UNDERSTANDING LARGE-SCALE ONLINE COLLECTIVE ACTION: EXAMINING THE CONDITIONS FOR AND OUTCOMES OF ENTERPRISE SOCIAL MEDIA-BASED ONLINE IDEATION IN A REGULATORY ORGANIZATION

By

NIK AHMAD ROZAIDI BIN NIK ABDUL RASHID

A dissertation submitted to the

School of Graduate Studies

Rutgers, The State University of New Jersey

In partial fulfillment of the requirements

For the degree of

Doctor of Philosophy

Graduate Program in Communication, Information and Library Studies

Written under the direction of

Jennifer Gibbs

And approved by

_____

_____

_____

_____

New Brunswick, New Jersey

JANUARY 2018

ABSTRACT OF THE DISSERTATION

Understanding Large-Scale Online Collective Action:

Examining the Conditions for and Outcomes of Enterprise Social Media-Based Online Ideation in a Regulatory Organization

by NIK AHMAD ROZAIDI BIN NIK ABDUL RASHID

Dissertation Director:

Jennifer Gibbs

Crowdsourcing is one of the innovative ways organizations are employing to gather quality ideas from a large group of people. It is used when organizations need to involve a larger group of participants who are collectively invested in the outcome, such as for initiatives with organization-wide implications, that which small group brainstorming cannot sufficiently accomplish. The unpredictability of the process from start to finish however raises questions on the conditions suitable for the large-scale online ideation process that belies the collective action, because it does not seem to parallel that of small group brainstorming. This dissertation documents a mixed-methods case study of a regulatory organization that used enterprise social media for large-scale ideation, with a focus on identifying the enabling conditions for large-scale online ideation, and the factors that may influence the quality of the ideation process. The study found that the process is conditional on having an emergent facilitator, a longer deadline, not having participants pre-selected, and technology that has unique affordances for ideation. The

study also found that functional diversity, number of comments, and presence of facilitator are significant predictors for the quality of the ideation process. The study has theoretical and practical implications on ideation, enterprise social media use, collective action, and for organizational communication.

Keywords: *collective action, connective action, enterprise social media, social media, affordance, ideation, brainstorming, innovation, organizational communication, knowledge sharing, public good, collective good, communal good, employee engagement*.

ACKNOWLEDGEMENTS

"A good dissertation is a finished dissertation."

This dissertation could not have been completed without the tireless support and prayers from my wife, Norliza Nuruddin, who has sacrificed a lot for the family, keeping us healthy and organized, while periodically prodding and waiting for me at every step of the way; Let's start going through that post-Ph.D. list of things-to-do. My magnanimous adviser and co-author, Jennifer Gibbs, who has patiently coached and mentored me throughout my doctoral student years; Thank you for making me an accomplished researcher. My committee members, Mark Aakhus, Matthew Weber, and Michele Jackson: Thank you for your service and critical thoughts for this project. My research colleagues in COSM: I very much miss our intellectual conversations. My sponsor-employer who funded my studies from the A-Levels at Abingdon, my first degree at Bristol, my masters at Michigan, and this Ph.D. at Rutgers: Thank you for all the opportunities. My previous bosses, Dr. Zeti Aziz and Abu Hassan Alshari: Thank you for believing in me when sending me off for my masters. My mom Nik Zaharah and brother Nik Fariz -- as my financial guarantors for the postgraduate sponsorship -- and to my family and friends: Thank you all for your prayers. Last but not least, my two beautiful kids, Sarah and Farhan, to whom I dedicate all of this chapter of my life.

May God continue to shower His blessings on us all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

This chapter establishes the rationale for the study of large-scale online collective action in the context of large-scale online ideation. The study was motivated by the rise of crowdsourcing in several facets of organizations. One recent phenomenon of interest is organizations leveraging on communication technology to crowdsource ideas from a large group of people for the purposes of innovation. Underlying this phenomenon of large-scale online ideation is collective action theory, but applied in online settings, and scaled up. Dissecting how the phenomenon occurs, several problems come to light, namely the general unpredictability of the process from start to finish. Existing theories of online collective action, brainstorming, and computer-mediated communication (CMC) can explain some aspects but not fully, because this phenomenon is quite different in a few respects. This study intends to address those gaps. The chapter concludes with a preview of the rest of the dissertation.

1.1. Background and rationale

"Innovate to stay relevant" is perhaps an axiomatic expression held by the management of many organizations especially those in a dynamic and competitive environment. These organizations regularly explore ways to improve themselves, by seeking ideas from various stakeholders, and developing solutions to solve identified problems (Bjelland & Wood, 2008). Even governmental or regulatory organizations need to improve themselves so that their policies and regulations remain relevant and do not hinder innovation in the industry they are overseeing. At one end, open innovation (Chesbrough, 2003) seeks feedback and ideas from external parties such as customers, industry partners, or the general public (Leimeister, Huber, Bretschneider, & Krcmar,

2009). At the other end, closed or internal innovation utilizes employees as the source of knowledge for issues and the ideas to address them. At the core of these approaches is ideation, or the communicative process of sharing conceived ideas and sharing knowledge when discussing the ideas (Kelley & Littman, 2001; Wolfe, 1994).

Ideation is akin to brainstorming but without the formality of that process (Osborn, 1963). A defining feature of ideation, or brainstorming for that matter, has been the size of the group of participants, which is generally small in number, in order to be manageable and productive (Osborn, 1963; Valacich, Dennis, & Nunamaker, 1992). Crowdsourcing ideas from the larger organizational population, i.e. large-scale ideation, however is needed in situations when participation by a small, select group of people is insufficient, because the effort may have organization-wide or broader implications. A larger number of participants will also generate more ideas (Renzulli, Owen, & Callahan, 1974), and the discussion that follows has the potential to produce better quality ideas that are more thought through from multiple dimensions (Perry-Smith, 2006; Zhou et al., 2009). Large-scale ideation is also important to get more people to be collectively invested in, or bought into the outcome, as they become involved in the process (Seibold & Shea, 2001), which is useful when subsequently implementing the ideas. Example cases include finding ways to improve process efficiency or cost efficiency across the whole organization (e.g. Di Gangi & Wasko, 2009, Tierney & Drury, 2013), or identifying new areas of business for the organization to explore (e.g. Bjelland & Wood, 2008).

Large-scale ideation however is problematic in several ways. The physical space and time constraints for example place an upper limit on the number of concurrent

participants. Even if there was a large enough venue to accommodate all employees simultaneously, ensuring their participation is close to impossible. There are bound to be *free riders* (Olson, 1965) who are not incentivized to participate because there is no adverse impact from not contributing, or that the effort to contribute exceeds any benefit that may be gained. This impacts the ideation process from start to finish. The use of communication technology addresses these issues to some extent -- for example, by eliminating the need to be collocated to participate, or even to interact synchronously in real-time -- which potentially enables a larger group of people to participate at the time of their choosing (Drury, 2008; Helander et al., 2007; Muller et al., 2013). Participation however remains a challenge, and the extent to which the ideation process itself can occur online varies, as some parts are done manually offline (e.g. Bjelland & Wood, 2008). This in turn raises questions on the limits of the technology's ability to support online ideation. In order to understand the problems of large-scale online ideation, several constitutive areas come under investigation, namely the ideation process, which involves the communicative acts of knowledge sharing and argumentation, the participants, and the technology. A common thread running through these areas is collective action, and specifically, collective action in online environments.

Collective action theory concerns the decision-making by individuals in a group to participate to produce or obtain a *public good*, which can be consumed or enjoyed without reducing its availability to others, who cannot be excluded from doing the same (Olson, 1965). Collective action is the manifestation of the group taking the necessary action together, because no single individual can afford to take a unilateral action or be effective or successful at addressing the group problem. Typical examples of public

goods include public parks and national defense, but wage increases for unionized workers are also a "public" good for the group, with collective wage bargaining or industrial action as the manifestation of collective action. An intranet or centralized database is also a public good because it holds communal information that is accessible to all members and does not diminish when consumed (Fulk et al., 1996). Similarly in that respect, the set of ideas shared to solve a group problem is also a public good, because it fulfills the non-exhaustivity and non-excludability criteria, with ideation as the collective action, because the group problem solving cannot be done unilaterally.

The decision to participate in collective action has been understood to be economic, based on the evaluation of cost against benefit, with participation likely occurring if the economic benefit from participating outweighs its cost (Olson, 1965). Typically though, the cost of participating, monetary-wise or effort-wise, in producing a public good is higher than the benefit gained, leading many to free ride the effort, enjoying the good without contributing anything towards its production. Ideation participants, when they are physically collocated as in a brainstorming group, also experience similar considerations when thinking about the problem and communicating their ideas to others, and in evaluating if the effort benefits them as much or more, which could result in the minimization of participatory efforts. Nonetheless, collective action is still triggered in many situations, with Olson (1965) arguing about its logic that there are other drivers in place, such as an individual being invested in the outcome, or a small select group organizing others to override the participation problem.

In light of technological advancements in communication, and how it has been found to reduce the effort or cost of participation in many situations, it has been argued

that collective action in the online environment may not necessarily suffer from free riding, and group members will hence participate more easily and without the need to be formally organized (Bimber, Flanagin, & Stohl, 2005). The decision-making to participate online was also reconceptualized as the transition from private to public domain instead of by economic consideration. The diminishing role of the formal organization and the increased sharing of personalized content (e.g. opinions and stories) in coordinating online collective action, have been characterized instead as "connective" action (Bennett & Segerberg, 2012). These revised approaches to understanding collective action especially when performed online have been examined in several specific cases such as on flash mobs utilizing social media to coordinate action, and for organizing social movements (Bennett & Segerberg, 2012; Bimber et al., 2005; Fulk et al., 1996). The theory however needs to be validated in different contexts, such as when using different communication technologies such as enterprise social media (ESM), or in a closed environment such as within a work organization, or for a specific purpose such as for ideation.

ESM in particular are beginning to be widely adopted by organizations. A survey by the International Data Corporation (IDC) of 700 senior executives of U.S. companies found that two-thirds of the surveyed companies had deployed enterprise social software (IDC, 2012). Another survey of 791 Western European small and medium-sized businesses found that almost a third of them had deployed some form of social media tools for business purposes, with adoption expected to reach 48% by mid-2014 (IDC, 2013). Such organizations are exploring ways to capitalize on the social interactivity of the technology, as part of a participatory management philosophy

(Seibold & Shea, 2001), in order to discover more productive and profitable uses of the technology for the organization that leverage the collective intellectual capacity of the employees, such as for enterprise-wide ideation. Research on ESM thus far has focused on its knowledge sharing "affordances" (e.g. Gibbs, Rozaidi, & Eisenberg, 2013; Majchrzak, Faraj, Kane, & Azad, 2013; Treem & Leonardi, 2012) -- which is defined in the next chapter as characteristics that suggest possibilities for action (Gibson, 1986). At the same time, studies on how the technology can be or is being used for large-scale online ideation are limited (e.g. Bjelland & Wood, 2008; Di Gangi & Wasko, 2009; Tierney & Drury, 2013).

It is therefore the imperative of this study to explore how the large-scale online ideation process works on the ESM, as a tool to leverage the collective intelligence of employees to gather ideas for identified problems, the conditions under which that process occurs in organizations, and what ESM affordances contribute to the process. Consequently, it is also necessary to identify the factors that may influence the quality of the ideation process, in order to provide a more complete picture in understanding large-scale ideation from start to finish.

Besides contributing to the practical knowledge of how ESM can be leveraged and perhaps customized for innovative purposes, the study intends to contribute to the discussion in the organizational communication and technology use space, about the use and appropriateness of social media in the workplace, about how ESM may be used for innovative purposes, and for engaging employees in participatory processes. It will also contribute to a better understanding of how large-scale collective action works in online contexts, in parallel to the theory of connective action (Bennett & Segerberg, 2012) thus

enhancing the theory of collective action. As ESM becomes more widely adopted by organizations and their employees, the need for this study becomes greater.

Preview of the Dissertation

The rest of this dissertation is structured as follows: Chapter 2 presents a review of relevant literature, and introduces concepts important for the study, such as collective action, ideation, and enterprise social media. It also presents the theoretical framework, discusses the concept of large-scale online ideation, presents gaps in research on large-scale online ideation using ESM, as well as the rationale for the research questions and hypotheses. Chapter 3 introduces the research site (a regulatory organization) which has an ESM used by its employees. The chapter also discusses the methods used, namely mixed-methods case study that is primarily based on the analysis of the server log data from ESM usage over 13 months and from 20 in-depth interviews. The key variables and analytical procedures are also introduced in the chapter. Chapter 4 contains quantitative results of the log data analysis, followed by Chapter 5 that contains qualitative findings from the interviews. Lastly, Chapter 6 covers the theoretical and practical implications of the results and findings, limitations and future directions, as well as the concluding section for the dissertation.

CHAPTER TWO: LITERATURE REVIEW

This chapter reviews the literature on collective action, brainstorming, and CMC in order to assemble the requisite knowledge to investigate the large-scale online ideation phenomenon. It discusses collective action theory in the context of the online environment to provide the base understanding for research. It examines the formal rules of brainstorming to help explain how ideation is carried out by participants. The chapter then argues about the need for organizations to scale up their ideation process, for various reasons, but importantly because it was enabled by CMC. The challenges that nonetheless remain bring us to the first research question about the enabling conditions for large-scale online ideation. Then the chapter turns to examining enterprise social media (ESM) as a recent CMC, and exploring its suitability for ideation. To that end, the second research question asks about the ESM affordances for ideation in order to characterize how users appropriate this new technology for a specific purpose. Finally, the chapter closes by exploring ideation quality in order to identify the factors that may influence the outcome, for which several hypotheses are developed for testing. Together these form the theoretical framework for examining large-scale online ideation.

2.1. Collective Action Theory and Ideation

2.1.1. Collective action theory

Collective action is the manifestation of a group of individuals working together to achieve a common goal. Collective action theory concerns the decision-making by individuals to participate in the group activity to produce or obtain a public good, which otherwise could not be produced or obtained unilaterally (Olson, 1965). Borrowing from economics literature, a public good by definition is non-exhaustive (or non-rivalrous) and

non-excludable, which means that it can be consumed or enjoyed without reducing its availability to others, who in turn cannot be excluded from doing the same (Chamberlin, 1974; Hardin, 1982; Samuelson, 1954). Based on the first two criteria mentioned -- exhaustiveness and excludability -- there are therefore three other types of goods, namely, private goods (exhaustive and excludable), common pool resources (exhaustive and non-excludable), and club goods (non-exhaustive and excludable). However, these other types of goods are not pertinent for collective action, because they are either exhaustive or excludable. Nevertheless, to avoid the confusion that public good is for the public at large, as with those provided by the government, such as national defense, the term "collective good" (Marwell & Oliver, 1993) will be used in this study when referring to a good that is non-exhaustive and non-excludable. An example of a collective good is a union-negotiated wage increase, because it can be enjoyed by all employees in the group, such as part-time lecturers, without regard to union membership. Further, the wage increase is unlikely to be achieved by unilateral action, but is more achievable with a collective effort (and including a threat of industrial strike). Similarly, a set of ideas shared to solve a group problem is also a collective good, because the ideas do not diminish as they are shared (non-exhaustivity) and everyone in the group can enjoy the benefit from the problem solving (non-excludability), with ideation as the collective action, and because the group problem-solving cannot be accomplished unilaterally.

