.9086935	0.6790827	14	12	19	20
Youth	0.5591867	1.194035	0.5318161	18	12	20	20
Cultural	0.4756984	1.157944	0.5563178	11	10	18	16
Healthcare	0.5540717	0.9437783	0.6541871	11	10	18	17
Civic	0.6246199	0.6734919	0.5052478	10	8	11	15
Total				**64**	**52**	**86**	**88**

LA: Lower Access, HA: Higher Access

Table 11: Average Number of Problems Solved by Each Team

One interesting outcome of the results as depicted in Figure 15 is that, problem complexity seems to have very little influence on the number of problems solved by a team when the organization condition is false (disorganization). The data showed that under the 'higher access' condition the with a low problem complexity (-4), the number of problems solved when the organization condition is true and false is very similar with disorganization marginally edging ahead. Under the 'same access' condition, with low problem complexity disorganization clearly outperforms organization. This is true under the 'lower access' condition with a low problem complexity as well; In fact, under the 'lower access' condition the performance gap between disorganization and organization is at its widest.

When the problem complexity is increased to moderate complexity (0) under the higher access condition once again the problem solving efficiency of disorganization and organization are similar (effect negligible). Nevertheless disorganization slightly outperforms organization once more. In the 'same' and 'lower' access conditions disorganization has a greater problem solving efficiency than organization. However it should be noted that the number of problems solved in total in either condition is lower when the complexity of the problems are moderate (0) compared to lower complexity problems analyzed earlier (-4).

When problem complexity is further increased (4); under the 'higher access' condition under disorganization more problems are solved compared to organization. However in line with previous findings here too the gap between the problem solving efficiency of disorganization and organization is minimal. It should be noted, though, that with each increase of problem complexity the problem solving efficiency gap between disorganization and organization also widens. However this gap is not as apparent when compared to the problem solving efficiency gap between disorganization and organization where problems are highly complex (4) and when the access type is either 'same' or 'lower'.

The way the model is developed there is inherent relationship between problem solving and motivation. Teams who solve highly complex problems routinely have higher increases for motivation. This in turn increases the team's capability which then enables the team to engage more problems with higher complexity, thus creating a positive feedback cycle. This behavior is also shown when teams engage problems with medium or low complexity as well albeit at a much smaller degree.

4.9 Discussion

This study simulated team problem solving behavior in organized and disorganized environments. I employed an agent based modeling approach to identify the dynamics behind problem solving behavior. Additionally, the model was calibrated using survey data. Overall, the results seem to support the idea that disorganization is beneficial to problem solving. It should be noted that generalizability of the results of this study is limited and further statistical analysis on a broader range of parameters would provide a stronger case for the generalizability of the results. However, the results analyzed in this study do provide a starting point for the implications of disorganization to be discussed and to be opened up for further investigation. More specifically, the results have a number of implications for the debate on problem solving efficiency. First, the findings on the number of problems solved under disorganization and organization clearly displays a stark difference between the two conditions where more problems are solved under disorganization. These results indicate some agreement with findings of Abrahamson and Freedman (2006), Fioretti and Lomi (2008) and Herath et al. (2015), and extend them to the team level. Results further seem to support some of the benefits of disorganization discussed by researchers (i.e. access to more resources, greater stakeholder participation; see e.g. Freeland, 2002; Warglien and Masuch, 1996; Shenhav, 2002).

Second, under disorganization (natural, structural and functional) the teams also have access to more problems which explains the higher number of problems solved as theorized (Fioretti & Lomi, 2008). These results then imply that when it comes to problem solving efficiency (number of problems solved within a specified period) reducing restrictions to access to resources might play role in increasing the number of problems solved in a real world setting.

Third, the variations of problem solving efficiency observed when comparing higher access conditions might have some implications for organizations.

Though a loose generalization, it might be worth considering the fact that in an organization where teams have access to resources from higher levels, the teams should find it easier to solve problems given that they get access to higher quality resources (Freeland, 2002). How access to resources is authorized is ultimately a strategic decision varying from organization to organization depending on organizational culture, management style, and governmental policies. However, the level of access a team receives is a case-by-case decision (Sellen and Harper, 2003). In an ideal scenario, completely unrestricted access (complete disorganization) is desired. But, more realistically, mechanisms for access to resources on higher levels should be provided within reasonable boundaries. Even with unrestricted access to resources below the average level of a team's hierarchical level proper legal and ethical factors should be taken into account.

Fourth, another relevant finding is the close relationship between problem complexity and problem solving efficiency. The lower the problem solving complexity, the more problems get solved. The results further showed the importance of the access type to problem solving efficiency. Teams with access to resources on higher hierarchical level apart from their own level in the hierarchy tend to solve more problems than teams who only have access to resources on the same level or lower. The more remarkable finding was that when the two factors are paired they increase the effect on problem solving efficiency substantially and the effects are accentuated. Therefore, for managers setting up teams it might be worth trying to understand the team capability and then provide them with problems with a suitable level of complexity and also enable them to access enough resources both in terms of quantity and quality in order to achieve desired results. For example a manger dealing with a team with high technical capabilities (i.e. IT specialist) need to find problems which require such capabilities. This "team to problem" matching process is essential for increasing performance.

With respect to our own study, two clear implications for practitioners are clearly emerging: First, natural, structural and functional disorganization consciously induced by management should go along with a removal of hierarchical access restrictions. Such an effort in a real world context might as a result make employees more likely to perceive higher organizational support and also more autonomy at work, both of which are beneficial for motivation and, ultimately, problem solving. Second, even though access to resources regardless of hierarchical level is generally better for problem solving, there seems to be no utility in having access to resources multiple levels higher or lower than a team's average hierarchical level (Bridges, 2009; Freeland, 2002). This is because a team on a lower level with access to a resource several levels higher than their usual access might find the resource unmanageable or too complicated to handle. Similarly if the resource is multiple levels below, that resource might not have enough quality or effectiveness for what it is required for at the team's hierarchical level. This finding establishes a boundary condition for the use of disorganization processes which is of high importance for practitioners.

Apart from the implications disorganization theory and management practitioners discussed earlier, this study adds two main contributions to academic research. First, the model's ability to act as a virtual laboratory allows us to study disorganization. Second, the methodological application of ABM allows for simulating disorganization. As discussed in the disorganization section in this chapter disorganization needs to be analyzed from multiple theoretical vantage points in order to provide mangers and organizations a better understanding of how to manage disorganization. This model provides a virtual laboratory to test the dynamics and implications of the theory focusing on disorganization as a process.

Ultimately, on the technical level, as discussed above, ABM provides a robust platform in which organizational behavior can be studied. This approach is novel in its application and enables further research in studying disorganization in a virtual laboratory. Additionally, it also provides the basis for studying other problems in management research.

4.10 Limitations

The model mimics the basic problem solving process within a work environment; however, the dynamics it encapsulates are currently limited. For instance, the structural disorganization component of disorganization continuum is not fully operationalized in the current version of the model. Therefore, in future iterations the disorganization continuum should be further operationalized in order to reflect different structural makeups of volunteer teams. Introducing multiple types of problems, solutions and opportunities (i.e.

stationary and mobile) are also future enhancements that will increase the simulation's link to reality. Currently I employ a unified value of a given agent in the decision making process.

In future iterations, a more straightforward operationalization of P-O fit and its relation to motivation can be implemented. Finally, when experimenting on the simulation I am currently employing a subset of all the parameter ranges. Thus, there are parameter variations that have not been tested yet and can be studied in the future.

Building on this study future research should consider further exploring conduciveness of disorganized work environments on problem solving efficiency by introducing more ways of structuring the work environment. Such work has the potential to generate more nuanced insights on what structures lead to efficient problem solving. Researchers can also focus on the benefits of disorganization, for example innovation and study how creative solutions emerge under disorganization. Exploring different types of organizational hierarchies (flat, lean, layered) potentially yields interesting results. As with chapter 3, the data of this simulation model has been analysed purely through comparison of problems solved under each condition (over multiple runs) and through visualisation of the data (fitting a line) produced by the simulation experiments. The next step in moving this study forward in the future would be to extend the analysis through the utilisation of statistical techniques to add further value to the findings of the study. Finally, future research could strive to build and model a stronger link to motivational theories which might provide insight into how to motivate a disorganized team while also aiming to conduct empirical studies validating the implications.