Collective action theory however suggests that collective action is difficult to occur because even though individuals in a group may share a common interest with other members, they also have selfish interests (Olson, 1965). An individual aware of a group problem would not normally have the incentive to share with others his or her

ideas to solve it. Instead, rational individuals would weigh the benefits accruing from participating in the collective action against the cost that they would incur. Hence, if participation is costly, and the benefit from the joint action is marginal or small, then rational individuals will decide not to participate, and vice versa if the economic benefit exceeds the cost. However, if the individual discovers that there is no cost to *not* participating, in that he suffers no penalty, he could decide to free ride. If he observes that others can also enjoy the good without contributing, due to the non-excludable property of collective good, then he definitely will free ride.

Despite the possibility of non-participation, the theory nevertheless suggests that collective action can still occur under two non-exclusive conditions. First, if the cost to participate is reduced, and second, if the benefit from participation is increased. Participation cost can be reduced if there was some kind of selective incentives, such as status, material good or financial reward offered, which would help offset the upfront cost or help overcome the temptation to free ride (Oliver, 1980; Olson, 1965). Additionally, participation cost can also be reduced if there was someone sufficiently altruistic or unselfish to make a large enough contribution that reduces the cost for everyone, monetary-wise or effort-wise. This individual may be privileged to gain from the outcome or gain significant personal benefit relative to others in the group (Olson, 1965) and wouldn't mind contributing more than others, especially in the early part when the returns are not forthcoming (Markus, 1990; Marwell & Oliver, 1993). Hence, someone who stands to gain tremendously from solving the group problem is theorized to take a lead in generating and sharing ideas, thus reducing the cost of contribution to others who then can participate more easily in discussing the ideas already shared.

However, as the collective good requires collective effort and cannot be produced unilaterally, the individual still relies on others to do their part in order to ensure the delivery or creation of the collective good.

Second, a small group of participants can combine and coordinate their efforts towards securing the collective good. However, this requires them to communicate beforehand with each other about the problem, so that the common realization or solidarity about the shared problem or goal can occur, and efforts can consequently be coordinated. This also has the effect of reducing the contribution cost for others. Whichever way, benefit from participation may increase as and when more people participate in the collective effort, who gets to realize the benefit from the collective good to themselves. This is the "logic" of collective action, i.e. it is only "logical" for a group to work together if they were in communication with each other, thus becoming aware of the commonality of problem or goal (Olson, 1965).

Overall, the decision to participate in the collective action can be reduced to a binary choice of contributing or not, depending on how the balance between cost and benefit is tipped (Bimber et al., 2005). Essentially, the decision point, according to the theory, is whether it is worthwhile to free ride the collective action, especially if the decision to not participate carries no cost or penalty.

2.1.2. Collective action theory in online setting

With the advancement in communication technologies, many informational and communicative tasks have been made easier. Search engines have made it easier to find information buried in the vast network of websites. Personal stories and opinions have become easier to publish and share. Communicative reactions to published materials have

also become easier to make. In terms of collective action, these technologies have made it easier to coordinate independent actors to contribute towards a collective good, often at a scale larger than small groups (McCaughey & Ayers, 2003). In organizational settings, online databases residing on the intranet created by the community become a communal good as the contents are shared among the members without affecting its availability to others (Fulk et al., 1996). Outside formal organizations, interested individuals can be coordinated to meet and act at a certain place and time in a "flash mob" (Rheingold, 2003) or participate in an industrial strike. More recently, the use of CMC to share personalized stories of hope or suffering has mobilized individuals to assemble and fight for a cause, in what Bennett and Segerberg (2012) term as connective action. These collective goods are mainly characterized by the largely uncoordinated individuals contributing information to a central place without knowing who the other contributors are, and without realizing what they are creating is a communal product. Examples include crowdsourced lists or online databases that can be used by unknown others to further their own interests, such as a list of non-governmental organizations for use by the international community (e.g. eldis.org; Bimber et al., 2005), or as simple as a list of cooking recipes.

As individual contribution online becomes easier, the cost of deciding to participate in a collective action becomes an unimportant factor (Yuan et al., 2005). For example, in contemporary media, the request for someone to share or forward an email, document, or message, is virtually costless (but not necessarily harmless), that there is almost no consideration given to do it (except when thinking about the harm it can do). Additionally, the use of certain technologies makes private information automatically

public, that free riding by withholding information becomes more effortful than sharing (Bimber et al., 2005). Hence, the question of whether to free ride also becomes unhelpful towards understanding collective action. The role of formal organization in coordinating action that is the backbone of Olsonian collective action theory becomes limited when explaining this new kind of participation (Lupia & Sin, 2003) and therefore was in need of reevaluation in light of developments in communication technologies and especially how people use them. Bimber et al. (2005) in particular argue that the decision to participate in collective action should instead be reframed as the boundary-crossing from the private to public domain, rather than a cost-benefit balance. In other words, whenever someone contributes something in the online space, he has shifted private information into the public space. Consequently, when two or more individuals do the same, collective action is said to have occurred. The authors argue that communication technologies have made the boundary between private and public more porous, resulting in the ease with which information and knowledge sharing happens. Nonetheless, where boundaries between private and public is firmer, such as within a group, organization, or community, then the boundary-crossing becomes costly, and the free rider issue comes into play. In other words, Bimber et al. (2005) are not rejecting the Olsonian theory, but reducing it to a special case of collective action. The authors further argue that in such situations, the role of the formal organization, often Weberian, becomes important in order to persuade individuals to participate in the collective action, by way of selective incentives mentioned earlier. On the contrary, when the boundary is porous, the role of formal organization becomes diminished, and less formal organizational forms can take shape if needed, depending on individual circumstances of the collective action.

In short, collective action theory that originated to explain how selfish individuals can come together for a common purpose on the basis of economic considerations became problematic when new technology reduces the organizing cost to almost zero. Revisions to the theory that looked into how users appropriate new CMC to create new explanations has made the theory more helpful in explaining collective action that occurs online or is coordinated online. This serves as a basis for examining the ideation process, which at the core is also a form of collective and connective action.

2.1.3. Ideation vis-a-vis brainstorming

For this study, ideation is defined as the problem solving process in which ideas are collectively shared, debated, and evaluated, which occurs prior to the ideas being presented to decision makers for consideration and implementation (Kelley & Littman, 2001; Wolfe, 1994). Ideas, meanwhile, are defined as suggestions made in response to an identified problem. In other words, the ideation process is an intermediate process between problem definition and management consideration, during which ideas are developed into meaningful proposals. Ideation is thus a cornerstone process in organizational innovation (Wolfe, 1994). This is necessarily a broader definition than those found in some studies (e.g. Briggs & Reinig, 2007; Jackson & Poole, 2003) in order to capture the communication practices surrounding the development of ideas, because idea conception or generation alone -- as defined in those studies -- is insufficient for that purpose. By this definition, ideation becomes an important organizational communication process, as it embodies elements of collective action, knowledge sharing and argumentation, which themselves are fundamental communication processes in organizations, including for decision making (El-Shinnawy & Vinze, 1998).

As a problem solving process, ideation is similar to brainstorming (Osborn, 1963), although by this study's definition, ideation does not mandate creativity or creative procedures to generate ideas as does brainstorming. Additionally, in many organizations, brainstorming connotes a structured and formal exercise or technique in idea generation, whereas ideation is less formal and more flexible in order to facilitate the exploration of thoughts and ideas to solve a problem (Donius, 2012). Moreover, brainstorming is usually measured in terms of quantity of ideas generated (Osborn, 1963), while ideation, as this study will argue, places a greater importance on quality. Also, brainstorming is typically done in small, face-to-face groups of between 5 to 10 people, because research has suggested that it is most productive when the group size is within that range (Valacich et al., 1992). Generally, brainstorming productivity increases with the number of participants involved, but above the upper threshold, the per person productivity starts to plateau and decrease as the size grows further (Renzulli et al., 1974).

Additionally, the facilitator is an important person in brainstorming, whose role is to encourage participation and to manage the process by controlling the turn-taking and enforcing the ground rules (Aakhus, 2001, 2013; Osborn, 1963). Without the facilitator, the flow tends to be disrupted as it is a natural reaction for participants to quickly criticize ideas that are incompatible with their existing understanding. Meanwhile, the participants are selected based on their functional areas to provide constructive, relevant and diverse input in the problem solving process, as studies have found that idea productivity and creativity are enhanced when participants come from diverse knowledge backgrounds (Perry-Smith, 2006; Zhou et al., 2009), although heterogeneous groups tend to be tougher

to convince. The participants are also of similar ranks to avoid productivity issues caused by power differentials arising from status differences (Adams, 1953).

Deconstructing ideation into its phases -- idea generation, idea development, and idea evaluation (Price, 1985) -- allows for the exploration of the communication activities that support ideation, although it must be noted that these phases are based on the normative model of facilitated, time-bound, face-to-face ideation exercise. First, the idea generation phase is characterized by the production of ideas by participants in the process. There are two main techniques for generating ideas, what the literature calls the *nominal group* and the *interactive group* techniques. The nominal group technique (NGT; Taylor, Berry, & Block, 1958) involves participants generating ideas individually before being nominally brought together by the facilitator who collates the ideas without further interaction. The interactive group technique (Osborn, 1963) sees participants sitting together to contribute ideas in rotational sequence, actively aware of what others have shared with the group. The interaction is guided by four principles: (1) focus on quantity; (2) defer judgment; (3) welcome wild ideas; and (4) encourage existing ideas to be combined and improved (Osborn, 1963). The intent of this guideline is to increase ideation productivity while avoiding what Osborn described as "driving with the brakes on" (Isaksen, 1998, p. 4) due to the tendency for individuals to criticize ideas that are incompatible with their existing mindset.

The next phase is the idea development phase, which is characterized by discussion about the shared ideas, which may include asking clarifying questions, exchanging opinions, or arguing about the merits of the ideas (Price, 1985). The objective of this phase is to eliminate redundant ideas as well as to consolidate and refine the

remaining ones in order to develop a case for evaluation in the subsequent phase. The intended outcome would be a list of existing and new ideas with their respective strengths and weaknesses, although it is entirely possible that some ideas will not be developed at all or only to a limited extent.

Finally, the idea evaluation phase is characterized by assessment of the ideas (Price, 1985; Wolfe, 1994). The goal is to have either a rank-ordered list or grouping of ideas categorized by specific evaluation criteria. This helps to filter out poorly developed or indefensible ideas and facilitates the subsequent process of decision-making by management, by prioritizing the ideas. This phase may see the participants making some collective decisions about the ideas, by voting or scoring them to give an indication about the quality of the ideas. Nonetheless, it is also possible that the participants are not able to reach this phase due to disagreement or a lack of consensus.

In sum, ideation process is more than just idea generation because of the inherent communication activities, and it is also closely associated with brainstorming but without the mandatory creative process. Understanding the normative phases of ideation helps to illustrate the potential challenges of ideation as it is undertaken.

2.1.4. Theoretical communication challenges within the ideation phases

Much of the literature on ideation has been based on the information management approach, which either ignores or takes for granted the communication and social aspects of ideation. Communication however is very important in working the ideation process and in shaping its outcomes. In the idea generation phase, ideas are shared so that others may learn from it. Bandura's (1977) social learning theory suggests that this knowledge sharing triggers the cognitive process to compare and relate what is

learned from others with the knowledge that one already possesses. The learner-participant also observes how the contributor openly communicates his/her idea to others, or as Young (1965) described as "submit[ting] to criticism by the judicious" (p. 32). Together these challenge the mind to produce an idea to help solve the problem. Appreciating the psychological benefit of conceiving an idea, the learner consequently shares it with others to perpetuate the social learning experience. Social comparison theory (Festinger, 1954) further suggests that participants in the group may be motivated to elevate their own self-esteem and seek social recognition by emulating the level of performance by others, by contributing more ideas and especially good ideas to the ideation process.

The synchronicity of communication in face-to-face ideation however may cause problems for some participants. Studies have documented several issues associated with collocated social interaction in ideation, namely production blocking, evaluation apprehension, and free riding. *Production blocking* is the participants' inability to contribute their own ideas after listening to others, after finding that their ideas have just become less original, which causes their thought process to be interrupted, and feeling inferior as a result (Diehl & Stroebe, 1987; Lamm & Trommsdorff, 1973). *Evaluation apprehension* is the fear of being judged negatively by others for ideas that seem poorly conceived or incompletely thought through (Diehl & Stroebe, 1987). If the judgment or criticisms are unfettered, the situation may even evolve to become the fear of retaliation (Camacho & Paulus, 1995). Meanwhile, *free riding* or *social loafing* is the non-participation by individuals who believe that their contribution is unnecessary and/or not individually rewarding or not penalizable (Latane, Williams, & Harkins, 1979) because

the group interaction increases anonymity and reduces identifiability for recognition (Harkins, 1987; Olson, 1965). Furthermore, face-to-face group discussions may also involve tangential discussions (Jackson & Poole, 2003) and social conversations that distract participants from producing good ideas compared to when participants are focused on the task, although such conversations may also be argued to facilitate the subsequent idea generation process (McGrath, 1984; Nunamaker et al., 1991).

In the idea development phase, participants may actively engage in social learning and social comparison, as they debate or argue about the contributed ideas, exchanging questions and answers, seeking clarifications and providing justifications, as well as exchanging opinions for or against the ideas. This phase however may also be unduly influenced by some dominant member's social influence, pushing the group in a certain direction, especially in cases of ineffective facilitation (Jablin & Seibold, 1978; McGrath, 1984). Similarly in the idea evaluation phase, there may be social pressures to conform with group norms or *groupthink* (Janis, 1972) when participants collaboratively negotiate and decide how the different ideas should finally be decided upon. Overall, the ideation process clearly demonstrates the collective action process embedded within, where interactive communication and coordination play a critical role in shaping the ideation outcomes.

In sum, face-to-face ideation presents its own communication challenges throughout the normative phases. Some of these challenges may have been addressed when the face-to-face interaction is substituted with a computer-mediated one, which arises from the need to automate certain ideation tasks such as keeping track of shared ideas and their discussion points. The flexibility of not being collocated at the same time

has enabled a different kind of interaction among participants, which gives rise to other kinds of challenges. In the next section, the review turns to CMC and how it has and can facilitate the ideation process, and whether the communication challenges previously identified in face-to-face ideation still apply.

2.2. The Enabling Role of CMC in Ideation

Traditionally, CMC includes communication media that run on computer software (McQuail, 2005), which would include email, instant messaging, computer conferencing, and online databases (Walther, 1992), but exclude telephone and television as well as physical communication artifacts such as letters, posters, and facsimile (Daft & Lengel, 1984; Walther, 1996). Nowadays however, CMC includes basically all communication technologies including smartphone-based ones, as well as any text-based electronic communication such as text messaging (or short message service; SMS), internet or web-based systems, and social media (boyd & Ellison, 2007; Katz & Rice, 2002; O'Reilly, 2005). CMC may also be classified into asynchronous and synchronous types (Walther, 1992), but again nowadays, the boundary between the two is blurred due to the modularity of today's technology that enables a single technology to offer multiple functionalities (Ellison & boyd, 2013).

From a communication perspective, however, CMC is largely text-based, despite the technologies' increasing use of multimedia content such as images and videos, because subsequent interactions and replies are still mainly text-based. As such, communication using text-based CMC necessarily provides a different experience than face-to-face communication. The reduction of nonverbal cues in CMC prevents certain kinds of messages -- those with high ambiguity and uncertainty -- from being

communicated effectively (Daft & Lengel, 1984). CMC also have less *social presence* (Short, Williams, & Christie, 1976) suggesting that online conversations are impersonal and cold, but which are efficient for task-based communication (Walther, 1996, 2011). Nevertheless, social information processing theory (Walther, 1992) suggests that CMC users look for cues in the communicated text as substitute for nonverbal ones, based on the premise that they have an inherent social need to build relationships regardless of the communication media available to them. Hence, given time and interest, CMC users have the ability to transform *impersonal* communication exchange into *interpersonal* ones, and may even elevate it to the *hyperpersonal* level, which occurs when their social relationships and personal identity can be managed more effectively online than in face-to-face settings (Walther, 1996). Yet, when CMC users depend heavily on the technology to communicate, it modifies how certain work and social tasks are performed (Ellison, Heino, & Gibbs, 2006; Gibson & Gibbs, 2006). CMC's ability to support multiple parallel and distinct conversations, compared to a serial conversation in face-to-face settings (Valacich et al., 1994), therefore suggests it has benefits for ideation.

CMC have facilitated ideation in several ways. Electronic brainstorming systems (Dennis & Valacich, 1993) have been used to record-keep ideas electronically, substituting the role of idea recorder by enabling participants to manually type in their ideas to a central database, which also features the ability to reproduce the list of contributed ideas on-demand. Group decision support systems (DeSanctis & Gallupe, 1987) meanwhile offered several important functionalities for ideation, such as: enabling the facilitator to start and stop the process to control the turn-taking; enabling each idea's strengths and weaknesses to be collaboratively documented by the participants; enabling

consolidation, refinement, or deletion of ideas; as well as enabling participants to vote on or score the contributed ideas (Aakhus, 2000; Gallupe, DeSanctis, & Dickson, 1988; Jackson & Poole, 2003; Leonardi, Treem, & Jackson, 2010).

Early implementations of these systems required participants to be physically collocated in a meeting room (e.g. Poole, DeSanctis, Kirsch, & Jackson, 1994) or in a laboratory setting. The real-time interaction afforded by this arrangement continues to provide the facilitator with a degree of control over the participants and the environment, to ensure the process achieves its desired outcome of producing a set of good ideas. Later, the development of internet technology allowing remote connections to centralized systems provided participants with the opportunity to participate in the ideation process remotely from distributed locations (Valacich et al., 1994). Some implementations continue to require participants to be online at the same time, while others allow participants to share and discuss ideas without being bounded by space or time (Cummings, Schlosser, & Arrow, 1996; Kiesler & Sproull, 1992). These implementations leverage asynchronous CMC like electronic discussion boards, email listservs, and newsgroups, which may be more readily found as part of an organization's suite of collaborative tools (Michinov & Primois, 2005).

The implication of using CMC for ideation is that it helps to address some of the aforementioned ideation productivity constraints (Dennis & Valacich, 1993). For example, by enabling participants to contribute their ideas at the same time, as soon as the process is started without having to wait for turns, computer-mediated ideation addresses the issue of production blocking caused by delays in contributing ideas (Valacich et al., 1994). Additionally, in ideation systems that allow anonymity, the

evaluation apprehension issue may be addressed by making idea contributors unidentifiable (Cooper, Gallupe, Pollard, & Cadsby, 1998). However, the anonymity may also worsen the problem of free riding. Consequently, it is not surprising that research found that computer-mediated ideation groups were more productive than face-to-face groups (Valacich et al., 1994; Valacich, George, Nunamaker, & Vogel, 1994) especially for large-sized groups (Dennis & Valacich, 1999), although the different nature of interaction between online and offline makes the comparison unfair. For small groups though, computer-mediated ideation may not be as beneficial, and working alone in a nominal group may even be more productive (Pinsonneault, Barki, Gallupe, & Hoppen, 1999). Beyond contributing ideas, participants may for example engage in question and answer (Q&A) exchanges about the ideas (Ehrlich, Lin, & Griffiths-Fisher, 2007; Thom et al., 2011), as well as share opinions or make arguments and counter-arguments about the merits of the ideas (Jessup, Connolly, & Galegher, 1990; Poole et al., 1994), although these can also be done offline. In short, CMC may have some advantages in terms of productivity when it comes to facilitating participants to undertake ideation, but a more important difference is in terms of its ability to scale up participation.

2.3. Scaling-Up Ideation Beyond Small Collocated Groups

Recent research in organizational innovation and management suggests that organizations are seeing enterprise-scale communication technologies as an opportunistic tool that may be used to leverage on the collective intelligence of employees to help drive innovation as well as to help identify and solve organizational problems (Chesbrough, 2003; Leimeister et al., 2009; Malone & Klein, 2007). Involving employees in organizational decision-making, where and when appropriate, is beneficial not just to the

organization, but to the employees as well. Participatory decision-making is practiced in organizations to varying degrees, depending on the process, the formality of the arrangement, the duration of the involvement, and the extent to which employees may influence the final decision, among other factors (Cotton et al., 1998). Certainly not all situations warrant employee participation, such as in crisis or emergency situations, when authoritative decision-making may be more efficient and effective (Bonn & Rundle-Thiele, 2007; Dutton, 1986). In most other situations though, enhanced employee participation has been linked to improved organizational outcomes such as increased productivity (Cotton et al., 1988; Wagner, 1994). Human relations theory (Mayo, 1975; Smith, 1998) suggests that organizations that view employees as individuals, rather than as economic labor (e.g. Gillespie, 1993), tend to be more sensitive to the needs of employees, whose cooperation may be secured via several ways, one of which is through their direct participation in key organizational processes. Employees who are more involved in the process, are more motivated and willing to contribute their efforts to ensure the success of their participation (Cheney, 1995; Seibold & Shea, 2001), which in turn is correlated with greater job satisfaction and productivity (Miller & Monge, 1986). As such, the ability to engage employees in key organizational processes is desired by many modern organizations, due to the benefits it brings not just to the organization, but also to the employees (Stohl & Cheney, 2001).

Ideation is one of the organizational processes that may benefit from wider employee participation. Employees are also an undertapped organizational resource due to how they are organized by functional areas as Weberian structures do. As such, crowdsourcing ideas from employees is a way to address both issues simultaneously.

Crowdsourcing is the act of getting the "crowd" or a large group of independent individuals to give or do something towards a common purpose (Brabham, 2008, 2013; Howe, 2006; Surowiecki, 2004). Usually the big task is parceled into smaller ones -- called "microtasks" (Brabham, 2013) -- in a way that can help accomplish the big task. In crowdfunding, which is a type of crowdsourcing, the big amount required to fund a project is divided into smaller bits that can be funded more easily by more people, than if funded fully by a few. The advantage of crowdsourcing is that small tasks can be accomplished more easily, which also contributes to the completion of the larger task. The disadvantage however is that the task must be easy enough, or the cause must be interesting enough, to attract interest from a lot of people (Brabham, 2013). For ideation to be crowdsourced, literature suggests that the process be done online, but also subdividing the problem-solving process into smaller tasks, and offering it openly to all target participants, so that there is enough critical mass who will participate in the process. Nonetheless, not much else is known on crowdsourcing ideas, such as who should be involved, how should online ideation be performed, or what should be in place for large-scale online ideation to happen. This leads to the first research question:

RQ1: What are the enabling conditions for large-scale online ideation?

2.4. Enterprise social media use in organizations

One of the more recent CMC seeing increasing adoption in the workplace is enterprise social media (ESM) (Leonardi, Huysman, & Steinfield, 2013). ESM are not merely a version of public social media tools implemented behind the corporate firewall for internal use by the employees (Brzozowski, 2009; DiMicco et al., 2009), but are a suite of integrated software programs based on Web 2.0 technologies (O'Reilly, 2005)

customized to fit the requirements of the adopting organization. Commercial examples include IBM Connections, Jive, and Microsoft Yammer. The suite of programs allow employees to perform several communication-related tasks, as Leonardi et al. (2013) put it, namely to:

> (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization, (2) articulate a list of coworkers with whom they share a connection, (3) post, edit, and sort text and files linked to themselves or others, and (4) view the messages, connections, text, and files communicated, articulated, posted, edited and sorted by anyone else in the organization at any time of their choosing. (p.2)

That said, in this era of rapid software development -- when functionalities change in a flash and become obsolete quickly, and distinctions between features are increasingly blurred by software mashups (Ellison & boyd, 2013) -- ESM could be argued to be any CMC that allows employees to socially communicate, collaborate, and network with fellow employees. So, a three-way mashup of the corporate email system (for communication), the electronic shared folders system (for collaboration), and the organization's online staff directory (for networking), when combined by a single login, would technically be an ESM -- except that it will still be used in a formal way. Social software on the other hand tends to be used in an informal manner, because the nature of communication is less official. So unless the assembled software suite is used in a less formal way in the organization, including in terms of proper language use or following certain protocols when communicating, then the system cannot really be called an ESM.

ESM are being adopted at a record pace (IDC, 2012, 2013) presumably due to the net benefits that the technology offers. Most work organizations, except for leading technology companies, are not known for adopting just any publicly popular technology. This itself is interesting because CMC prior to Web 2.0 tend to begin life in organizations

first before being widely adopted by the public (e.g. email). This reversed adoption sequence is perhaps because Web 2.0 technologies, as the backbone of ESM and social media, are built around the user experience, enabling users for example to create and publish their own content directly to the Internet (O'Reilly, 2005) and bypassing the traditional media channels such as television and print publications. Readers may also openly interact directly with the authors and fellow readers by commenting on blogs (Efimova & Grudin, 2007; Huh et al., 2007), as well as collaborate and co-create documents in wikis (Majchrzak, Wagner, & Yates, 2013; Kittur & Kraut, 2008), as examples. The most notable user experience with social media technologies is arguably the ability to form connections, or network, with other users in the online community, and when mashed-up with the ability to exchange messages in almost real-time, this creates an unprecedented form of online communication, that is manifested as social network sites (boyd & Ellison, 2007; Ellison & boyd, 2013). boyd (2010) argues that users of social network sites contend with a different kind of dynamics that shape the communication environment. First, the existence of *invisible audiences* challenges how one should behave and act online. In its place, users create *imagined audiences* to assess if their behavior is socially appropriate, interesting, and relevant. Second, given the different categories of relationships one would typically have, it is important that the communication with these various *peoples* be properly managed, by strategizing the communication, so that their impression of the self is maintained (Goffman, 1959). In social media however, the openness and equal access others have with the online self, collapse these various social contexts (Ellison, Gibbs, & Weber, 2015; Marwick & boyd, 2011; Vitak, Lampe, Gray, & Ellison, 2012) making it difficult to create a

communication strategy that satisfies the various impression and privacy requirements. Third, without control over the contexts, the distinction between what is considered private and public are increasingly blurred. In the context of ESM, the boundaries between the personal and the official are similarly also becoming permeable. The socialness of ESM is suggested to be incompatible with workplace norms (Treem, Dailey, & Pierce, 2013), creating internal conflicts especially among the younger generation of workers who perceive and are more used to using social media for personal rather than official communication. For others who desire to clearly demarcate the two relationship domains, the adoption of ESM in the workplace may have made it more difficult to maintain the separation (Skeels & Grudin, 2009). Lastly, maintaining social and work relationships on ESM have been found to be highly demanding of one's time and attention, resulting in strategic use (and non-use) of the technology in order to accomplish work goals (Gibbs et al., 2013; Lampe, Vitak, & Ellison, 2013). Hence, considering the challenges of using ESM, for work organizations to adopt these suites of largely untested technological tools for internal use suggests that ESM may have some unique abilities that decision-makers in those adopter organizations believe can address some issues in the workplace, including for ideation.

2.5. Potential of ESM for Large-Scale Online Ideation

ESM seem to be well-suited for this kind of task as it is widely accessed by the whole organization, especially when implemented in the corporate intranet. The equal opportunity for all credentialed users to participate in online communication processes has heralded ESM specifically, and social media more generally, as democratizing participation (Campbell, Lambright, & Wells, 2014; Klang & Nolin, 2011; O'Reilly,

2005). Examining the activities of each ideation phase suggests that it is possible for ideation to be crowdsourced. Contributing ideas, asking questions, providing answers, sharing opinions, documenting strengths and weaknesses for each idea, and voting on the ideas -- when done online -- are small enough tasks to make large-scale ideation possible. If factors motivating individual participation in face-to-face ideation are unchanged, this open access to ESM to perform small ideation tasks could lead to greater overall employee involvement in the online ideation process. Furthermore, as long as the involvement is pervasive throughout much of the organization, the technology could even help to enhance communication across hierarchical, functional, and geographical boundaries (DiMicco et al., 2008; Gibbs, Eisenberg, Rozaidi, & Gryaznova, 2015).

Nevertheless, there is still plenty to be learned about how online ideation on ESM works because not many organizations have done it. Of the few studies on the topic (e.g. Bjelland & Wood, 2008; Di Gangi & Wasko, 2009; Helander et al., 2007), the focus was on the management of the ideation platform and/or process. For example, Bjelland and Wood (2008) investigated IBM's innovation jam, which was a large-scale ideation session involving the global IBM organization. Employees contributed as many ideas as possible for a few days about areas for future innovation, after which a managerial team sat down to filter and review the ideas. Subsequently, the team shortlisted the good ideas under several umbrella themes, present them back to the employees, who then participated in the discussion again. Finally, the managerial team finalized the ideas that were deemed innovative and feasible for the IBM organization to pursue. While the study showcased the feasibility of using ESM to conduct large-scale ideation, it does not inform us about how employees used the technology. It would be interesting to investigate for

example what aspects of ESM motivate employees to contribute ideas and discuss them while being occupied at work. It would also be interesting to know how the ideation process is actually subdivided into smaller tasks, which enables it to be crowdsourced using ESM.

In order to address these questions, one approach that is seeing increasing acceptance among organizational communication scholars studying technology use is the *affordance approach* (e.g. Ellison et al., 2015; Gibbs et al., 2013; Majchrzak et al., 2013; Treem & Leonardi, 2012). This approach is theoretically interesting as it avoids focusing on either specific functionalities and features of the technology, which may change, or how users may shape the technology through repeated uses (Fulk, 1993; Venkatesh, Morris, Davis, & Davis, 2003), but instead focuses on the intersection between the material features of the technology and the intended goal of the users using the technology. In other words, the approach allows for theorizing about how users appropriate the technology to accomplish their goals, without being either technologically or socially deterministic (Ellison et al., 2015).

2.6. The Affordance Approach to Understanding Technology Use

The concept of affordance originates from the works of psychologist James Gibson (1986) who coined the term to describe the relationship between objects in the environment and animals, humans included, who act on the objects. He argued that the actor does not merely sees the object, but perceives the object as having certain characteristics that enable only certain actions, depending on the environmental condition and the physical characteristics of the actor. This ecological approach to visual perception, which was also the title of his book, offered a way of explaining how the

same object may be used differently by the same or different actors. For example, a chair affords a standing human to sit, but also a platform to stand on to reach higher shelving. The same chair might be used by a cat as a resting place. In other words, an object's affordance is the result of the interplay between the intention of the user and the perceived possibilities for action provided by the object.

From how objects are perceived, the concept of affordance was "reverse applied" -- for lack of a better term -- by Norman (1988, 1990) and used instead to approach how objects should be designed so that they are used as intended. For example, a door may be designed to be opened by pushing instead of pulling by removing the knob or handle so that the perceived affordance for holding and pulling is removed, and replacing it with a push lever to obviate the perceived affordance for pushing, as often seen in emergency exits. Subsequently, this affordance approach was extended to the design of computer software's graphical user interfaces (UI), such as how on-screen buttons were skeuomorphically designed to make it easy for users to figure out and use, and adding tactile and audible feedback to confirm actions (Gaver, 1991). This was especially important in the early days of UI design, although now the practice has moved to flat design. This flexibility in redesigning software interfaces and adding functionalities may have contributed to the commodification of technology. Evidently, we may observe multiple technological products that have essentially the same functionality, sometimes differentiated only by their look and feel, especially when they were first launched. For example, Facebook, Google+, Orkut, and Badoo were originally social networking sites (boyd & Ellison, 2007), while Instagram, Flickr, and Pinterest were originally photo sharing platforms. That said, the modularity of today's technologies

has resulted in technological products that have multiple functionalities, blurring the distinctions between them (Ellison & boyd, 2013). Facebook for example today is not only a platform for social networking, but also for multimedia sharing and even social gaming. This product evolution has also occurred rather quickly, with features and functionalities changing and becoming obsolete without much notice, as companies developing the product are driven by investors to push-to-market quickly and to continually enhance it so as to remain competitive and relevant in the dynamic marketplace.