With two simulation studies exploring the concept of disorganization and its effects on both individuals and teams complete the next step is to explore the findings further through an empirical study. An empirical study can be used as a means to further validate the results of the simulations.

Chapter 5: Measuring Disorganization

One of the major hurdles for measuring disorganization in a real world setting has been the ambiguity of the theoretical implications behind its conceptualization (Abrahamson, 2002). Furthermore the lack of theoretical development in the concept itself was one of the major issues in trying to measure disorganization in organizations. One of the primary objectives of this entire research project was to provide a theoretical clarification to the concept of disorganization thus clearing out the ambiguity and setting up a foundation on which empirical investigations of disorganization could be conducted. Given that substantial work has been carried out in developing the concept of disorganization (natural, structural and functional) and systematically studying the implications of the theory of disorganization, the next logical step would be to measure disorganization in businesses. However, there is one final hurdle in being able to accurately measure disorganization. This is the lack of a validated measurement scale or an index. Producing such a validated scale would take a considerable amount of time and is one of the future research initiatives coming out of this research process. Thus, this chapter presents a foundational study measuring disorganization which aims to act as a basis for future empirical research of disorganization.

5.1 Theoretical Background

Even though a handful of scholars have expressed the need for systematic empirical studies of disorganization (Brunsson, 1996), thus far there are no such studies. As Abrahamson, (2002) points out, without empirical evidence none of the theoretical concepts can be validated. Early studies of disorganization posit (Chapter 2) a positive relationship to the level disorganization within an organization and its usefulness to the organization in terms of efficiency (Brunsson, 1996). Abrahamson (2002) and Abrahamson and Freedman (2007) both articulate the need for empirical measurement of disorganization. They posit that the level disorganization and its utility to the organization have a concave relationship (Abrahamson, 2002). This means that up to a certain threshold the increase of disorganization increases the usefulness of disorganization to the organization. However, beyond the threshold any additional increase in disorganization decreases its usefulness to the organization. This relationship however has been conveyed purely on a theoretical basis and the threshold where the utility to the organization starts to decrease is not clear. Furthermore, the simulation studies discussed in chapter 3 and 4 did show that increasing disorganization increases efficiency and that after a certain point increasing disorganization did not further increase problem solving efficiency to a significant extent. However, the studies failed to observe any clear concave relationship where efficiency decreases beyond a given disorganization threshold. Thus, the theorized concave relationship between disorganization and its utility remains an open question. There are multiple issues in measuring disorganization. From a purely logistical vantage point any attempt to measure disorganization in a business is met with resistance due to negative connotations associated with the terminology itself. Furthermore, given that still a large proportion of organizations tend to lean towards order as its primary mechanism for increasing efficiency, any attempt to challenge this assumption is also met with resistance. From a technical point of view, determining valid measurement criteria as to what can be constituted as disorganization is also a major challenge. In attempting to address this measurement problem, Abrahamson and Freedman, (2007) proposes the breadth, depth, volume, and intensity (BDVI) model for measuring the dimensions of disorganization. In the BDVI model, the breadth refers to the span disorganization has spread within a given hierarchical level of the organization; the depth refers to number of hierarchical levels disorganization encompasses within a given organization. Volume refers to the number of entities out of order, while intensity refers to the ratio of disorganized entities to the organized entities. It should be noted that this model is proposed as a mechanism to measure disorganization as defined by Abrahamson, (2002) where disorganization is the accumulation of varied entities within socially organized complex human structure. As discussed in chapter 2, the aforementioned definition only considerers natural (unintentional) disorganization. Therefore, the use of the BDVI model under this context would only provide a partial measurement. However, apart from a minor technicality there are no major issues in extending the BDVI model for measuring structural and functional disorganization. The aforementioned technicality has to do with the fact the constituents of this model seem to overlap in practice. For instance, the depth and breadth proposed to measure disorganization are almost interchangeable. For instance, the breadth measures the span of disorganization spread within a hierarchical level, while the depth measures the number of hierarchical levels out of order while volume measures the number of things that are out of order within a level. In such a case measuring the volume and depth might be enough to gauge the level of disorganization within the organization and measuring depth might be a redundant effort. Depth and volume do measure slightly different aspects; however it is unclear if both these nuanced measurements are needed for explaining how disorganization affects a given organization. Furthermore, in an instance where one aims to measure disorganization in a flat organization (few hierarchical levels) it might be more useful to drop the depth measure and directly measure the breadth and volume of disorganization as a whole. In addition, when measuring the volume of disorganization the procedure for determining how many `things` are disorganized might pose problems. It seems relatively easy to demarcate physical things that might be disorganized as artefact a, artefact b and so on; however, when considering measuring relationships that can be disorganized it is not clear how relationships can be easily isolated or how one can determine one relationship over another given that most organizational relationships tend to be overlapping and entangled with a lot of other relationships. It is also not clear if physical and non-physical things can be measured by one general measure (volume). It might well be the case that these measurements are all equally important or it might even be the case that the measures in the BDVI form do not fully capture disorganization. Given the aforementioned open questions, the fact that there is no clear way to gauge the relevance of the BDVI model or the applicability of the model for measuring disorganization as manifested in organizations it is imperative to start empirical research into disorganization. Therefore, in order to rectify the aforementioned issues, a systematic set of empirical studies should be conducted where each study builds on its predecessor. Consequently, the study discussed in this chapter is the first attempt at starting such a systematic exploration of disorganization through empirical methods. Given that there are no previous empirical studies to use as a basis for this study, I decided to start from a relatively small exploratory study as an attempt to lay a foundation for future research to build on in the long term. The theoretical reasoning and justification for each of the measures used in this study are discussed in detail in subsequent sections. In the next section the hypothesis development process discussed in detail.

5.2 Hypotheses Development

Based on the literature discussed earlier in this chapter and in previous chapters (chapter 3 and 4) one can establish that disorganization, In general, is considered to have a positive effect on task performance. It is further understood at this point that disorganization consists of natural, structural and functional elements. The theory suggests disorganization yields better performance per worker but does not clearly specify what tasks are involved in measuring the performance. The simulation results from chapter 3 and 4 show that there is a positive relationship between individual worker performance and disorganization (measures based on generic tasks). Simulation studies also show that disorganization seems to increase task performance while boosting both employee satisfaction and motivation. Therefore this study aims to explore the effect of disorganization (structural & functional) acting on some organizational factor like task performance. Even though in the simulation studies discussed in chapter 3 and 4 the organizational factor considered were ‘*tasks* performed by each individual’; what exactly constituted ‘tasks’ were not explicitly specified or differentiated. This was done in order to increase the generalizability of the simulations. However, in measuring task performance in the real world requires a more specified organizational factor than the generic notion of a ‘task’. One such factor is an individual workers financial performance. Financial performance per worker is an outcome of a worker performing their day to day activities (tasks), therefore there is a direct link between financial performance per worker and the tasks discussed in the simulation studies (chapter 3 and 4). Financial performance is a commonly used performance measure in economics and social science mainly due to the fact that it is universal and that every organization has some way of keeping track of it. Furthermore every organization’s financial performance can be divided into individual worker’s financial performance within that company. Therefore, financial performance per worker was considered the organizational factor to be studied along with disorganization. It consequently provides added value to this study given that the effect of disorganization on *financial performance* has also not been studied before (Abrahamson and Freedman, 2007). As a result, this study is one of the first attempts to look into the effects of disorganization on the financial performance of organizations. All things considered, given that both theory and the simulation studies point towards a positive relationship between disorganization and performance per worker, the study presented in this chapter puts this question to test. In doing so, this study aims to investigate whether there is a *positive association between disorganization and employee performance (financial) that can be empirically identified*.