For the study of technology use, this rapid technological development has made identifying and classifying technologies more challenging. However, the affordance approach may be helpful in addressing this issue. By reversing Norman's (1988, 1990) reverse application of the concept, the affordance approach allows researchers to identify the core or *material* features of a technology based on how it is used by the users, generalizing across product-specific features that may obfuscate the understanding. For example, Twitter's tweets and Facebook's posts may be classified as the affordance of information sharing, and that Twitter's following and Facebook's friending afford users to create their own social network. In sum, the affordance approach allows researchers to see through the technological characteristics and understand what the technologies are essentially used for and how they are being used. In studying the use of CMC, the affordance approach is finding increasing acceptance especially among communication scholars as a way to understand how users interact with the technology to accomplish their goals (e.g. Ellison et al., 2015; Gibbs et al., 2013; Majchrzak et al., 2013).

Some of the communication research that used the affordance approach to study enterprise and public social media use are briefly reviewed here to illustrate the usage. Treem and Leonardi (2012) propose that social media applications (wikis, blogs, microblogs, social network sites, and social bookmarks) comprise the affordances of visibility, persistence, editability, and association, arguing that the various social media applications rank high across all affordances, while existing collaborative technologies perform less consistently on the affordance scorecard. For them, the affordances represent the material features of the technologies that may be perceived by users as they use it in the context of organizations. For example, the *persistence* affordance suggests that content shared on social media tends to remain on the platform, as it may easily be replicated and widely distributed, even after the original was deleted or edited. As such, users of the technology should be aware of the implications of sharing content online.

Majchrzak et al. (2013) suggest that ESM have the affordances of metavoicing, triggered attending, network-informed associating, and generative role-taking, when used to share and discuss knowledge at work, which may have positive and/or adverse effects on the conversations. For them, the affordances are *action potentials* that may be taken given the intention and the technology. For example, the metavoicing affordance suggests that ESM users may participate in a conversation in multiple ways, such as by commenting, upvoting, liking, or tagging. Depending on the context, users may strategically choose how they appropriate the technology to best signal their intentions to others, and possibly shape the outcome.

Gibbs et al. (2013) used the affordance approach to evaluate how users of a social media tool manage the tensions arising out of the technology use. They argue that

the technology simultaneously affords visibility and invisibility, engagement and disengagement, as well as sharing and control. For them, the affordances are strategic features of the technology that enable certain actions to be taken as needed depending on the situational circumstances. Ellison et al. (2015) used the affordance approach to argue that enterprise social network sites may have not only individual affordances, but also collective or organizational affordances, namely to support socialization and interpersonal interaction, that enable a group of coworkers sharing knowledge using the technology to accomplish their shared goals.

In sum, the affordance approach allows researchers to explain how the technology may be used differently by users for different purposes, by investigating the relationship between users' intentions and their perceptions of the extant, material features of the technology (Fulk, 1993; Leonardi, 2009; Treem & Leonardi, 2012). Consequently for this study, in order to understand and characterize how ESM are being appropriated by employees to support large-scale ideation, I therefore ask:

RQ2: What are the affordances of ESM for large-scale ideation?

2.7. Evaluating the Quality of Large-Scale Online Ideation Process

Earlier, it has been established that many idea crowdsourcing projects face multiple challenges. Primarily, large-scale online ideation suffers from quality issues in terms of the ideas and process. For example, Bjelland and Wood (2008) reported on the case of IBM that conducted online ideation sessions called "innovation jams" across its global organization. Around 150,000 employees were involved and they generated about 46,000 ideas. While seemingly impressive, the effort to review and refine the ideas was reportedly tremendous, not just because of the high number of ideas involved, but also

due to the high number of duplicate, irrelevant and poorly formed ideas. It was a similar story with Dell and its IdeaStorm platform where selecting ideas for final consideration took months (Di Gangi & Wasko, 2009). Other studies reported similar results, in that the online ideation process was generally productive, but obtaining meaningful results from the process was challenging (Leimeister, Huber, Bretschneider, & Krcmar, 2009; Lindegaard, 2011; Knoll & Horton, 2011). Furthermore, in many of these cases, idea acceptance or rejection was undertaken offline and documented elsewhere. As such, it is pertinent for the problems of large-scale online ideation to be recognized, and steps taken to understand the issue. To that end, the quality of the ideation process need to be examined, to understand how it can be operationalized and measured, as well as the factors that may influence the measure.

2.7.1. Dependent Variable: Ideation Quality

Reinig et al. (2007) defined ideation quality as "the degree to which an ideation activity produces ideas that are helpful in attaining a goal" (p. 144). They posit that ideation quality can be measured by one of four approaches. First is ideation productivity, as propounded by Osborn (1963), which is the number of ideas produced in the ideation session. This is the most common approach because it is the easiest to measure, but it does not address the idea quality issue at all, which is the source of the problem identified by this study. The other three approaches are based on assigning a quality score to each idea, and then either (a) totaling the score, (b) averaging them, or (c) counting the "good ideas", which are ideas that have a quality score above a set threshold (e.g. median). The authors however were silent on the criteria. This is understandable due to the variety of criteria available for scoring idea quality -- from a single measure of creativity,

originality, novelty, rarity, implementability, or appropriateness, among others, or some combined measure thereof (e.g. Connolly, Routhieaux, & Schneider, 1993; Diehl & Stroebe, 1987; Gallupe et al., 1992; MacCrimmon & Wagner, 1994). Further, the scoring may be influenced by the experience or expertise of the raters, so interrater reliability tests are critical. The scoring is also context-specific, in that one idea may be novel in one situation but not so in another, so it may have limited external validity. Due to the incomparability of research findings across ideation studies, Dean et al. (2006) proposed to harmonize the dimensions of idea quality, by combining the constructs of novelty with relevance, workability, and specificity, and providing a more objective evaluation scale for each. However, based on the search of the online-accessible journal articles that cite Dean et al. (2006), there has not been any study that empirically tested their proposed measure, probably because it is too complex to administer. The key takeaway is that because idea quality and ideation quality are quite subjective and can be complex to measure, it is a generally accepted practice for a study to pick one or a combination of several quality criteria, as long as they are valid and reliable measures, and relevant to addressing the research question.

For this study therefore, a "quality" ideation process means that the process has the appropriate characteristics to enable the deliberation of ideas. Such characteristics may include the presence of a facilitator (Aakhus, 2001, 2013), involvement of a diverse set of participants (Klein, 2010; Osborn, 1963), a platform for voicing (Poole et al., 1994), and a commonly understood and shared end goal (Jackson & Poole, 2003). Ideation quality therefore ranges from the lowest, in which ideas are only produced but not deliberated, to the highest, where ideas shared are discussed from various angles,

evaluated as to their relative qualities, and some kind of decision made about them. In other words, ideation quality is constructed by measuring the completeness of the ideation process. The methodology chapter will explain further how the dependent variable is operationalized.

2.7.2. Independent Variables: Diversity of Participants

Earlier in this chapter, the type and composition of participants in the ideation process have been argued to influence the quality of ideas produced. Specifically, having participants from diverse knowledge backgrounds in the ideation process have been associated with greater idea productivity and creativity (Perry-Smith, 2006; Zhou, et al., 2009). Participants chosen from similar ranks reduces status or power differential, which eliminates apprehension and increases productivity (Adams, 1953). Put another way, when a diverse set of participants are involved in discussing ideas, the ideas can become more solid as ideas are validated across more than one perspective. On the flip side, an idea can also be killed if it does not survive the validation across multiple knowledge domains. One useful way to capture the various types and composition of participants involved in the ideation process is by measuring participant diversity.

Diversity of participants can be examined in many ways, such as hierarchical, functional, geographical, gender, cultural, national, and others. Each dimension influences the dynamics of participant interaction in quite different ways. For example, there may be some interaction bias if a group or team is composed of several nationalities, as individuals naturally gravitate towards those whom they share apparent traits such as language or ethnicity (e.g. Ibarra, 1995). For this study, the focus is on the

organizational dimensions (and not personal dimensions) that literature has established as influencing creativity or idea productivity.

Functional diversity. Ideation research has shown that participants' functional diversity is positively correlated with creativity (Perry-Smith, 2006; Zhou et al., 2009), which is one of the criteria for assessing idea quality (Dean et al., 2006). This is well recognized even by Osborn (1963) whose brainstorming guidelines include recommending participants to come from different areas in order to produce creative inputs in the problem solving exercise. The diversity in perspectives and backgrounds is an important factor for effective deliberation (Klein, 2010) and for innovation (Kavadias & Sommer, 2009; Monge, Cozzens, & Contractor, 1992). In an ESM-based ideation session, participation is expected to come from various functional areas due to its open access. As ideas are shared and displayed, it is likely that some of those who are online have some level of interest or knowledge in the subject. The ease of participating in the ESM-based online discussion may lead them to share their knowledge and opinion about the merits of the ideas. This communication activity is expected to be sustained as long as there is interest in the subject, manifested by continued exchange of novel information, which is associated with the diversity of the participants' knowledge background (Aral & Van Alstyne, 2007; Hansen, 1999). A higher level of participants' functional diversity is expected to sustain the deliberation of the ideas, increasing the quality of the ideation process. As such, I hypothesize that:

H1: The level of functional diversity of the participants in the ideation thread is positively correlated with ideation quality.

Hierarchical diversity. Besides functional diversity, another measure of participant diversity in ESM-based ideation process is hierarchical diversity. This is defined as the degree to which participants come from different hierarchical levels or job positions in the organization. Hierarchical diversity may contribute to ideation quality, because different job positions may see the problem from different levels and thus contribute and discuss ideas based on those perspectives. For example, support staff could see the problem from an operational viewpoint, and give suggestions that concern the details of effort. Managers could provide ideas based on resource management, while top management could give ideas based on strategic organizational needs. Although it may also correspond to how long an employee has been with the organization, hierarchical diversity cannot be equated with tenure diversity (Burt, 1992). While it has been argued that the same cohort of new employees tend to band together regardless of which department or teams they are assigned to, due partly to the same newcomer socialization process they went through, some employees rise up the ranks faster than others. In traditional brainstorming sessions, participants are recommended to be of similar rank to ensure status congruency (Adams, 1953; Osborn, 1963). Status and power differences have been associated with reduced participation and productivity, as the presence of higher ranked organizational members creates anxiety in lower ranked members who feel they are being evaluated beyond the ideas, which adversely impacts their performance (Adams, 1953; Diehl & Stroebe, 1987). However, the involvement of higher ranked members may also be argued to bring greater maturity and experience to the ideation process. Besides challenging fellow participants to consider the ideas from various angles to develop the ideas further, these hierarchically senior members can also

share their knowledge about what ideas have and have not worked based on their past experiences. While this may help to filter out low quality ideas, such an evaluation may kill the creative problem solving process as well as future discussions about the ideas -- if it happens too early in the process (Osborn, 1963). It is therefore hypothesized that:

H2: The level of hierarchical diversity of the participants in the ideation thread is negatively correlated with ideation quality.

2.7.3. Other variables

Thread duration. It has been suggested that the longer the time an idea is gestated, the better it will be, due to the thinking that would have gone into the idea (Gallupe et al., 1992; Olson, 1965). In terms of the ideation process, the longer an idea is discussed, the greater the possibility that the idea will be decided upon, perhaps because the deadline has been reached. As such, it is hypothesized that:

H3: The duration of the ideation discussion thread is positively correlated with ideation quality.

Length of discussion thread. The number of comments discussing an idea, as represented by the length of the discussion thread, may indicate the extent to which an idea is discussed. This however does not imply that a longer discussion thread would lead to better idea quality because it can also go the other way. Similarly, a short discussion thread does not necessarily indicate a poor quality idea because there could be a very good idea that was accepted immediately. In fact, Adamic et al. (2008) found that thread length was a significant negative predictor on the outcome of a question, i.e. the likelihood of getting a "good" answer is worse with more comments. In terms of the ideation process, the number of comments is related to the extent of discussion of the

ideas. This does not necessarily correspond to the number of participants, because two participants may be taking turn to discuss the ideas. More generally though, the longer the discussion, the more likely that the ideation process can be progressed to the next level, and consequently its quality. Hence, it can be hypothesized that:

H4: The number of comments in the ideation thread is positively correlated with ideation quality.

Number of participants. Literature has established that the more participants involved in the ideation process, the more ideas that will be produced, but only up to a certain threshold beyond which, the number of ideas per person will decrease, as the larger group size accommodates free riding more easily (Renzulli, Owen, & Callahan, 1974; Valacich, Dennis, & Nunamaker, 1992). In terms of the process, the more participants involved in the discussion, the more likely that it will progress the ideation process to the next level, and consequently its quality. Hence:

H5: The number of participants in the ideation thread is positively correlated with ideation quality.

In sum, to give a more complete look at the large-scale online ideation process, from start to finish, the outcome of the process needs to be examined. To that end, ideation quality has been identified as a measure of process outcome. Subsequently, the factors that could influence the measure were explored from the literature, and five variables were identified together with their own hypotheses about their correlation with the ideation quality measure.

To recap, the chapter reviewed the literature concerning collective action, brainstorming, and CMC in order to establish a base understanding from which to

investigate the large-scale online ideation phenomenon. Two research questions were produced as a result, namely what are the enabling conditions for large-scale online ideation, and what are the ESM affordances for ideation. Both questions should provide an interesting insight into how ideation specifically and collective action more generally plays out online and within organizational settings. The chapter concludes with five hypotheses regarding the relationships between ideation quality (as a process outcome measure) and five variables, namely functional and hierarchical diversity of ideation participants, thread duration, thread length, and the number of participants. In the next chapter, the methodology for answering the research questions and testing the hypotheses are discussed.

CHAPTER THREE: METHODOLOGY

This chapter details the methods used to answer the research questions and to test the hypotheses developed in the previous chapter. This study is characterized as a mixed-methods case study, based on a combination of quantitative and qualitative analyses of the ESM server log files that captured user activities on the ESM platform, as well as qualitative analysis from in-depth interviews with employees who were ESM users. This approach is adopted to enable the identification of the enabling conditions for large-scale online ideation (RQ1) and the affordances of ESM that contribute to the ideation process (RQ2), as well as to test the hypotheses predicting the associative relationships between ideation quality and multiple variables derived from the ESM server log files, including functional diversity (H1), hierarchical diversity (H2), thread duration (H3), and thread length (H4), and the number of participants (H5) in the ideation-related discussion threads.

3.1. Case Study of a Single Organization

This study was undertaken as a case study of a single organization for three reasons. First, the research concerned *ideation* on the *ESM*, both of which are highly contextualized. In other words, how ideation takes place and what is being discussed are heavily influenced by the organizational setting. Additionally, an ESM, unlike public social media, is largely tailored to the organization in terms of access and functionality. As such, a generalized study such as a survey would not be able to sufficiently capture the conditions and nuances influencing the ideation process on the ESM. On the contrary, a case study is able to provide a holistic and in-depth investigation of processes, structure, and people in the organization (Yin, 2009). Case studies have been used in sociological

investigations as well as in business studies and organizational studies (Feagin, Orum, & Sjoberg, 1991). They are designed to extract the details from participants and the organization using multiple data sources from multiple methods of investigation (Stake, 1995), reflecting a triangulated research strategy. The triangulation comes from the theories, data, and methodologies that help to confirm the validity of the protocols (Snow & Anderson, 1991). The use of interviews, computer logs, surveys, and organizational artifacts relevant to the matter in question help to ensure construct validity (Yin, 2009), while the development of a formal case study protocol ensures its reliability (Tellis, 1997).

One issue affecting case studies however is access (Patton, 2002). While publicly accessible documents could be sufficient to study an organization in certain contexts, the research needs of this particular study necessitated greater access to the organization, including for example, its technological systems, such as the ESM, its people and other non-public information that would be subjected to non-disclosure agreements. While this could seem to limit the replicability of this study in other organizations, many organizations are open to be studied if the benefits to granting such access more than offset the costs to them, which could be mitigated by adding certain conditions such as anonymizing the organization or its respondents.

For this study, I have secured access to an organization at which I am an employee. I was also able to secure access to the organization's non-public information such as the server log files and pseudonymized employee information. While being an insider could introduce some familiarity bias that could occlude certain insights, being away from the organization for several years on study leave mitigated that risk, as the

changes in structure, systems, and people during the absence created some degree of novelty to the situation. Consequently, having ready access to the organization formed the second reason to undertake this research as a case study. The third and final reason was that the constraints in terms of time and energy placed on this research necessitated the focus on a single organization.

3.2. The Research Site

The organization chosen for this study was a national regulatory organization overseeing the banking and financial industry, whose policies and initiatives have implications for the national economy, somewhat like the Federal Reserve Bank in the United States, or the Bank of England in the United Kingdom. The organization employs about 2,800 employees in 35 departments, with offices located in two building complexes about half a mile apart in the national capital, as well as in five small regional offices throughout the country, and three even smaller representative offices for the American, European, and Asian regions. The organization size as well as the functional diversity and geographical distribution of the employees necessitated the use of centralized IT systems, including email and the intranet, to facilitate work and communication across the enterprise.

The intranet in this organization is known as K*net, which is an integrated platform for enterprise-wide communication that combined Web 2.0 tools, such as blogs and wikis, with a moderated discussion board, and an employee directory, among others. These tools in combination represented the essential components of an ESM, in that they provided users with the ability to, among other things, create an online profile of themselves, write and share posts, respond through comments and flags, as well as locate

and network with other individuals. All employees were presented with the home page of the ESM every time they logged in to the office network. This homepage highlighted the latest news from throughout the organization, as well as posts from the discussion board that were the most recently commented, amongst other items. The ESM was used by the organization's management to communicate policies and programs to employees, and for employees to comment or provide feedback and ideas on such matters. Employees who chose to interact on the ESM through the comments were identifiable by their login credentials although everyone who commented used a pseudonym instead of real names. All activities on the ESM were captured or "logged" in a database on the server. This server log file contained amongst other records, the metadata of user commenting activity. This file was one of the two main sources of data, besides interviews, in answering the research questions and testing the hypotheses.

3.3. Data Collection (Phase 1): User Activity Data from the ESM

As evidenced by earlier research on public social media tools such as Facebook and Twitter (e.g. Burke, Marlow, & Lento, 2010; Naaman, Boase, & Lai, 2010), the use of server logs as a data resource provides an accurate depiction of the activities of the research subjects and is more reliable than methods that rely on self-recall. Using server logs is also less intrusive for the research subjects compared to directly observing them, although getting access to the data is a challenge in most cases, due to privacy and proprietary reasons. For this study, the organization was asked for the dataset of users' commenting activity, because an earlier study (Gibbs et al., 2015) suggested that such data would offer a richer insight into understanding how the ideation process worked on the ESM in the organization. The organization subsequently provided a pseudonymized

data of the user commenting activities on the ESM for the period between April 2008 and October 2013. It also provided a pseudonymized list of employees as of September 2013 to help identify hierarchical positions and functional areas that were pertinent to this study's requirements. No other data were granted due to internal policy. Rutgers University's Institutional Review Board (IRB) had approved the research protocol to access the organization's proprietary and confidential information, subject to taking the necessary steps to protect the identity and reputation of the individual subjects and the organization at all times.

Several steps were employed to prepare the data for analysis and to ensure the replicability of the study. The first was to create a workable dataset from the different formats of the data sources. Upon receipt of the server log and employee data, respectively in text and Excel formats, the files were converted into a MySQL database. This was done to facilitate interactive data query on a large dataset, due to the evolving information need of this study. After conversion, the two datasets were merged to connect the data about the ESM users with their demographic information. This is done by matching the pseudonyms (technically their login IDs) in both datasets, thus providing a richer categorical data about the users. The combined data were then checked for errors, and any inconsistencies were rectified to improve its internal validity. Data inconsistencies could come from employees who have changed departments, or promoted to different job positions. Any such cases were updated to match the latest information about the employees. For users who had left the organization's employment as of the data extraction date -- as evidenced by user activity unmatched to any employee records -- their hierarchical positions and functional areas were categorized as missing. The data

were not removed because the comments associated with the user could still be useful in the qualitative analysis. Ultimately, the starting dataset that was used for the next step in data analysis contained information that helped to identify the posts, the comments, and their contributors (see Table 3.1). There was no sampling done to the data. This study also did not make use of any data collection instruments. The merged and cleaned dataset was converted back into Excel to facilitate subsequent coding.

Next, the dataset was partitioned to make it more manageable to code. As the time and effort required for coding and analyzing the comments text in the complete dataset was at the beginning unknown, the strategy was to first work on one year's worth of data, so that upon its completion, a more realistic estimate of the time and effort needed to undertake work on the rest of the dataset could be known. There was also a constraint due to the sluggishness and occasional instability of Excel in handling and sorting large, text-heavy worksheets. Eventually, only the latest 13-month data were analyzed due to the resources required and the limited time available to complete the study. Nevertheless, the 13-month period covered all the annual events and activities in the organization, as well as some unscheduled ones, which provided sufficient data points to establish a base contextual knowledge of the organizational operations to inform the study.

Table 3.1: List of fields collected for data analysis

Field name	Description
PostID	Identifier number for the discussion thread
PostDate	Starting date and time of the discussion thread
PostTitle	Subject of the discussion thread
CommentID	Identifier number for the comment
CommentDate	Date and time of the comment
Commenter	Pseudonymized name of the commenter
Nickname	Display name of the commenter
JobTitle	Job title of the commenter
Department	Department where commenter worked
JobPosition	Hierarchical group of the commenter, as per codebook
JobGroup	Functional area of the commenter's department, as per codebook
Comment	The comment
CommentGenre	The type of comment, as per codebook

3.4. Data Analysis (Phase 1): Qualitative Coding for Ideas

The comments in the dataset were openly coded to identify ideation-related threads and their general subject matter (topic). At this stage, the starting dataset did not have any explicit data about ideas, which remained embedded in the comments. Unlike other systems, this ESM did not have a flag to indicate if a comment was an idea. In certain ESM implementations, ideation posts were identifiable by them being in a special section, such as in an innovation forum, or that some posts would be keyword-tagged or explicitly labeled as an idea (e.g. Gibbs et al., 2015). For this study, ideation-related threads were those that contained a suggestion, feedback, or idea in response to a perceived problem, as well as all the follow up discussions. Threads that did not contain an idea were excluded. A qualitative analysis therefore was performed on the comments to extract ideation-related information. To that end, the dataset was arranged in chronological order to organize the discussion threads and comments in the order they were created. By naturally following how the conversations developed, the discussion of

ideas could be tracked and their contexts understood. It was not necessary to fully reconstruct the discussion threads into a screen-friendly format for analysis.

The coding process used an open coding approach initially and selective coding subsequently (Charmaz, 2006), because there was no prior knowledge of the contents of the comments. Each line of comment was reviewed to identify its type and to develop a codebook. A theme emerged that enabled the identification of ideation-related comments, such as a suggestion or an idea, an agreement or disagreement with the idea, and whether the idea was accepted, rejected, or taken into consideration. Other types of comments and the topic of each discussion thread were also openly coded. Finally, non-ideation threads were eliminated to create an ideation-only dataset. Some information from this phase of the data collection and analysis was used for the qualitative data collection and analysis phase. In particular, coding the comments for ideation-related threads enabled the identification of a pool of the most active ideation participants and non-participants who could provide a richer understanding of the online ideation process, as opposed to randomly recruiting employees for the interview, which may have included non-active ESM users.

3.4.1. Types of comments made in the ESM

After trimming the original ESM user activity dataset, there were 2,883 comments made between October 2012 and October 2013. These comments were openly coded by the author to identify the types of expressions ESM users make, in order to locate ideas and ideation-related comments for the subsequent procedure. The coding exercise revealed the following types of comments:

- ***Complaints***. Commenters shared their problems or issues and express frustrations regarding almost anything that concerned them, such as with how an event was run, or on a new policy being introduced. They requested something to be done. They could also be sarcastic in how they raise the issue.
- ***Advice and reminders***. Occasionally in response to the complaints raised, some commenters took the role of advising others to look at the issues in a more positive light. Some asked or warned others to behave and not be rude when they write, citing the community engagement guidelines. Some reminded others to be more grateful for what they have received, citing God or religious verses.
- ***Ideas***. Often in response to the problems or issues highlighted, ESM users shared tips or suggestions to address the problems or issues raised. Commenters also offered alternatives or counter-proposals.
- ***Opinions***. Following up on the ideas, commenters shared their assessments that either agree or disagree with the suggestions. At other times, commenters shared their opinions related to current organizational issues.
- ***Questions and answers***. Users also used the ESM to ask questions to seek clarifications on various matters and topics. Other users responded by sharing answers, offer facts or other information.

Other types of comments include chants, well-wishes, compliments, and condolences. The codebook for this first round of coding is provided in the Appendix. It is important to stress again that the ultimate goal of the coding is to identify ideation-related discussion threads, because the unit of analysis is a discussion thread, but that can only be achieved by first identifying the types of comments within the threads.

3.4.2. Intercoder reliability test

In order to strengthen the validity of the coding, and to ensure it was consistent and reliable, two independent coders were recruited and trained by the author to code a sample of the ESM comments based on the newly developed codebook. The training involved giving both coders the same set of 300 randomly-selected comments and asking them to code each comment based on the codebook. Any confusion was clarified to both coders and when necessary, the codebook was amended. At the end of the process, an intercoder reliability test was performed. A Cohen's (1960) kappa that exceeded .7 would deem the coding reliable (Holsti, 1969; van Someren, Barnard, & Sandberg, 1994). For this dataset, the Cohen's kappa was .82. Most of the mismatches were due to multiple codes inconsistently assigned to a comment, because some comments contained multiple comment types. For example, the following comment contained a congratulation, an opinion or reminder, and a suggestion or advice:

> Congratulations to the committee. I really look forward to attend the dinner. Just a bit odd that there is still a bicycle being listed as a lucky draw prize this year when previously there were complaints it was impossible to bring it home. Why not let the winner pick it up at the office, so that he or she has the time to prepare the transportation. I think there is still time to reconsider. (#12079)

Subsequently, the coders were asked to code a different set of 300 comments based on the updated codebook, but asking them not to be fixated on identifying the comment types at the sentence level. The interrater reliability then improved (Cohen's kappa: .92). Lastly, all the comment codes were reviewed at the discussion thread level to identify threads that were ideation-related. An additional variable to flag ideation-related discussions was added to the dataset for this purpose.

At the end of the long and tedious process of coding and recoding the comments, threads that did not contain ideation-related comments were eliminated. With only the ideation-related discussion threads remaining in the dataset, several measures were developed based on each discussion thread, which was the eventual unit of analysis.

3.5. Measures

3.5.1. Dependent variable: Ideation quality

The dependent variable for the quantitative part of the study is ideation quality, which was constructed from the values of three dichotomous variables relevant to the ideation process. The dichotomous variables were *Idea Discussed* (whether or not an idea was discussed in the thread), *Idea Voted* (whether or not there were agreements or disagreements about the idea), and *Idea Acted* (whether or not an action was taken on the idea). As such, the value of *Ideation Quality* ranges from 0 to 3, with level 3 indicating the highest quality level in which the idea was discussed, voted, and decided. These were qualitatively coded from the comments dataset because there was no such flag for voting or action status in the ESM. It did not matter how many comments were made in the discussion, nor were the number of votes for and against (agree or disagree), nor were the type of action taken -- whether it was implemented, accepted, kept in view, or even rejected. In summary, ideation quality is an ordinal variable with the following levels:

Level 0: Idea was not discussed, voted, or acted upon (a single comment thread)

Level 1: Idea was either discussed, or voted, or acted upon.

Level 2: Idea experienced any two of discussed, voted and acted upon.

Level 3: Idea was discussed, voted, and acted upon.

The measure was modeled after Reinig et al.'s (2007) measure of idea quality. In that it was the number of "good" ideas produced, which in turn were ideas that met or exceeded a set threshold of certain quality criteria such as novelty or completeness. A metastudy of the literature by Dean et al. (2006) showed that idea quality was regularly measured against a checklist of attributes. This study, however, was interested in the quality of the ideation process rather than the quality of the ideas themselves. As with how the completeness of an idea indicates its quality, the completeness of the phases of the ideation process is be argued to indicate its quality.

3.5.2. Independent and other variables

Functional diversity of participants. In coding the dataset, it was found that there were more than 50 departments to which employees were assigned. Some of the functions of these departments were clear from their names, such as finance, I.T., human resources, communication, security, and legal. The names of some others obscured their function slightly because they were named for the segments of the industry for which they were responsible, and these included research, policymaking, examination, or enforcement. There were also a few specialized operations such as currency and treasury. In terms of the reporting structure, the departments (headed by Directors) were divided into sectors (headed by Assistant Governors). Generally, this sectoral assignment of departments was based on the similarity of the functions, but the exceptions were many. For the purpose of this study, the functional areas were coded as described by their department names, except for those with industry segment descriptions -- they were recoded based on their core functionalities. 16 functional areas were coded. Subsequently, the employee records were updated to reflect this new functional area

assignment. Table 3.2 shows the list of departments and their respective functional area codes.