Therefore the hypothesis (h1) can be stated as

Hypothesis 1: Disorganization is positively associated with financial performance per worker.

Upon testing the aforementioned hypothesis, we will be able to understand the issues and constraints involved in measuring disorganization and as to whether pursuing further studies in measuring disorganization are viable research options.

5.3 Method

For this particular study, the most relevant dataset was identified in the work and employee relations study (WERS, 2011). The dataset consists of both variables which can be used to develop a disorganization measure and organizational financial performance which can be transformed into individual level financial performance per worker. The dataset used in this study consists of data from over 2500 British organizations (small to large scale) and is the biggest dataset available of this kind. The WERS is a data set sponsored by multiple public and private institutions and is considered the best officially collected employee relations survey data in the UK (Deepchand et al., 2013). The data collections occurs every three to four years and the subsequent documentation and coded data are released the following year (takes up to two years in some cases). Even though the latest data was collected in 2014, it is still undergoing various changes while some data is protected due to various legal procedures. Therefore, the 2011 dataset is the only freely available fully coded dataset with full assisting documentation. The dataset contains information pertaining to the financial year 2010-2011 (12 months back from the week the data is collected). The data has been collected in as one 12 month block in order to reflect the usual financial units similar studies take. The 2011 WERS in particular is co-sponsored by the Department for Business, Innovation and Skills (BIS), the Advisory, Conciliation and Arbitration Service (Acas), the Economic and Social Research Council (ESRC), the UK Commission for Employment and Skills (UKCES) and the National Institute of Economic and Social Research (NIESR). The completed WERS 2011 dataset consists of three firm level data subsets with one individual level employee dataset. These datasets were collected using the employee profile questionnaire, financial performance questionnaire, management questionnaire and worker representative questionnaire. The employee profile questionnaire gathers data on the employees participating in the data collection process (company executives or high level managers). The financial performance questionnaire gathers information on the input cost, output costs (wages) and the overall asset values of the organization. The management questionnaire gathers the bulk of the data pertaining to the operations of the organization and the management of its employees, some of which have been chosen for this study and discussed in this chapter (including sample questions). The worker representation questionnaire gathers data relating to the organization and its relationship to internal and external work unions. All datasets were connected with a unique key in order to enable analysis across datasets. The following figure shows a summary of the data collected.

Total response and response rates, 2011	All workplaces
Management Questionnaire	2,680
	46.3%
Worker Representatives Questionnaire	1,002
	63.9%
Survey of Employees	21,981
	54.3%
Financial Performance Questionnaire	545
	31.8%

Figure 16: Dataset Summary

As shown above the total number of organizations participated were over 2500. However, the organization which provided financial information was 545. Thus only the organizations which provided financial performance information were considered for this particular study.

5.3.2 Data Preparation

For this particular study, the datasets of interest were the financial performance survey data and the management survey data. Given that multiple variables, how they are measured and the government policy has changed during WERS 2004 WERS 2011, the datasets differed significantly in how and what has been measured. Therefore, a decision was made to only use the WERS 2011 dataset. The first step was to combine the two datasets using the unique key (serno). Given that the dataset consists of over 30 variables it was important to only select the variables which were of interest for this particular study. The following table depicts all the variables chosen.

Variable	Given Name	Meaning and Measurement	Possible values
Serno	Serno	Unique identifier to merge data if needed	[auto generated]
Turnover	Sales	Number of sales in a 12 month period	0 - 999999999
q4tot	Employees	Total employees in the organization in the 12 month period	0 - 999999999
Ownoth	Assets	Assets owned	0 - 999999999
Purchase	Input cost	Cost of purchases	0 - 999999999
Empcost	Emp cost	Cost of employees	0 - 999999999
Ahowlong	Firm age	How long has be business been in operation	0 - 999999999
Cvariety	Job variety	Extent to which staff in largest group have variety in their work	1 to 4 (1 a lot, 4 none)

Cdiscret	Emp discretion	How much discretion do employees have on what the pace of their work?	1 to 4 (1 a lot, 4 none)
Control	Emp control	How much control employees have on how they work?	1 to 4 (1 a lot, 4 none)
Cdesign	Emp design	How much discretion do employees have over their work design?	1 to 4 (1 a lot, 4 none)
Cteamhoa	Mutual depend	Team members depend on each other's work to be able to do their job	1 or 2 (1 - Yes)
Cteamhoc	Collective decisions	Team members jointly decide how the work is to be done	1 or 2 (1 - Yes)
Dinvplan	investment plan	Does management give employees information about internal investment plans?	1 or 2 (1 - Yes)
Dfinance	finance plan	Does management give employees workplace level financial information?	1 or 2 (1 - Yes)
Dstaffin	staffing plan	Does management give employees information about staffing plans?	1 or 2 (1 - Yes)
nsicod07	Sector	Type of business (service, manufacturing, etc.) - used for clustering	2 to 19 (different types)

Table 12: Selected Variables

Observations with missing values were completely removed from the dataset which reduced the overall observations from 545 to 460. Out of the remaining 460 observation outliers were also eliminated after running a few regressions. Finally, further 15 observations were removed in order to enable clustering based on sector as some sectors had less than 20 observations.

5.3.2.1 Context (control) Variables

The context variables for this study include firm size, firm age and sector. The following table depicts the summary of the context variables.

Variables	Dummy Variable Setup
Employees	Broken down into 5 blocks of 2000. 1) Less than 2000 : <2ThouEMP (variable name) 2) 2000 to 3999 : 2to4ThouEMP 3) 4000 to 5999 : 4to6ThouEMP 4) 6000 to 7999 : 6to8ThouEMP 5) 8000 to 10000: 8to10ThouEMP
Firm age	Broken down into 10 block of 100 1) 100To199Y 2) 200To299Y 3) 300To399Y 4) 400To499Y 5) 500To599Y 6) 600To699Y 7) 700To799Y 8) 800To899Y 9) 900To1000Y

Sector	Initial Dataset consisted of 19 sectors. However upon analysis it was discovered cases for some sector were below 20 observations. Therefore, in order to make the clustering process accurate only sectors with 20 observations or more were selected. The sectors which had less than 20 observations were dropped. This brought down the sectors to 12. The sectors are as follows. The reference sector was the sector with the lowest number of observations compared to the others and is marked in *italics*. - A: Manufacturing - B: Construction - C: Wholesale and retail - D: Transportation and storage - E: Accommodation and food service - F: Real estate activities - G: Professional, Scientific and Technical Activities - H: Administrative and Support Service Activities - I: Education - J: Human health and social work activities - K: Arts, entertainment and recreation - *L: Other service activities*

Table 13: Context Variables

Given the nature of the study these three context variables were adequate for isolating the effects of disorganization on employee performance. The control variables discussed above serve a specific purpose which is to control for the contextual information which might be acting upon the analysis. In a dataset such as the one utilized for this study the number of employees has a significant influence on an organization's financial performance. Organizations which have more employees might outperform a significantly smaller organization solely due to the larger workforce. In such a situation isolating the effect of the independent variables will be problematic. Furthermore, it presents an opportunity for a richer level of analysis if the effect of disorganization can be observed depending on the firm size. Firm age is also another contextual variable which needs to be controlled for in order to isolate the effects intended for observation (namely the effect of disorganization) and it also provides richer insight as to whether disorganization has a higher effect on younger organization than their older counterparts. Sector is another measurement which needs to be controlled for in order to see if disorganization depends on sector or to observe if certain sectors exhibit more disorganization than the others. Sector in particular is very important since some of the variable discussed in the disorganization index (Section 5.2.3), namely Investment Plan , Financial Plan and Staffing Plan yield drastically different measurements depending on the sector. For example an organization which is in the defense industry might not be at liberty to pass certain information pertaining to its investments to its employees, while another organization which might be in the service sector might not have such restrictions. It is therefore imperative to control for sector in order to have a fair analysis. The three control variables (firm age, firm size and sector) are also widely used as controls for similar studies including studies which use the same data set (Huergo and Jaumandreu, 2004; Majumdar, 1997).