Table 3.2: List of departments by coded functional area

Department Name	Functional area
Office of the Governor Islamic Banking and Takaful Consumer and Market Conduct Money Services Business Development Finance and Enterprise Foreign Exchange Administration Payment Systems Policy Financial Sector Development Prudential Financial Policy	1. Policy
Banking Supervision Financial Conglomerates Supervision Insurance and Takaful Supervision Internal Audit	2. Audit
The Mint Currency Management and Operations [Southern] Regional Office [Northern] Regional Office [Central] Currency Office [Redacted] Regional Office [Redacted] Regional Office [Eastern] Regional Office [Redacted]	3. Currency Operations
Centralized Shared Services Facilities Management Services Hospitality Services Museum, Art Gallery, and Knowledge Management Services Regulation and Supervision Administration Organizational Development Administration	4. Services
Human Resources and General Services Human Capital Development Center Human Capital Strategy	5. Human Resources
Monetary Analysis and Strategy Economics Statistical Services Financial Surveillance	6. Research
Security	7. Security
IT Services	8. IT

Strategic Communications International [Redacted] Islamic Financial Center Promotions	9. Public Relations
Risk and Strategy Management Risk Specialist	10. Risk Management
Treasury and Financial Markets Operations [American] Representative Office [European] Representative Office [Asian] Representative Office	11. Treasury Operations
Consumer Information and Advisory Credit Counseling and Management Agency	12. Financial Counseling
Finance	13. Finance
Financial Intelligence and Enforcement	14. Intelligence
Office of the General Counsel	15. Legal
Employees on attachment at other organizations Employees on extended paid or unpaid leave	16. On attachment

The functional diversity measure was calculated using Blau's (1977) index of heterogeneity. Blau's index provides a reliable and valid measure of the degree of diversity in the whole population, be it functional diversity, hierarchical diversity, ethnicity, national, or other groupings. It does not make any assumption about the relationships between participants in and across the groups. Despite its relative simplicity, the measure is sufficient to indicate the degree of diversity among the participants in this study. Furthermore, this study assumed that the participants did not know the other participants, because of the total use of pseudonyms, and because the identifying information was located elsewhere in the ESM. As such, network measures such as the strength of the relationships between the participants were not considered, and the discussion threads were also not examined as a social network. Blau's index is given by the formula:

$$B = 1 - \sum_{i=1}^{k} p_i^2$$

where p is the proportion of group members in a given category *i* (e.g. “Policy” sector) and *k* is the number of different categories across all members (which for functional diversity, *k*=16). Thus, if all participants in one discussion thread came from the same organizational sector, Blau’s index would be 0. On the contrary, if all participants in one discussion thread each came from different departments, Blau’s index would approach 1. The diversity index was then calculated using the R software (R Core Development Team, 2008) specifically using Meyer's (2009) R function for Blau's index of heterogeneity, which script is provided in the Appendix. The function took two arguments, namely the discussion thread number and the code for the functional area for each participant in the thread. Blau's diversity index values were generated for each discussion thread that became the independent variable for functional diversity.

Hierarchical diversity of participants. In this study, there were many job titles listed in the dataset, but as advised by the human resources department, there were only a few categories of pay grades. Hence, the various job titles were classified and coded into five hierarchical groups of top management, upper management, middle managers, analysts, and support staff. This was similar to how Gibbs et al.'s (2015) study classified the many employee job titles into more generic job levels. Hierarchical diversity was subsequently also calculated using Blau’s (1977) index of heterogeneity. Table 3.3 shows the list of job titles and their respective hierarchical levels.

Table 3.3: List of job titles by coded organizational hierarchy

Job Title		**Organizational hierarchy**
Governor Deputy Governor	Assistant Governor General Manager	1. Top Management
Director Deputy Director		2. Upper Management
Manager Editor Actuary Syariah Specialist Risk Specialist Senior Actuarial Analyst Senior Analyst	Senior Architect Senior Economist Senior Engineer Senior Financial Investigator Senior Legal Counsel Senior Solution Architect Senior Supervisor	3. Middle Management
Analyst Associate Analyst Associate Risk Specialist Associate Syariah Specialist Actuarial Analyst Associate Actuarial Analyst Architect Architectural Assistant Audit Officer Coin Designer Curator Assistant Curator Dealer Associate Dealer Economist Associate Economist Engineer Assistant Engineer	Engraver Executive Associate Executive Financial Investigator Associate Financial Investigator Senior Inspector Inspector Assistant Superintendent Legal Counsel Associate Legal Counsel Risk Analyst Associate Risk Analyst Supervisor Associate Supervisor Senior F&B Officer Solution Architect	4. Analysts
Administrative Assistant Administrative Officer Executive Secretary Secretary Caretaker Clerical Officer Sergeant Corporal Constable Currency Hand F&B Officer Graphic Designer	Production Fitter Production Officer Receptionist Registered Nurse Senior AV Officer AV Officer Senior Driver Driver Forklift Driver Senior Maintenance Officer Maintenance Officer	5. Support Staff

Graphic Officer	Senior Printing Officer
Handyman	Printing Officer
Junior Maintenance Officer	Senior Technical Officer
Coin Design Assistant	Senior Technician
Engineering Assistant	Technician
Office Assistant	Senior Toolmaker
Production Assistant	Toolmaker

Thread duration. Thread duration is the number of days that lapsed from the first comment to the last comment in the thread. This system or technical variable was derived by calculating the time difference between the first and the last comment in one thread, and converting it into days. This was easily done in Excel arithmetically.

Thread length. Thread length refers to the number of comments in the ideation thread. This technical variable was simply the count of comments per thread.

Commenter count. The number of participants is operationalized as the commenter count, which refers to the unique number of commenters in the ideation thread. This technical variable required sorting the commenters by unique identifiers in each thread, and eliminating any duplicates. This could also be done programmatically.

Nonwork topic of discussion. This measure is not system-produced but needed to be qualitatively coded from the comments dataset. Specifically, the title of each thread was assessed as to whether they were work-related, or otherwise. Whether or not a topic is work-related is subjective and contextual to the organization. In this study, the guiding principle was that if they were related to employees doing office work or work related to the central banking business, or related to employment terms and conditions, then they were work-related. Another guiding principle was about who owned the information. If it was one of the departments, then it was work-related. If it was one of the staff organizations, such as Puspanita (ladies' association), Persatuan (staff association), and

the Koperasi (employee credit union), then it was nonwork. Examples of work topics include HR matters, seminars, and corporate news. On the other hand, nonwork topics include social events like treasure hunt, company annual dinner, sports, and the Koperasi promotions.

Presence of facilitator. A facilitator in this case could be anyone who either encourages participation in the ideation process, encourages discussion of the ideas, or dissuades participants from making (negative) comments that could derail the discussion, while remaining neutral. This was also highly contextual to the discussion and thus needed to be qualitatively coded. The guiding principle was first about encouragement, namely the comments should encourage new discussion and contribution, or that it discourages negative comments from derailing the conversation from the ideas. The second principle was neutrality, that the comments should be about giving advice and not taking sides. From the dataset, facilitators were generally be found in long discussion threads, or topics owned by staff organizations.

3.6. Quantitative Data Analysis

Following the coding of the comments data, an ideation-only threads dataset was created, from which several variables were developed to be used in statistical analysis. Each variable was reviewed to identify their statistical properties, including plotting the data to identify the shape of data distribution. This is needed for determining the kinds of statistical analysis that could be performed. Where relevant, data transformations -- namely log transformation of long tailed skewed data (Field, 2009) -- were performed to enable certain statistical analysis to be done.

For the two control variables, namely the nonwork topic of discussion and the presence of facilitator, additional statistical analysis were performed. First, the main data was subset to produce two groups with dichotomous values that represented the control variable. Specifically, the main dataset was subset to create work and nonwork groups, and facilitated and unfacilitated groups. Next, certain variables -- namely, thread length, thread duration, commenter count, and ideation quality -- were examined to see if their properties were different between the two groups, and t-tests for differences of means were performed to confirm if the means of the two groups were significantly different. The alternative hypothesis was that one of the means was greater, depending on the actual reading. These variables were tested because they were believed to be influenced by the control variables.

3.6.1. Correlation Analysis

Given the five hypotheses involved testing associative relationships, bivariate correlation tests were ordered. As the dependent variable *Ideation Quality* was a polychotomous 4-level ordinal categorical variable, and that the independent variables were continuous interval variables, polyserial correlation tests (Olsson, Drasgow, & Dorans, 1982) were performed. Using R, the polycor package was installed and used to run the correlation tests, without changing the default options. The coefficient and p-values were tabulated for each independent variable against ideation quality. The resulting correlation coefficients were evaluated for statistical significance, with the appropriate null and alternative hypotheses. As the direction of the correlation was uncertain for the two hypotheses (H1 and H2), a two-tailed t-test at 95% confidence (i.e. $p < .05$), was performed to identify the significance of the derived coefficient.

Subsequently, the independent variables were also tested against each other. Visual plots of two variables were also done to quickly assess their relationships, including the check for non-linearity and non-monotonicity in the associative relationships. Since the variables involved were continuous interval variables, and because their distribution was not normal even after transformation, the test ordered was a non-parametric Spearman's rank-order correlation test. This is because it does not make an assumption about the distribution of variables, nor the linearity or heteroskedasticity of the relationship, but requires the variables to be at least of the ordinal type, and have a monotonic relationship. All coefficients and p-values were recorded and tabulated. The results were then checked against the hypotheses stated to find evidence of support or otherwise.

3.6.2. Regression Analysis

As a last step in the statistical analysis process, a regression analysis was performed to predict the value of the dependent variable based on the values of one or more predictor independent variables. This exercise allowed for a better explanation of the results and hypothesis testing, as the correlation test would only inform about the relationship direction (positive or negative), whereas a regression would provide evidence about the predictive power of the relationships. It is also a source of new knowledge in studies due to how new variables are combined in the regression model.

For this study, the purpose was to predict the quality of the ideation process given the values of multiple predictor variables identified in the comments dataset, namely, functional and hierarchical diversity, thread duration, thread length, commenter count, nonwork topic, and presence of a facilitator. Due to the types of variables at play, the

regression analysis became a procedure to produce estimates of the effect of predictor variables on the dependent variable, at certain values of the moderator and control variables (Hayes, 2013). In other words, given the values of the predictor variables, could the ideation quality be predicted to be either of none (0), low (1), medium (2), or high (3) quality? As the dependent variable in this study was a 4-level ordinal variable of ideation quality, an ordinal logistic (also known as ordered logit) regression was performed (McCullagh, 1980). The regression predicts the odds ratio that the dependent variable will change one level, when the predictor variable increases by one unit, while other variables remained constant. More specifically as an example, what are the odds that ideation quality will improve from low to medium, or medium to high when there is one extra comment in the ideation thread?

The initial model tested was for ideation quality to be predicted by hierarchical diversity, functional diversity, thread duration, thread length, nonwork topic of discussion, and presence of facilitator. Using R, several packages were required, namely: foreign, ggplot2, MASS, and reshape2. Then, the polr function was implemented to run the regression. Additional steps were done in R to find the p-values, and taking the exponent of the coefficients of the regression to derive the odds ratio.

In order to find the model that best predicts the dependent variable, the regression analysis were repeated several times while removing and adding variables at each step, while assessing its Akaike Information Criteria (AIC; Akaike, 1973) value. R provides a tool called StepAIC that automates the process. At the end of the sequence, the best model is presented with the relevant coefficient statistics.

AIC is used in statistical data modeling when the true model is unknown and is aimed at reducing information entropy (Bozdogan, 1987). A lower AIC value means the information entropy or uncertainty about the model is lesser. AIC rewards a model's goodness of fit but penalizes extra parameters. In other words, a model with a lesser number of parameters is preferred than a model with more parameters having the same AIC value. For smaller sample sizes, a corrected AIC is calculated, using the formula:

$$AICc = AIC + \frac{2K(K+1)}{n-K-1}$$

where *n* is the sample size and *K* is the number of parameters in the model, whereby the correction term becomes smaller as the sample size grows. Mathematically, for a model that has 7 predictors (such as this study initially), the sample size that makes the correction term to be adequately small (around 0.5) is 230. It is important to note that AICc (and AIC) values are ordinal and are used to predictively rank the models, rather than as determinant of explanatory power (Shmueli, 2010).

3.7. Data Collection (Phase 2): In-depth Interviews

While the coding exercise in Phase 1 served to identify the kinds of ideation-related comments made on the ESM, it also revealed, to a limited extent, through the reading of the discussion threads, how the users employed the ESM to virtually interact with one another and perform ideation. In order to fully comprehend the ESM users' ideational activities, it was necessary to engage with them using in-depth interviews. The interviews would inform the study and/or validate what was known about the ideation activities and phases, as well as how the ESM was used to undertake the ideation activities in the context of the studied organization. This would get at both research

questions, as to what are the enabling conditions for large-scale online ideation, and the affordances of ESM for ideation.

3.7.1. Interviewee Recruitment (Sampling) Procedure

The interviewees were initially selected based on the analysis of the log data for the most active discussant in ideation-related threads, in order to have access to information-rich cases that directly informed the study about "issues of central importance to the purpose of the research" (Patton, 1990, p. 169). Subsequently, the interviewee pool was expanded by purposefully selecting (Schatzman & Strauss, 1973) and adding other ESM users based on their hierarchy and function in the organization to provide a fuller picture of the related activities, while also capturing some users who were not actively participating in the ideation process. This provided a balanced approach in informing the study about the ESM affordances and enabling conditions for large-scale online ideation.

Invitation to participate in the study was sent out by email to the first 30 users in this ordered list. In order to remove any element of coercion in the study due to my being a fellow employee, anyone who was under my direct supervision when I was working there between 1994 and 2007, or in anyway felt obligated to participate due to my perceived supervisory status, was excluded. This was communicated in the invitation email. Email replies that agreed to the interview were considered electronic consent. A follow-up telephone call was done to schedule a time for the actual interview during which time, they were reminded that participation was voluntary. Those who did not initially reply were sent one email reminder after one week. Further non-response, refusal, or disqualification was replaced by others further down the list. This continued

until 16 employees were interviewed when theoretical saturation on the theme was achieved (Charmaz, 2006; Glaser & Strauss, 1967). Then 4 more employees were selected to round up the list to 20, based on gaps in job categories, such as P17 from IT, P18 from HR, and P19 from the upper management group. P20 was a substitute addition. Table 3.4 shows the summary profile of the interviewees, who represented all hierarchical levels and several functional areas.

Table 3.4: Profile of Interviewees

ID	**Hierarchical Group**	**Functional Group**	**Gender**	**Age**	**Tenure**
P1	Middle Management	Public Relations	Male	45	22
P2	Analyst	Public Relations	Male	39	10
P3	Support Staff	Policy	Female	41	9
P4	Support Staff	Policy	Female	36	14
P5	Analyst	Policy	Male	28	5
P6	Support Staff	Finance	Female	39	17
P7	Analyst	Public Relations	Female	31	7
P8	Middle Management	Public Relations	Male	42	13
P9	Middle Management	Attachment	Male	59	36
P10	Top Management	Policy	Male	53	29
P11	Middle Management	Security	Male	36	13
P12	Support Staff	Services	Male	54	34
P13	Support Staff	Intelligence	Male	39	18
P14	Analyst	Finance	Female	31	7
P15	Analyst	Currency Ops	Male	47	8
P16	Support Staff	Audit	Male	27	5
P17	Analyst	IT	Male	28	4
P18	Analyst	HR	Male	40	8
P19	Upper Management	Public Relations	Male	51	8
P20	Support Staff	Currency Ops	Male	36	8

3.7.2. Interview Protocol

At the start of the interview, I followed the protocol as approved by the IRB of Rutgers University to inform the subject about the study, why they were selected, and their option to either withdraw at any time or not answering any questions. They were provided the opportunity to ask any questions about the study and procedure. Finally, the

subjects were asked permission to audiotape the conversation, and to sign another consent form, a copy of which was provided them for their own record. If they refused to be audiotaped, the interview proceeded without one, and no one refused. The consent forms and the interview questions are as outlined in the Appendix. Occasionally, the interviews digressed into questions concerning the organization structure, internal communication culture, innovation programs, and technology implementations, but these were valuable to help inform and enrich the case study. Most of the interviews were conducted in English and lasted between 30-60 minutes. Some of the interviewees however wished to be interviewed in the national language of the country, or a mix of the two languages. Either case was accommodated as I am fluent in both languages. At the end of the interviews, the subjects had another opportunity to ask questions, and after which, the interview was completed, and they were thanked for their participation. There was no monetary compensation for their participation. The audiotaped interviews were transcribed verbatim and where necessary were immediately translated into English to facilitate coding. Transcription of these interviews resulted in 602 typed pages of double-spaced interview data. Qualitative analysis of these interviews focused on identifying the enabling conditions for ideation and the affordances of ESM for ideation, instead of purely open coding, and the analysis suggested that theoretical saturation have been met.