5.3.2.2 Dependent Variable (DV)

Given the nature of the dataset and the objectives of the study the financial performance per worker was selected as the dependent variable. The dependent variable (a production function in this case) was calculated as follows.

$$ln(Pp) = ln(\frac{S-(I_C+E_C)}{E}) + C \qquad (1)$$

Where *ln* is log, Pp denotes performance per worker, S denotes sales, Ic denotes Input costs while Ec denotes employee costs. E denotes employees while C denotes the constant. The variable was logged in order to normalize it and make it suitable for regression. The constant was added in order to eliminate the negative values when the log is calculated.

5.3.2.3 Independent Variables (IVs): Disorganization Index

The IV for this particular study was devised in the form of an index variable which was made up of a combination of variables. The following paragraphs discuss each of the variables selected for developing the disorganization index. While discussing how these variables reflect the theoretic dimensions of the disorganization construct this study is trying to gauge.

Job Variety (jobvariety) - Job variety as measured in the dataset looks at whether '*employees can do other jobs tasks apart from their primary job tasks*'. In an organized setting (functionally organized, chapter 3) an employee is limited to one primary task without '*range*' to engage with other tasks; this denotes a rigid structure. In a functionally disorganized setting the employee will be allowed to seek and engage other tasks apart from their primary tasks. This variable therefore clearly gauges if an organization is highly organized or disorganized in terms of ‘*range*’ provided to an employee (horizontal mobility). Thus this variable translates clearly to the ‘*range*’ variable used for the studies discussed in chapter 3 and 4.

Employee Discretion (empdiscretion) - This variable measures ‘*how much discretion do employees have on the pace of their work?*’ An employee controlling their own work pace denotes increased autonomy in the work place (high functional disorganization). Increased autonomy is theorized to an antecedent of disorganization where managers allow employees to freely make work related decisions. This variable however only measures one dimension of work autonomy (namely the freedom to choose the work pace). Autonomy as measured by this variable translates to functional disorganization (chapter 2).

Employee Control (empcontrol) - This variable measures a different dimension of autonomy compared to ‘*empdiscretion*’. The particular variable looks at how much control do employees have on *how* they work. This variable tries to gauge whether employees are free to choose their own method of working and executing their work. An organization which allows such freedom can be seen as an organization with high functional disorganization while an organization who does not allow such autonomy is low in functional disorganization.

Employee Design (empdesign) - This variable measures the last dimension of autonomy where the measurement tries to gauge if employees are given the freedom to design their own work. This again falls under functional disorganization where organizations which allow employees to design their work score high on functional disorganization while the organization who does not allow work design score low. The separate measurement of work pace, work control and work design present an interesting dynamic to the study. This is due to the fact that organizations might provide autonomy in work design while not providing any autonomy on work pace. If all three dimensions were measured as a single variable '*autonomy*' such difference might be overlooked. Therefore the way in which work pace, control and design is measured translates well to disorganization theory and acts as the constituent parts which add granularity to the broader measure *functional* disorganization.

Mutual Dependency (mutualdepend) - This variable measures if employees in an organization can work together in performing their tasks. Therefore if mutual dependency is high that organization can be seen as "structurally disorganized". Which means that employees are allowed to work with each other without It should be noted that the variable does not measure if *mutual dependency is a requirement* for certain organizations; instead it measures if *mutual dependency is allowed*. The difference of these two measurements is vital as there might be organizations which allow mutually dependent work but the work itself (by its nature) does not require any collaboration (mutual dependency).

Collective Decisions (collectivedecsions) - This variable measures if the employees can work together in deciding how the work is executed. This variable is similar to ‘*empdesign*’ but the emphasis in this particular case is on whether an employee can seek other employees on executing their work. This variable thus covers both functional and structural disorganization. If an organization allows the freedom (eases the rules) to interact with other in executing work it can be constituted as high functional disorganization. At the same time if the organization allows decisions to be made collectively (unidirectional communication) this translates to an organization which has disorganization in its structural set up which constituted high structural disorganization.

Investment Plan (dinvplan) - This variable seeks to gauge if information is freely circulated within the organization (information transparency). A rigidly structured organization has restriction of information flow (Graber, 2002) and usually has key information isolated at the top of the hierarchy (Minetaki and Takemura, 2009). Therefore an organization which circulates information in a less restricted way can be seen as highly disorganized while an organization which doesn’t can be seen as a low disorganization environment. However, not all information needs to be circulated within the entire organization and depends on the type operation carried out by the organization. Therefore this particular variable measures if employees are given information on a company’s “investment” plans.

Financial Plan (dfinance) - This particular variable measures if information related to workplace finances are circulated down the employees within the organization. There is literature which suggestions informing employees at all levels of the organization of its financial performance helps workers integrate with the organizations overall strategy and direction (Christensen, 2002). Therefore, the more transparent the information flow is within the organization, it can be deemed 'disorganized' given the flexibility of the information circulation process within the organization.

Staffing Plan (dstaffin) - This particular variable measures if information about staffing plans is communicated to employees within the organization. An organization that exhibits such behavior (free movement of information) can be seen as exhibition disorganization while the organizations who do not can be deemed organized, perhaps rigidly.

In developing the disorganization index the variables selected were variables which measured functional and structural disorganization. It should be noted that this data collection by WERS 2011 was not designed to specifically measure disorganization. Therefore, some level of judgment was required in determining which variables should be chose for the disorganization index. Upon determining the variables which were suitable for disorganization index a principle component analysis (PCA) was conducted in order to explore possible avenues of analyzing the data. This exercise was also used to check whether the dimensionality of the components (input variables) can be reduced. The variables used in the PCA were job variety, employee discretion, employee control, employee design, mutual dependency, collective decisions, investment plan, finance plan and staffing plan.

```
Importance of components:
                          Comp.1    Comp.2    Comp.3     Comp.4     Comp.5   Comp.6
Standard deviation     1.5826716 1.2803678 1.0815551 0.89956980 0.87470902 0.799341
Proportion of Variance 0.2783166 0.1821491 0.1299735 0.08991398 0.08501288 0.070994
Cumulative Proportion  0.2783166 0.4604657 0.5904392 0.68035314 0.76536601 0.836360
                           Comp.7     Comp.8     Comp.9
Standard deviation     0.75614900 0.72115645 0.61719688
Proportion of Variance 0.06352904 0.05778518 0.04232578
Cumulative Proportion  0.89988904 0.95767422 1.00000000
```

Figure 17: Principle Component Analysis

Upon performing the PCA and analyzing the data as presented above, it was observed that the explanation of the variation within the dataset was spread-out among the components and none of the components individually explained more than 28% of the variation. Given that none of the generated components above individually explained more that 30% of the variation in the dataset there was not clear utility in using a PCA based regression therefore it should be noted that the PCA discussed here was used merely as an exploratory exercise in order to determine possible avenues of moving the analysis forward. Hence, it was decided that the variables used for the final polynomial regression therefore were not components but the original variables as discussed in earlier section 5.3.2.3. In future studies a more refined approach could be used.

Next, how the aforementioned variables were collated to form the disorganization index is discussed. The following table depicts the data transformations carried out in developing the disorganization index.

Variable	Possible values	Transformation
Jobvariety	1 to 4 (1 a lot, 4 none)	Categorical variable was created. Observations with a value of 2 or less were considered 1 = high variety and observations with a greater value than 2 was considered 0 = low variety
Empdiscretion	1 to 4 (1 a lot, 4 none)	Categorical variable was created. Observations with a value of 2 or less were considered 1 = high employee discretion and observations with a greater value than 2 was considered 0 = low employee discretion
Empcontrol	1 to 4 (1 a lot, 4 none)	Categorical variable was created. Observations with a value of 2 or less were considered 1 = high control and observations with a greater value than 2 was considered 0 = low control
Empdesign	1 to 4 (1 a lot, 4 none)	Categorical variable was created. Observations with a value of 2 or less were considered 1 = high design autonomy and observations with a greater value than 2 was considered 0 = low design autonomy
Mutualdepend	1 or 2 (1 - Yes)	‘2’ was recoded as 0.
Collectivedecsions	1 or 2 (1 - Yes)	‘2’ was recoded as 0.
Dinvplan	1 or 2 (1 - Yes)	‘2’ was recoded as 0.
Dfinance	1 or 2 (1 - Yes)	‘2’ was recoded as 0.
Dstaffin	1 or 2 (1 - Yes)	‘2’ was recoded as 0.

Table 14: Disorganization Index Variables

In order to develop the disorganization index, the IVs were summed. This procedure, creates a disorganization variable with a minimum value of 0 and a maximum value of 9. Each organization then will have a disorganization score somewhere in between these two values. The index was constructed through a simple aggregation method. This was prompted due the fact that each of the variables were measured using the same scale pointing towards the same direction and was pointing towards a positive correlation in relation to the dependent variable (performance per worker). This was further corroborated by the principle component analysis (PCA) conducted. In a situation where the independent variables used in the index were pointing towards contradicting correlations such an index could not be constructed using a simple aggregation method. Through the PCA it was also discovered that the variable in questions are evenly responsibly for explain the variation on the dependent variable. Therefore all components were used in the index construction. At the point of index construction the choice of there was a choice to be made on whether index will be an average variable or an aggregated variable. Given that either option is statically equivalent the simple aggregation was preferred. It should be noted these questionnaires were developed to gather general data on financial performance and management information and employee relations and was not devised to measure disorganization. Therefore in developing the disorganization index not all types of disorganization could be considered.

5.4 Findings

After completing data preparation, polynomial regression was utilized to systematically analyze the data. The primary reason for choosing polynomial regression is to examine with the purported concave correlation (Section 5.1) between the independent and dependent variable. Given the polynomial regression provides the best method in which such curved non-linear regression lines (exponential) can be analyzed polynomial regression was preferred over other regression methods. *Polynomial regression* is a form of regression in which the relationship between the independent variable *x* and the dependent variable *y* is modeled as an *n*th degree polynomial. Polynomial regression fits a nonlinear relationship between the value of *x* and the corresponding conditional mean of *y*, denoted E(*y* | *x*), and has been used to describe nonlinear phenomena (Stigler, 1974). Researchers have theorized that disorganization and performance could have a non-linear relationship where disorganization will be beneficial up to a certain peak point and then any more disorganization will have an adverse effect (Abrahamson and Freedman, 2007). This theoretical prediction has not been empirically observed. Therefore, polynomial regression was chosen as the preferred method in order to gauge a nonlinear relationship if there is one. The models (R routine) used for the regression are listed below.

1. Model 1: (Performance per work ~ Control variables)
    a. *Performance Per Worker = constant + control variables*
2. Model 2: (Performance per work ~ Control variables + disorganization)
    a. *Performance Per Worker = constant + control variables + disorganization*
3. Model 3: (Performance per work ~ Control variable + disorganization + disorganization squared)
    a. *Performance Per Worker = constant + control variables + disorganization +* $disorganization^2$
4. Model 4: (Performance per work ~ Control variable + disorganization + disorganization squared + disorganization cubed)

a. $Performance\ Per\ Worker = constant + control\ variables + disorganization + disorganization^2 + disorganization^3$

The regression was conducted hierarchically.

The following table depicts the results obtained through the polynomial regression analysis.

	Dependent variable:			
	Log Performance Per Worker			
	(1)	(2)	(3)	(4)
Logassetsemp	-0.003	-0.003	-0.002	-0.002
	(0.011)	(0.011)	(0.011)	(0.011)
logEmp	-0.035	-0.029	-0.026	-0.027
	(0.025)	(0.025)	(0.026)	(0.026)
Manufacturing	0.186**	0.212**	0.209**	0.211**
	(0.085)	(0.085)	(0.085)	(0.085)
Construction	0.137	0.153*	0.154*	0.155*
	(0.092)	(0.092)	(0.092)	(0.092)
Wholesale and retail	0.242***	0.266***	0.265***	0.267***
	(0.085)	(0.085)	(0.085)	(0.085)
Transport and storage	0.121	0.141	0.134	0.136
	(0.102)	(0.102)	(0.102)	(0.102)
Accommodation and Food service	0.059	0.083	0.082	0.084
	(0.097)	(0.097)	(0.097)	(0.097)
Real Estate	0.137	0.141	0.139	0.141
	(0.102)	(0.101)	(0.101)	(0.102)
Professional, scientific and technical	0.175*	0.178**	0.175**	0.176**
	(0.089)	(0.088)	(0.089)	(0.089)
Administrative and support	0.204**	0.235**	0.234**	0.233**
	(0.099)	(0.099)	(0.099)	(0.099)
Education	-0.070	-0.077	-0.077	-0.075
	(0.089)	(0.088)	(0.088)	(0.089)
Health and Social	-0.016	-0.025	-0.026	-0.025
	(0.088)	(0.088)	(0.088)	(0.088)

Arts, entertainment and recreation	-0.082	-0.071	-0.071	-0.071
	(0.106)	(0.105)	(0.105)	(0.105)
Size 2000 to 4000 Employees	0.073	0.072	0.073	0.071
	(0.099)	(0.098)	(0.098)	(0.098)
Size 4000 to 6000 Employees	0.051	0.038	0.035	0.037
	(0.127)	(0.126)	(0.126)	(0.126)
Size 6000 to 8000 Employees	0.286	0.224	0.244	0.250
	(0.243)	(0.242)	(0.243)	(0.244)
Size 8000 to 10000 Employees	0.047	0.006	0.014	0.015
	(0.240)	(0.239)	(0.239)	(0.240)
Firm-Age 100 to 200y	0.035	0.033	0.029	0.029
	(0.067)	(0.067)	(0.067)	(0.067)
Firm-Age 200 to 300y	0.076	0.029	0.048	0.054
	(0.238)	(0.237)	(0.238)	(0.239)
Firm-Age 400 to 500y	0.088	0.108	0.090	0.088
	(0.329)	(0.327)	(0.328)	(0.328)
Firm-Age 500 to 600y	-0.116	-0.085	-0.108	-0.117
	(0.405)	(0.402)	(0.403)	(0.405)
Firm-Age 900 to 1000y	-0.132	-0.051	-0.041	-0.035
	(0.334)	(0.333)	(0.333)	(0.334)
Disorg		0.021***	0.061	0.026
		(0.008)	(0.040)	(0.128)
DisorgSQ			-0.003	0.004
			(0.003)	(0.025)
DisorgCube				-0.0004

				(0.002)
Constant	11.632***	11.474***	11.370***	11.415***
	(0.092)	(0.110)	(0.150)	(0.218)
Observations	447	447	447	447
R^2	0.116	0.130	0.132	0.132
Adjusted R^2	0.070	0.082	0.083	0.081
F Statistic	2.525*** (df = 22; 424)	2.743*** (df = 23; 423)	2.672*** (df = 24; 422)	2.562*** (df = 25; 421)
Note:			*p<0.1; **p<0.05; ***p<0.01	

Table 15: Polynomial Regression Results

The results indicate that the NULL hypothesis could be rejected with confidence in the first instance (linear model). However, the significance dissipates in the quadratic and cubic model. This can be interpreted as that a significant part of the variation in the dependent variable is explained by the independent variable in the linear model while the quadratic and cubic models explain no additional variation. Thus the quadratic and cubic models can be rejected. For prediction purposes, the regression equation with the values plugged in looks as follows.