3.8. Data Analysis (Phase 2): Qualitative Coding of Interviews

The transcribed interviews were coded and analyzed using MaxQDA, a software program for qualitative data analysis software not unlike Atlas.ti. The coding procedure emulated the conventions of the grounded theory approach (Charmaz, 2006; Corbin & Strauss, 1990; Glaser & Strauss, 1967). Namely, the transcripts were first open coded to

identify the concepts and phenomena in the data, specifically using the constant comparative method (Miles & Huberman, 1994), whereby each meaningful set of conversational interaction was marked and labeled with a relevant concept. From this open coding process, after some categories have appeared from the data emically (and etically also from literature), axial coding was subsequently used to link the categories to find specific themes and concepts. From these themes, knowledge claims were developed guided by the research questions in order to arrive at a set of statements that best explain the enabling conditions for large-scale online ideation, and the affordances of the ESM for ideation. To improve internal validity, "member checks" were performed to validate the research findings with several participants. To that end, several interviewees were randomly selected and the summaries of interview findings were shared to solicit their feedback.

The qualitative analysis of the interviews produced some interesting themes, which were related to how the employees used the ESM to perform ideation, and about the ESM itself. These went towards formulating the qualitative findings. Some themes such as anonymity were not used because it was not covered in the literature. Table 3.5 shows some sample codes and quotes from the analysis.

Table 3.5: Sample codes and quotes

Code	Description	Sample quotes
Suitability	ESM is suitable technology for ideation	In K*net, there are usually more ideas. Sometimes it's something that we would never have thought of. (P4) I find it engaging or even fun to read other people's comments to understand their ideas. (P5)
Visibility (Virality)	Knowing small issues because it was on the ESM	I don't play bowling, but I know about the issue from K*net. (P15) Because everyone has access to K*net, and lots of eyes looking at it, and this issue, it will attract attention to it. (P1)
Paused (Asynchronicity)	ESM use is not real-time; wait before responding	I won't wait after posting to see a reply. I'm not an attention seeker. haha. (P4) They may not reply on the spot, but we're hoping that they will actually read our comments. (P5)
Bypass rules (Informality)	Need not be official or formal when using ESM	Usually IT problems you have to log in the Helpdesk system. But for live streaming, staff just complain on K*net and we know we have to fix it. (P17) Sometimes I get to know OSH issues from reading the comments. There are better ways to do this, to get it up to me. (P18)
Anonymity	Use of ESM with a pseudonym and not knowing others	The platform allows you to put nicknames, so people take that as a guarantee that other people may not know who they are. (P5) If you used real names, then there won't be anymore keyboard warriors. Definitely. Everyone will give good ideas and positive comments, no more negative ones, really. (P4)
Pressure	ESM pressures people to respond	K*net may not be the best for us, because it creates pressure on us to respond. (P9) It was a hot issue. Staff were asking me if I can do something about it. I said I will bring it up to management for discussion. (P10)
Voluntarity (Motivations)	Things that drive people to share ideas; freedom to contribute	I give ideas because I can. … No one asked me to. No one said I cannot. " (P16) When I see things that can be improved, I will not hesitate to suggest, to voice out. (P2)
Topic dependence	Commenting depends on topic	It depends on the topic. Some topics attract more attention than others. Things like Annual Dinner, um.. the salary increment, some events, they usually tend to get more ideas than serious stuff. (P1)

Facilitation	Encourage sharing; discourage derailleurs	I would advice them to not simply say what they want, and maybe check the facts first. (P3) The discussion was going nowhere. I went in to suggest to put it back on track. Focus on the main issue, (P13)

To recap, this chapter detailed the procedures needed to perform this study, which was designed as a case study of a single organization, using both quantitative and qualitative methods to answer the research questions and test the hypotheses. The ESM server log containing the comments and in-depth interviews were the main sources of data. Correlation and regression analyses were outlined, as were the in-depth interview and qualitative coding processes. The next chapter presents the results of the statistical analysis.

CHAPTER FOUR: RESULTS FROM QUANTITATIVE ANALYSIS

This chapter presents the results from quantitative analysis of the comments dataset from the ESM server log file, as well as from the correlation and regression analyses. These results are used to test the hypotheses identified in the previous chapter.

4.1. Descriptive statistics of the comments dataset

The original ESM user activity dataset contained 12,992 comments created by 1,752 pseudonymized usernames between April 2008 and October 2013. This period represented the time between the launch of the ESM and when the data was requested. The original pseudonymized list of employees as of September 2013 contained 2,829 individuals. When this list of employees was merged with the aforementioned comments dataset, 1,251 usernames were matched to individuals, while 501 were unmatched and thus unclassifiable in terms of position or function. This meant that the participation rate in the ESM was 52.6% historically, and 44.2% most recently. As all employees had access to the ESM, this suggests that around half of employees chose to be lurkers or non-active users. Table 4.1 shows the demographic distribution of employees by gender, age, tenure, hierarchical level, and functional area.

Examining the distribution of commenters in each group, the level of participation in the ESM was generally consistent with their proportion in the organizational population. Certain groups had greater proportion of commenters relative to their sizes, such as Support Staff in terms of job level, as well as the Security and Currency Operations groups in terms of job function. This suggests that these groups had relatively more free time due to how the ESM was used in between work periods, as discussed in the next chapter. Nonetheless, using the z-test for proportions, except for Support Staff

(z=2.95, p<.01), these deviations were not statistically significant relative to the population. (See Tables 4.2 and 4.3).

Table 4.1: Demographic distribution of employees (n=2,829)

Category	Group	Count	Percentage
Gender	Female	1,395	49.3%
	Male	1,434	50.7%
Age	Up to 25 years old	147	5.2%
	26-35 years old	1,017	35.9%
	36-45 years old	907	32.1%
	46-55 years old	643	22.7%
	More than 55 years old	115	4.1%
Tenure	Up to 5 years	580	20.5%
	6-15 years	1,160	41.0%
	16-25 years	579	20.5%
	26-35 years	480	17.0%
	More than 35 years	30	1.1%

Table 4.2: Distribution of ESM Commenters and Ideators by Organizational Hierarchy

Organizational Hierarchy Group	All Employees	All Commenters	z †	Commenters in Trimmed Dataset
1. Top Management	11 (0.4%)	2 (0.2%)	.045	0 (0.0%)
2. Upper Management	140 (4.9%)	44 (3.5%)	.430	25 (3.5%)
3. Middle Management	521 (18.4%)	201 (16.1%)	.842*	117 (16.5%)
4. Analyst	1,166 (41.2%)	488 (39.0%)	.987	284 (40.1%)
5. Support Staff	991 (35.0%)	516 (41.2%)	2.953**	283 (39.9%)
Total	**2,829**	**1,251**		**711**
Unclassifiable		501		41

* p<.05, **p<.01

† https://www.medcalc.org/calc/test_one_proportion.php

Table 4.3: Distribution of ESM Ideation Participants by Functional Area

Functional Area	All Employees	All Commenters	z †	Commenters in Trimmed Dataset
1. Policy	453 (16.0%)	181 (14.5%)	.550	116 (16.3%)
2. Audit	439 (15.5%)	171 (13.7%)	.650	93 (13.1%)
3. Currency Operations	395 (14.0%)	201 (16.1%)	.858	103 (14.5%)
4. Services	252 (8.9%)	121 (9.7%)	.309	74 (10.4%)
5. Human Resources	142 (5.0%)	61 (4.9%)	.036	47 (6.6%)
6. Research	217 (7.7%)	93 (7.4%)	.109	48 (6.8%)
7. Security	200 (7.1%)	115 (9.2%)	.877	55 (7.7%)
8. IT	114 (4.0%)	58 (4.6%)	.233	32 (4.5%)
9. Public Relations	83 (2.9%)	41 (3.3%)	.153	21 (3.0%)
10. Risk Management	61 (2.2%)	24 (1.9%)	.100	23 (3.2%)
11. Treasury Operations	114 (4.0%)	37 (3.0%)	.310	18 (2.5%)
12. Financial Counseling	85 (3.0%)	31 (2.5%)	.163	24 (3.4%)
13. Finance	71 (2.5%)	31 (2.5%)	.000	13 (1.8%)
14. Intelligence	67 (2.4%)	39 (3.1%)	.286	23 (3.2%)
15. Legal	48 (1.7%)	14 (1.1%)	.174	7 (1.0%)
16. On Attachment	88 (3.1%)	33 (2.6%)	.166	12 (1.7%)
Total	**2,829**	**1,251**		**711**
Unclassifiable		501		42

* p<.05, **p<.01

† https://www.medcalc.org/calc/test_one_proportion.php

After the dataset was trimmed for reasons explained earlier, there were 2,883 comments that were made between October 2012 and October 2013 by 711 identified

commenters, with 42 usernames unclassifiable. Examining their distribution in terms of hierarchy and function, none of the deviations from the full dataset was statistically significant. This suggests the representativeness of the trimmed dataset, thus supporting its validity for studying this ESM as an enterprise-wide tool. Tables 4.2 and 4.3 show the distribution of commenters in the original and trimmed datasets, by organizational hierarchy and functional areas respectively.

4.2. Dependent variable: Ideation quality

Ideation quality is this study was operationalized as an ordinal variable that summed three dichotomous variables of *Idea Discussed*, *Idea Voted*, and *Idea Acted* derived from each ideation thread. This made the range of values for the ideation quality variable, called *Ideation Quality*, to be between 0 and 3, with a score of 3 indicating the highest ideation quality, with the score of 0 meaning that the idea was essentially ignored, despite the possibility of there being discussion in the thread. The frequency distribution of the ideation quality variable (median=2, mean=1.49, s.d.=1.06) is shown in Table 4.4, which shape is not normally distributed. This has implications on the type of statistical analysis that can be performed on the variable.

Table 4.4: Frequency distribution of Ideation Quality (n=101 threads)

Ideation Quality Score	**0**	**1**	**2**	**3**
Frequency	30 (29.7%)	6 (5.9%)	51 (50.5%)	14 (13.9%)

4.3. Independent variables

4.3.1. Hierarchical and functional diversity of participants

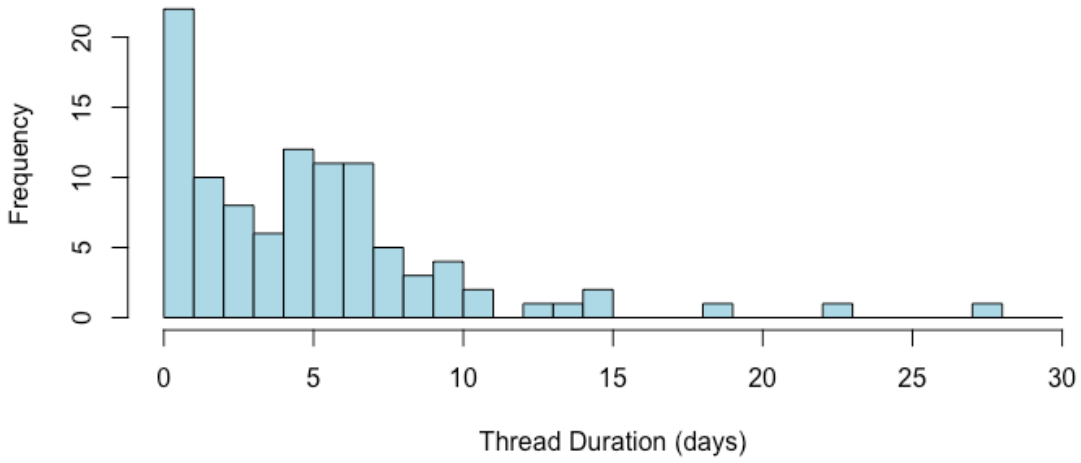
From the comments dataset, there were 5 hierarchical levels and 16 functional levels. The hierarchical and functional diversity measures were calculated for each

ideation thread using Blau's (1977) index of heterogeneity, using R software, specifically Meyer's (2009) R function for Blau's diversity index. The resulting continuous variables have values that ranged between 0 and 1, where 0 means no diversity in the group. Across 101 ideation threads, the hierarchical diversity index (median=0.54, mean=0.47, s.d.=0.21) and functional diversity index (median=0.77, mean=0.67, s.d.=0.26) were also not normally distributed, due to several cases in which the index were 0. These were threads in which participants came from the same job level or job function group.

4.3.2. Thread duration

Thread duration is the number of days that lapsed from the first comment to the last comment in the thread. Due to the slow pace of how conversations on the ESM develop, it could provide some time for participants to think about the ideas shared before providing their own contribution to the discussion, so that the idea could be better developed. Hence, a longer thread duration could indicate a higher ideation quality. The frequency distribution of the thread duration is as Figure 4.1, which also followed a long tail distribution, with a median of 4.3 days.

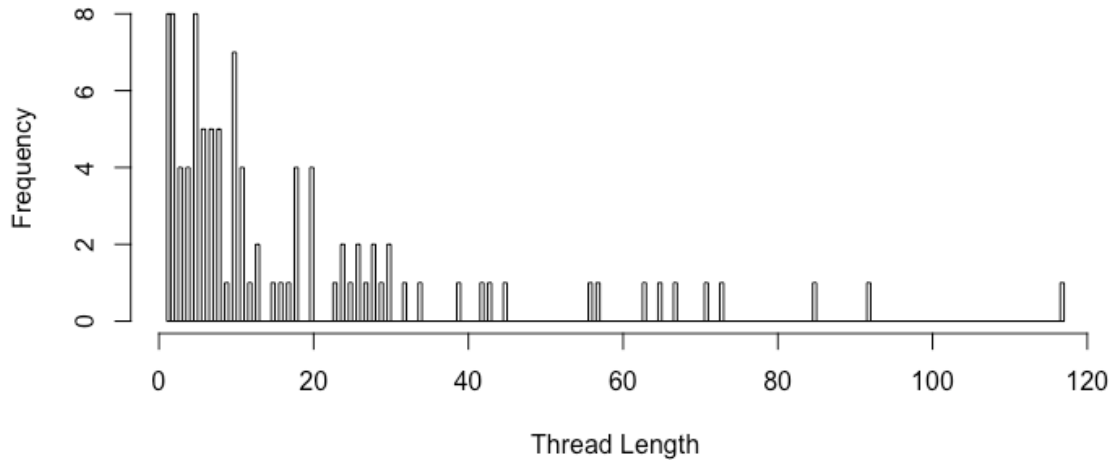
Figure 4.1: Frequency distribution of ideation thread duration



4.3.3. Thread length

Thread length refers to the number of comments in the ideation thread. A longer thread is assumed to imply a healthier discussion of an idea. While it may not be necessary for all comments to be about an idea in the thread, due to how ideation threads were identified in this study, this possibility was minimized. The frequency distribution of the ideation threads is as in Figure 4.2. It followed a long tail distribution, with 8 threads having only one comment, the median thread had 10 comments, and the longest thread had 117 comments, which was about the annual company dinner.