*LnPerformsnce per Worker = 11.474 + (-0.003*Logassetsemp) + (-0.029*logEmp) + (0.212* Manufacturing) + (0.153* Construction) + (0.266*Wholesale and retail) + (0.141*Transport and storage) + (0.083*Accommodation and Food service) + (0.141*Real Estate) + (0.178* Professional, scientific and technical) +*

*(0.235*Administrative and support) + (-0.077* Education) + (-0.025*Health and Social) + (-0.071*Arts, entertainment and recreation) + (0.072*Size 2000 to 4000 Employees) + (0.038*Size 4000 to 6000 Employees) + (0.224*Size 6000 to 8000 Employees) + (0.006*Size 8000 to 10000 Employees) + (0.033*Firm-Age 100 to 200y) + (0.029*Firm-Age 200 to 300y) + (0.108*Firm-Age 400 to 500y) + (-0.085*Firm-Age 500 to 600y) + (-0.051*Firm-Age 900 to 1000y) + (0.021* Disorg)*

This also indicates that the relationship between disorganization and financial performance seems to be linear and that when disorganization increases, financial performance increases accordingly. However, given that the quadratic and cubic models seems to explain no additional variation there seems to be no curvature (nonlinear) in the relationship between the IV and the DV. This seems to be consistent through the sectors and firm sizes. This result yields important insights into considerations which need to be taken in conducting a full scale study in the next section the implications of these findings are discussed in detail.

5.5 Discussion

Results of the study show disorganization has a significant positive correlation with performance per worker. This suggests that mangers could embrace disorganization as a means to increasing employee performance. However, the results do not shed light on how much disorganization is optimal thus leaves room for further research on the matter. However, when observing the results it is clear that the amount of variation in the dependent variable (financial performance per worker) explained by the independent variable (disorganization) is 13%. This provides a promising start and shows the potential explanatory power of disorganization. However, it is also clear that there are more factors at play. Therefore, it is worth considering mediation/moderation effects in future studies in order to increase the explanatory power. The reason that a large amount of variation in the dataset is not explained by disorganization is due to the manner in which the data was gathered. These limitations are discussed in detail in the next section. Furthermore, the results did not depict a concave relationship (the utility of disorganization ceases after a certain cut off) as discussed in literature. Nevertheless, the results obtained from this study lay the foundation for a few research implications.

Firstly, the results highlight the importance of the dependent variable (financial performance per worker) especially when measuring the effects of disorganization. How the dependent variable is calculated therefore plays a major role in analyzing the effects of disorganization. From the significant result it is clear that the dependent variable as a financial measure of an individual workers performance is a relatively sound measure given that 13% of the variation can was explained by the independent variable (disorganization). However, it also opens up the questions as to which other variables could have a significant relationship to disorganization. Some candidates for this are a) performance per worker by the number of tasks completed within a specified time, b) job satisfaction of the worker and c) motivation of the worker. Future research efforts could focus on exploring is disorganization has an effect on these variables as it did on financial performance per worker as in the study discussed in this chapter.

Second, the results highlight the role the disorganization index plays in determining a significant effect on financial performance per worker. In this case the disorganization index takes into account measures which measure all natural, structural and functional disorganization (some more than the others). However, the ratios of the three types of disorganization measured are disproportionate. This disproportionality does not play a major role given that the index averages out the effects of any individual variable; however, a more proportionate measurement would provide further solidity to the results of this study.

Third, the measures used for the disorganization index are from a limited number of measures which were available from the WERS 2011 data set. As discussed in the theoretical framework section, currently there are no established measures for disorganization and no exhaustive list of disorganization measures have been developed yet. Therefore, it should be noted that the measures for disorganization can be extended in future research effort. Essentially, the question then is “how many things do we need to measure in order to capture disorganization?” At the current juncture we cannot speculate if the set of all measures for measuring disorganization is a) non-exhaustive, b) large but exhaustive or c) small in nature. We can however eliminate option a) for two reasons. One, there is no indication that the measures for disorganization is non-exhaustive in the literature and secondly, even if they were (non-exhaustive) in order to carry out practical studies of disorganization an exhaustive set of measures will need to be derived from the larger set of all possible disorganization measures. In such a case how we put our credence on which measures are important will depend largely on the questions we are asking and depending on the nature of the study some measures will play a more significant role than some others. Option b) however seems to be the most likely case. Current literature being largely theoretical is indicative of this. This primary reason for the lack of empirical studies of disorganization is largely due to establishing validated measures for measuring disorganization. However, in contrast to option a) in the case where the set of measures for disorganization is exhaustive it is imperative for researchers to work out the entire list of measures for measuring disorganization. Through the research discussed in chapter 2, 3, 4 and 5 I have laid foundations for how these measures can be worked out and then sorted disorganization accordingly into relevant categories as natural, structural and functional disorganization. At this point however, a question can be mounted relating to overlapping measures where one can posit a measure which according to interpretation might fall under one or more categories of disorganization as defined in chapter 2. From the conceptual developments discussed in chapter two, such an overlap seems highly unlikely. Nevertheless, it is a question that must be considered as we start increasing efforts in studying disorganization through empirical research. Finally, as with option a) option b) too requires researchers distribute credence depending on the aim of the study being conducted. Finally option c) posits that the set of measures for measuring disorganization is small. In this case the first thing to be worked out is ‘how small’ the set of measures are. Then one must eliminate the possibility of no new measures being developed by either arguing in principle no new measures can be found due to conceptual, practical reasons. Furthermore, one can argue that a small set of measures are adequate for explaining any variation in a given dataset and any new measure would not add to the explanatory power of the study. Option c) even though less likely than option b) has to be taken seriously. Nevertheless, the literature on disorganization suggests that the set of measures should be considerably large given the applicability of disorganization to a multitude of domains both within organizations and in the world in general. However, it could be the case that even though the disorganization can be observed in many domains the core components can be measured using a limited small set of measures. It can also be argued that even if a multitude of measures are discovered they can be further aggregated to come up with a smaller set of measures or it could be the case that eventually researchers might find that some measures are simply wrong. Therefore some credibility should be given to option b). The discussion in this section relating to the set of measures for disorganizations presents a number of interesting questions which needs to be answered in moving the empirical research of disorganization forward.

Finally, even though determining the set of measures for disorganization is very important, studies which use only a selected number of measures can be conducted too. The study discussed in this chapter is a case in point. Studies of this nature then lead to limited applicability and limits the level of generalization one could make based on the results. In the case discussed in this chapter however, the limited measure of disorganization provided a tangent towards talking about developing a more comprehensive set of measures as detailed in this section. Studies of this sort however, presents a high utility only due to the fact that it's one of the first empirical studies of disorganization and over time the utility of limited studies might decrease given a better understanding of disorganization measures. However, if working out all explanatorily useful measures of disorganization is the goal, conducting smaller limited studies looking at only a specific set of measures can be conducted and then aggregated to develop a broader understanding of disorganization. For this to happen however, the manner in which the studies are conducted should be compatible with past studies as well as future studies (replicability over time). Limited studies as a standalone research effort however will remain prevalent for domain specific studies which emphasize studying a given case (i.e. a particular organization) than drawing up large scale implications for disorganization research.

5.6 Limitations, Implications and Findings

The preliminary findings of this study underscore the need for substantial improvements in measurement of both independent and dependent variables. Even though the results which showed a positive relationship between disorganization and performance per worker it should be noted that the measurements were not fully geared towards measuring disorganization. The main objective at this stage of empirically exploring disorganization was to start with a small exploratory study as the one presented in this chapter in order to gauge the effect of disorganization. Even though results favor disorganization even with the limitations of the dataset mentioned above, a comprehensive disorganization measure should be the next main priority. This scale development therefore is the most pressing future study spinning off the disorganization research conducted thus far. Based on this exploratory work there are a few lessons which can be of use for future researcher efforts. These avenues are threefold.

Worker financial performance as dependent variable – the dependent variable used for this particular trial study is productivity per worker measured in monetary terms. This approach even though has its advantages (as direct method of providing financial performance per worker) and is popular among certain scholars (King and Lenox, 2001) has its limitations (not assessing effort of an employee). Future studies could utilize a dependent variable which takes into account the quality of the work produced and/or the problem solving efficiency in order for greater alignment with the studies discussed in previous chapters. Given that this study is exploratory in nature and was created to facilitate future research initiatives and nature of the data available a DV in monetary terms serves as the first step in initiating the era of empirical research on disorganization.

Disorganization Index – Even though the data set provides some measurements pertaining to functional and structural disorganization the disorganization index is relatively incomplete in an absolute sense since measurements pertaining to natural disorganization are not available. Furthermore the dataset lacks a rich level of data specifically measuring disorganization. There, although adequate, the disorganization index can be further improved. Hence, it should be noted that the index developed for this study acts as a demonstration of how a potential disorganization index (presumably more complete) can be developed in the future. For such an index to work, the data gathering should clearly focus on measuring disorganization through a validated scale. Nevertheless, this first attempt at looking at disorganization through empirical lens does hint towards the importance of disorganization.

Data Gathering – The data used for this particular study was obtained from the 2011 UK “work and employee relations survey”. This data was obtained by the UK data services and was geared towards measuring the employee and work relations among the work force and their employers. The data is secondary in nature and was not gathered with the intention of measuring disorganization. Therefore, the conclusions obtained through the statistical analysis should only be considered preliminary. However, this can also be seen as an advantage since the data gathered for a different purpose reduces the bias respondents might have with regard to disorganization. Furthermore the nature of the data available only provides a part of what can be constituted as a characteristic of disorganization. Yet, this study provides a solid starting point for future research initiatives.

Building on this study, the next step is to devise a measurement scale for disorganization. This scale should measure natural, functional and structural levels of disorganization within organizations. The measurements should also focus on measuring the breadth, depth and intensity of disorganization as suggested by Abrahamson, (2007). Each of these aspects can be measured in terms of a continuum with complete organization at one end and complete disorganization at the other. Using what has been learned through the literature and simulations, measurements of effectiveness of problems solving (i.e. quality of the solutions produced) and efficiency of problem solving (i.e. time taken for solution to be produced) should be measured. In addition, levels of motivation among workers, level of employee skills and job satisfaction should be also measured. Finally, the range of resource seeking that is available for employees and teams should also be measured as it was uncovered through simulations that the "range" variable plays a significant role in the effectiveness of disorganization. The crucial aspect of this measurement process will be the validation of the measures. Upon validation the measurement scale comprising of the measures discussed before can be standardized and disorganization can finally be studied in a consistent empirical manner. Subsequently the results from these studies can be fed back into the simulations. This would increase the accuracy of the simulations while enabling researchers to explore disorganization in greater depth in accordance with the methodology described in Chapter 1, Figure 2.

Chapter 6: Conclusion

The research aim for this particular project was the '*study of the concept of disorganization and its effect on individuals and teams in organizations'*. This research aim was used to systematically study "disorganization" in order achieve three specific objectives. These were, **1)** *provide a theoretical clarification of disorganization and its benefits* **2)** *develop an understanding of the causes, characteristics, and effects of disorganization* and **3)** *understand the implications of disorganization for academic research and management practitioners*.

The primary reason for these research objectives were i) lack of consensus on what constitutes disorganization in theory, ii) lack of research into the causes, characteristics and effects of disorganization both in academia and in practice, and finally iii) lack of details on what the implications of disorganization are for both management science and practice. Given the aforementioned research gaps, it was essential to set the foundation for a theory of disorganization. In achieving the aforementioned objectives a new relatively new methodological approach for management research was introduced and operationalized (i.e. agent-based simulations) providing new methodological advancements to management research. Building on the theoretical advancement made at various stages of the research process, as a final step, a first empirical study was conducted in order to open up research avenues for further research. The following sections of this chapter outline each of the research aims, assess what/to what extent they were achieved, and what the implications of these findings are for management scholars and practitioners.

6.1 Theoretical Clarification of Disorganization and its Benefits

The first chapter and the second chapter presented the current state-of-the-art in the theoretical understanding of the concept of disorganization. Even though the concept was introduced in the late 60s, as a solution for highly ordered organizations and team (Crozier, 1969; Merton, 1968), it has received only sporadic attention (Grieco, 1988; Warglien and Masuch, 1996; Abrahamson, 2002; Abrahamson and Freedman, 2007). Given this inconsistent treatment of the concept, some research has overlapped (Abrahamson, 2002) while other research efforts have conducted to debate (Abrahamson and Freedman, 2007). This has even led to a multiplicity of terminology which created misunderstandings among scholars (Warglien and Masuch, 1996). Chapter two is an attempt to put these misunderstandings to rest by providing a clarification of the terminology and distinguishing "disorganization" as the most appropriate term when referring to the concept. This was predominantly determined by the term's ability to subsume its rivals (disorder, mess) into one all-encompassing whole.

Another issue dealt with in chapter two was the disproportionate research attention given to varying attributes of disorganization. The major school of thought focused on the unpredictability and unintentionality of disorganization (Abrahamson, 2002) while completely leaving out disorganization which was intentional and controllable. This was mainly due to the fact that most research focused on describing disorganization based on its state (i.e. how does disorganization look like?). This viewpoint is useful as a rudimentary understanding of the topic but it also was a hindrance in exploring the mechanisms of disorganization. Therefore, chapter two also focuses on introducing the process-based view of disorganization, thus addressing the disproportionate research attention issue. A process-based view enables researchers to study disorganization in terms of causes, characteristics and effects as a whole rather than focusing on one aspect. This viewpoint then provided the opportunity to look at intentional and predictable forms of disorganization.

This conceptual development opened up the avenue for disorganization to be categorized into types. Even though there have been prior attempts for such categorization, they have all focused on the uncontrollable and unpredictable type of disorganization (Abrahamson, 2002). The process-based view enables the categorization of all types of disorganization into three major classes. These were a) *natural* disorganization (defined as unpredictable and uncontrollable forms of disorganization which increase with time), b) *structural* disorganization (defined as a predictable and controllable form of disorganization which can be imposed by redesign how organizations and teams are structured from a topological viewpoint, i.e. hierarchy or not), and c) *functional* disorganization (understood as another predictable and controllable form of disorganization which focuses on the reduction of rules and procedures imposed on individuals and teams in achieving their tasks).

By developing these three types of disorganization a clear demarcation of what constitutes each type of disorganization was detailed thus providing a theoretical clarification on the concept. Finally, emerging from these categorizations, the benefits of disorganization, which were previously listed non-exhaustively by researchers, can now be attributed to various types of disorganization. This provides a better understanding of what type of disorganization will be required for certain benefits (e.g. as shown in chapter 4 higher access disorganization enables individuals or teams to acquire resources of high quality).

6.2 Causes, Characteristics, and Effects of Disorganization

With the theoretical clarification at hand, the next step was to develop a finer understanding of disorganization. The theoretical clarification (chapter 2) itself, especially after dividing into a process- and state-based view, provided a clearer picture of disorganization. This led to the development of the three types of disorganization discussed earlier. In order to further develop our understanding of the topic, the next step was to systematically study implications of disorganization from a process-based view. In doing so, two major simulation studies were conducted. These studies were a way to operationalize the three types of disorganization and to study the implications of disorganization on individuals and teams. It was also a mechanism to compare between disorganization, organization and other variations in between. Finally, the studies also provided an understanding of the boundary conditions for disorganization.

Upon analyzing the results of the first study (individual disorganization) it was established that at first glance disorganization seems to be a much more conducive setting for problem-solving efficiency compared to “organization”. It also showed that having structural disorganization (no hierarchical limitations) seem to be not enough if you do not provide the individual with some functional disorganization (enough range to seek out resources to solve problems). This study also showed that a mixture of organization and disorganization also can work well, corroborating previous studies which predicted such behavior (Cohen et al., 1972; Fioretti and Lomi, 2008). The second study took the developments of the individual study to a team level. The results of the second study showed once again that disorganization seems to provide higher problem-solving efficiency than “organization”. However, the results indicated the need for the disorganization to be managed adequately. This meant that if disorganization is enabled but the teams do not have access to quality resources there is no increase in problem-solving effectiveness. Therefore, the results indicated that access to resources matters in disorganized environments considered in this research. More specifically, if teams can access a large pool of resources not only in terms of quantity but also in terms of quality, problem-solving may improve. The most surprising finding of this study was that it showed that when teams were given enough access to quality resources disorganization was not necessary. This means that an organization could have combination of structural, functional and natural *organization (opposite of disorganization)*, granted that the functional organization enables teams to access quality resources on a routine basis. Nevertheless, this was only the case when the problems that teams had to solve were mild in complexity. The results showed that when problem complexity increases, disorganization (structural, functional and natural) was essential for increasing problem-solving effectiveness.

These two studies used theoretical developments from chapter two as the basis and provided a clearer picture of the effects and characteristics of disorganization. These clarifications are summarized in Table 16 displayed below:

Disorganization	Causes	Characteristics	Observed Effects
Unintentional			
Natural	Random accumulation of physical and nonphysical entities over time	Unpredictable, inconsistent (accumulation frequency varies randomly), hard to manage, hard to re-organize	All effects are inconsistent and unpredictable and could lead to negative (confusion) as well as positive effects (innovative solutions).
Intentional			
Structural	Deliberate relaxation of hierarchy and rules of command. Organic communication.	Predictable, clear step by step proves of dismantling hierarchy and lines of command, easy to re-organize, manageable	Increased productivity, increased efficiency, increasing autonomy, higher levels of

			motivation.
Functional	Deliberate relaxation of rules imposed on individuals and teams when seeking resources	Predictable, rules can be relaxed and re-organized with relative ease, manageable	Increased productivity, increased efficiency, increasing autonomy, higher levels of motivation.

Table 16: Types of Disorganization

Natural disorganization, which has received the widest research attention thus far, has unpredictable effects given that natural disorganization is characterized by its inherent unintentionality, unpredictability, and inconsistency. On the other hand, structural and functional disorganization are characterized by their ability to be managed to some extent, and providing consistent and largely beneficial effects for organizations. Furthermore, natural disorganization is inevitable over time while intentional forms such as structural and functional disorganization are solely at the discretion and control of the managers. In a real world work environment, all these three types of disorganization can be in action. Even though, the aforementioned results provide a promising case for disorganization, further developmental studies need to be carried out as pointed out in chapters 3, 4 & 5 in order to further substantiate the findings of this research.

6.3 Understanding the Implications of Disorganization for Academic Research and Management Practitioners

Finally, with the theoretical clarification and richer understanding of disorganization and its causes, characteristics, and effects the final objective was to consider the implications of these findings for research and practice. It should be noted that these implications are suggestive and not prescriptive.

Implications for practitioners: Disorganization consciously induced by management may consider going along with a removal of hierarchical access restrictions. As a result employees are likely to perceive higher organizational support and also more autonomy at work, both of which is beneficial for motivation and ultimately problem solving.

As exemplified through the studies discussed in chapter 2 and 3, even though access to resources regardless of hierarchical level is generally better for problem solving there seems to be no clear utility in having access to resources multiple levels higher or lower than a team’s average hierarchical level (Bridges, 2009; Freeland, 2002). This is because an individual or team on a lower level with access to a resource several levels higher than their usual access might find the resource unmanageable or too complicated to handle. Similarly, if the resource is multiple levels below, that resource might not have enough quality or effectiveness for what it is required for at the team’s hierarchical level. This finding establishes a boundary condition for the use of disorganization processes which is of high importance for practitioners.

Implications for Research: The research conducted into disorganization now has provided a clarification of the concept and its implication. This opens up research avenues both in expanding the concept of disorganization and in empirically verifying the findings of the studies discussed in this document. The simulation models developed through the research process act as a virtual laboratory to study the concept of disorganization thus helps corroboration and confirmation of previous studies of Abrahamson and Freedman (2006); Fioretti and Lomi (2008) and Herath et al. (2015) [Chapter 3]. Then the models extend the previous studies mentioned above to a team level adding a new layer of analysis to the concept of disorganization while helping clarify the causes, characteristics and effects.

From a methodological point of view given that application of ABM to studying organizational behavior is relatively new the approach and the operationalization of disorganization through simulation is a new addition to how organizational behavior and management research can be carried out. Both the case for ABM as a research method optimizer and as a tool for exploring theoretical implications have proven to be effective through this research process and thus can be adopted by other researchers.

From an empirical vantage point the study presented in chapter 5 provides a basic blueprint as to how disorganization can be explored. It is first of its kind and the only study thus far which explores natural, functional and structural disorganization. The results of the study showed that disorganization did have a significant effect on employee performance. The study however, was not without its limitations. Therefore, future research can be carried out in order to fortify the exploratory study discussed in chapter five. Future studies could also improve the disorganization index or develop their own scales for perceived disorganization.

I began this research with the aim of *studying of the concept of disorganization and its effect on individuals and teams in organizations. The latter has been narrowed down to the three objectives* discussed above, and the research process comes to an end now. The process involved approximately three years of research and has produced three primary studies – (a) individual level simulation, (b) team level simulation and (c) exploratory empirical study – of which ‘a’ and ‘b’ both have been presented and conferences, peer reviewed an published. These studies consisted of conceptual developments (chapter 2) and the methodological developments (chapter 1) discussed in this document. Most importantly all the research studies discussed in each of the chapters help provide clarity to the concept of ‘disorganization’. Moreover this work provides a way of conceptualizing disorganization and a method in understanding different types of disorganization along with their effects and consequences. These insights then yield practical implications for managers (suggestive) while also providing research implications for academics moving disorganization research forward. In the future, the research presented herein can be used as a foundation for further studying disorganization with which how organizations manage their workforce can be improved.

In moving the research discussed here forward, there are a few avenues one can explore. Building on chapter 1 and 2, the next step would be to further develop the conceptual framework of disorganization. In performing such an expansion, a more evidence based conceptualization would be the logical next step. Positioning disorganization as a organizational adaptive capability is one avenue which can be explored. Furthermore, the models presented in chapters 3 and 4 can both be expanded in addressing the limitations discussed in each chapter. The next step in the model discussed in chapter 3 involves an expanded set of experiments with the addition of a systematic statistical analysis in order to further substantiate the findings discussed in this research. The model can also be further developed reducing the current assumptions discussed in chapter 3. Such a development would increase the precision of the model and the validity of its results. The model discussed in chapter 4 can be improved upon similar lines with a large set of experiments followed up by statistical analysis. Such an expansion on both models will provide a stronger case for disorganization moving forward. However, when considering the entire research effort as a whole, the most important expansion of this research would be from an empirical vantage point. This is mainly due to the lack of empirical research on the subject. Therefore, developing a validated measurement scale is the next step in empirically investigating disorganization in real world settings. In performing such an expansion, more production functions similar to the one discussed in chapter 5 can be tested. Furthermore, the disorganization index can also be improved using a more specific set of variables. Building on what has been discovered in this research, the next step would be to conduct a study directly measuring natural, structural and functional disorganization using a scale incorporating the variables (both the disorganization index and the BDVI model) discussed in chapter 5. The empirical findings from such future studies then can be fed into the models discussed in chapter 3 and 4 in order to explore the dynamics of the new empirical data. This can then be used to update the current conceptual understanding of disorganization. Therefore, the research discussed here can be holistically expanded on three major fronts which are conceptual, computation and empirical. This three pronged approach would be complimentary in nature and would provide more cumulative support for the findings of this research. Ultimately, such an expansion would provide further justification for the utility of disorganization in contemporary organizations while also providing a richer picture of the subject.

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