Figure 4.2: Frequency distribution of comments in the ideation threads

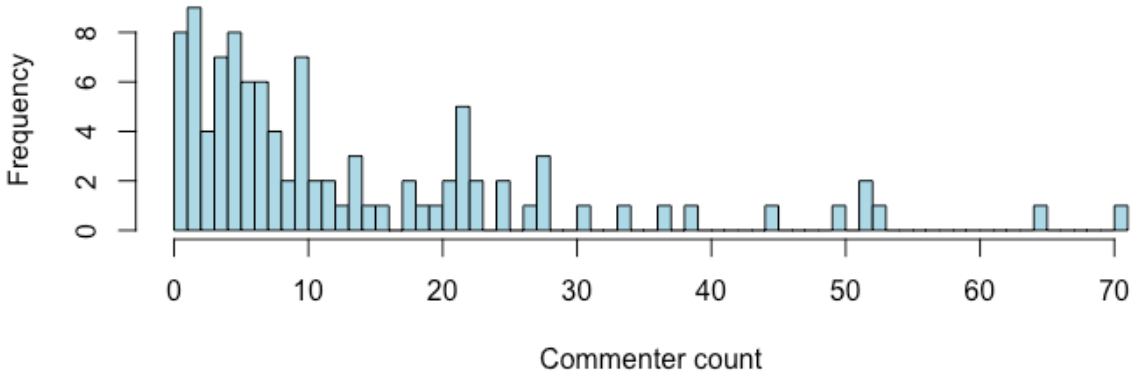


4.3.4. Commenter count

Commenter count refers to the number of commenters in the ideation thread. A greater number of commenters indicates that more participants were involved in the ideation process. While not all commenters may be necessarily be discussing the ideas, due to how ideation threads were identified in this study, this possibility was minimized. The frequency distribution of the ideation threads is as in Figure 4.3. It also followed a long tail distribution, with 8 threads having only one commenter, the median thread had 8

commenters, and the longest thread had 71 commenters, which was also about the annual company dinner.

Figure 4.3: Frequency distribution of commenters in the ideation threads



4.4. Control variables

4.4.1. Nonwork topic of discussion

During coding of the comments dataset, certain discussion topics seemed to garner more comments than other topics. Upon closer examination, the data suggested that there could be a difference between work and nonwork topics in terms of participation. This was guided by earlier studies that have divided communication on the ESM into work and nonwork, with nonwork posts getting more attention over time (Gibbs et al., 2015). Hence, the threads were qualitatively coded into work and nonwork based on the title of the threads (Cohen's kappa: 0.94; discrepancy due to misleading or creative way some threads were titled). For example, the new human resource policy was coded as "work topic", and the annual treasure hunt was coded as "nonwork". The two groups were compared and a two-sample t-tests for differences of means were carried out for several variables, namely thread duration, thread length, commenter count, and ideation quality. The results of the t-tests as shown in Table 4.5 suggested the acceptance the alternative hypothesis that nonwork topic had more comments than work topics, and

that more participants commented on nonwork topics than work topics. However, the same t-test results suggested that work topics have better ideation quality than nonwork topics, albeit by just a small margin of .02.

Table 4.5: Difference between work and nonwork topics for select variables

		Work (n=24)	**Nonwork** (n=77)
Thread duration	Mean	4.38	5.01
	s.d.	4.79	4.75
Log(1+Thread duration)	Mean	1.31	1.50
	s.d.	0.92	0.81
t-test for differences of means (H_0: $\mu_{nonwork}$-μ_{work}=0)	t=-0.94, df = 34.93, p=.36		
Thread length	Mean	17.33	18.74
	s.d.	25.05	21.32
Log(Thread length)	Mean	2.04	2.34
	s.d.	1.30	1.17
t-test for differences of means (H_0: $\mu_{nonwork}$-μ_{work}=0)	t=–1.00, df=35.52, p=.16		
Commenter count	Mean	12.50	14.27
	s.d.	16.25	14.23
Log(Commenter count)	Mean	1.85	2.17
	s.d.	1.19	1.06
t-test for differences of means (H_0: $\mu_{nonwork}$-μ_{work}=0)	t=1.19, df=35.19, p=.12		
Ideation quality	Mean	1.5	1.48
	s.d.	1.06	1.07
t-test for differences of means (H_0: μ_{work}-$\mu_{nonwork}$=0)	t=–.08, df=38.69, p=.47		

4.4.2. Presence of facilitator

From the analysis of the comments data and subsequent interviews, the role of the facilitator appeared as a potential variable that could influence participation in the ideation process, and thus ideation quality. A facilitator in this case could be anyone who either encourages participation in the ideation process, encourages discussion of the ideas, or dissuades participants from making (negative) comments that could derail the

discussion, while remaining neutral. After recoding the dataset for the facilitator variable (Cohen's kappa: .78 due to difficulty in ascertaining neutrality), two sample t-tests were again conducted across several variables, to check if the variable had any influence on the ideation outcomes, including participation, discussion, and quality. The results as shown in Table 4.6 suggested the acceptance of the null hypotheses that the means are different for all test variables. In other words, the presence of a facilitator made a huge difference (despite the smaller number of cases) in improving participation and discussion, which also led to improved ideation quality.

Table 4.6: Difference between having a facilitator or not for select variables

		Facilitated (n=25)	**Unfacilitated** (n=76)
Thread duration	Mean	8.99	3.51
	s.d.	6.09	3.26
Log(Thread duration)	Mean	2.15	1.23
	s.d.	0.55	0.79
t-test for differences of means (H_0: $\mu_{facilitated}$-$\mu_{unfacilitated}$=0)	t=6.46, df = 58.60, p<.001		
Thread length	Mean	44.28	9.90
	s.d.	26.85	11.25
Log(Thread length)	Mean	3.62	1.82
	s.d.	0.62	1.00
t-test for differences of means (H_0: $\mu_{facilitated}$-$\mu_{unfacilitated}$=0)	t=10.63, df=67.58, p<.001		
Commenter count	Mean	30.32	8.43
	s.d.	15.69	9.38
Log(Commenter count)	Mean	3.28	1.71
	s.d.	0.53	0.94
t-test for differences of means (H_0: $\mu_{facilitated}$-$\mu_{unfacilitated}$=0)	t=10.4, df=74.10, p<.001		
Ideation quality	Mean	1.92	1.34
	s.d.	.99	1.05
t-test for differences of means (H_0: $\mu_{facilitated}$-$\mu_{unfacilitated}$=0)	t=2.45, df=42.99, p<.01		

4.5. Polyserial correlation analysis

Bivariate correlations were performed in order to test several hypotheses about the relationships between several independent variables and ideation quality (as the dependent variable). To recap, the hypotheses were that there is positive correlation between functional diversity of participants in the thread and ideation quality (H1); negative correlation between hierarchical diversity in the thread and ideation quality (H2); positive correlation between thread duration and ideation quality (H3); positive correlation between thread length and ideation quality (H4); and positive correlation between number of participants and ideation quality (H5). As the ideation quality dependent variable was a polychotomous 4-level ordinal categorical variable, and that the independent variables were continuous interval variables that did not satisfy the assumptions of the more typical correlation tests, polyserial correlation tests (Olsson, Drasgow, & Dorans, 1982) were performed using R's polycor package. Bivariate correlations between other variables used the Spearman's method. The results are as presented in Table 4.7. It shows that the correlations between functional diversity, hierarchical diversity, thread duration, thread length, and number of participants (commenters) were all positively correlated with ideation quality at the .10 confidence level. Other correlations were highly significant. Thread length (number of comments) and number of commenters was almost perfectly correlated. Hence, H1, H3, H4 and H5 were supported, but H2 was not supported.

Figure 4.4: Visual correlations between study variables and ideation quality

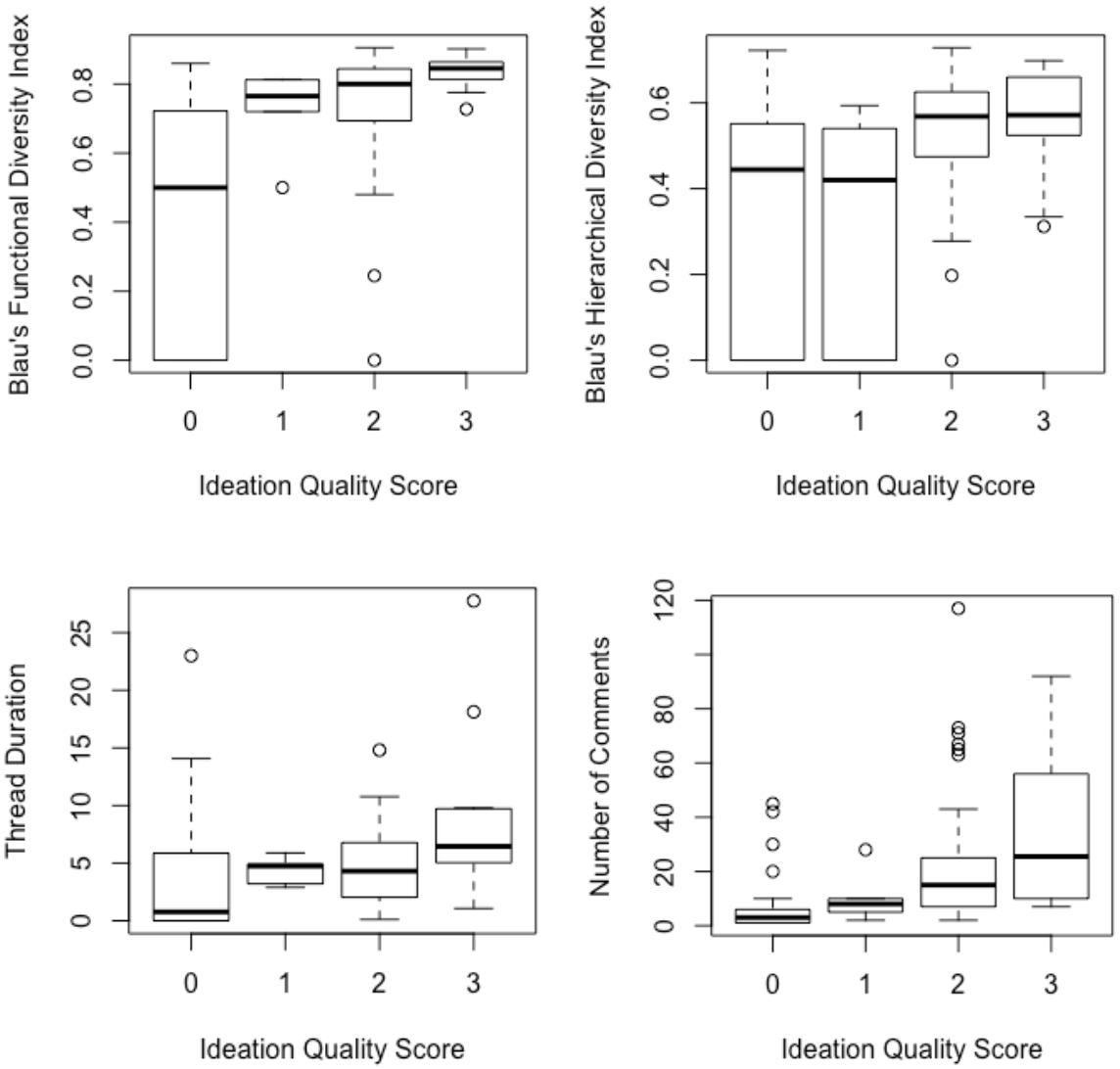


Table 4.7: Means, Standard Deviations, and Correlations Among Study Variables

Variable	Mean	S.D.	2	3	5	7	9
1. Ideation quality score	1.49	1.06	.60*	.45*	.61*	.43*	.60*
2. Functional diversity	.67	.26	--	.58***	.85***	.54***	.88***
3. Hierarchical diversity	.47	.21	--	--	.53***	.31***	.56***
4. Thread length	18.41	22.14	--	--	--	--	--
5. Log(Thread length)	2.27	1.20	--	--	--	.64***	.99***
6. Thread duration	4.86	4.74	--	--	--	--	--
7. Log(1+Thread duration)	1.46	.84	--	--	--	--	.61***
8. Commenter count	13.85	14.67	--	--	--	--	--
9. Log(Commenter count)	2.10	1.10	--	--	--	--	--

*p <.10; **p <.05; ***p <.01; Polyserial not using ML

4.6. Ordinal logistic regression analysis

Regression analysis is performed to predict the value of the dependent variable given the values of one or more predictor variables. In this study, as the dependent variable in this study was a 4-level ordinal variable of ideation quality, an ordinal logistic regression was performed (McCullagh, 1980). The regression predicts the odds ratio that the dependent variable will change one level, when the predictor variable increases by one unit, while other variables remained constant.

The initial model tested was for ideation quality to be predicted by hierarchical diversity, functional diversity, thread duration, thread length (number of comments), number of commenters, nonwork topic of discussion, and presence of facilitator. The results are as in Table 4.8. The results show that functional diversity and thread length were the two significant predictors of ideation quality at the 0.05 level. The results show that for a 1 unit increase in functional diversity, there was a 85-times greater odds that ideation quality will improve by one level, such as from a score of 1 to 2, or 2 to 3, while

other variables are untouched. In other words, as more participants from different departments join in the ideation discussion thread, there is bigger chance for ideation quality to improve. These numbers however are not additive. Compare this to the odds of when more participants from different job positions join in the discussion, the results suggest that the chance for ideation quality to improve is only about 5 times greater, although the quality will still improve. Meanwhile, the results also suggest that with just 1 additional comment, or 1 additional day of discussion, there is just a 8% and 2% chance respectively that ideation quality will improve up a notch. Nonetheless, the same results suggest that an additional commenter has a slight chance of reducing ideation quality, if other variables remain constant. Quite surprisingly, the odds of having a facilitator in the discussion thread who will improve ideation quality, is less than not having any facilitator, but only so slightly. Similarly, work topic is said to have just a slightly better chance of producing higher ideation quality than nonwork topics. All these other odds however were not of sufficient statistical significance. In short, the results suggest that ideation quality is very likely to be increased if more participants with diverse knowledge and work backgrounds participate, or if participants contribute more comments to the discussion, which is rather unsurprising.

Table 4.8: Ordinal logistic regression analysis, initial model (n=101)

Predictor	**B**	**S.E.**	**t**	**p**	**OR**
Hierarchical diversity	1.58	1.28	1.24	0.21	4.87
Functional diversity	4.44	1.53	2.90	0.00	84.68
Thread duration	0.02	0.06	0.34	0.74	1.02
Thread length	0.08	0.04	1.96	0.05	1.08
Number of commenters	–0.09	0.06	–1.54	0.12	0.92
Nonwork topic	–0.41	0.50	–0.82	0.42	0.67
Presence of facilitator	–0.52	0.66	–0.79	0.43	0.59
Model AIC=211.02, Residual deviance=191.02, AICc=212.22					

In order to find the model that best predicts the dependent variable, the regression analysis were repeated several times while removing and adding variables at each step, and assessing the AIC and AICc values, in which a lower value reflects lower information entropy and thus predictive power of the model. R provides a tool called StepAIC that automates the process. The final model chosen had the lowest AICc of 203.92 but the variables that remained were functional diversity, thread length (number of comments), number of commenters, presence of facilitator and an interaction term of thread length and facilitator. Table 4.9 shows the regression results.

Table 4.9: Ordinal logistic regression analysis, final model (n=101)

Predictor	**B**	**S.E.**	**t**	**p**	**OR**
Functional diversity	4.44	1.41	3.16	0.00	84.51
Thread length	0.18	0.07	2.58	0.01	1.20
Number of commenters	–0.16	0.08	–2.10	0.04	0.85
Presence of facilitator	1.42	1.02	1.40	0.16	4.14
Thread length x Presence of facilitator	–0.08	0.04	–2.20	0.03	0.92
Model AIC=203.92, Residual deviance=187.92, AICc=204.55					

The results show that all predictors were significant at the 0.05 level, except for the facilitator presence. In this model, for a 1 unit increase in functional diversity, there was the same odds (84.5 times) that ideation quality will improve by one level, while other variables are constant. The results also suggest that with just 1 additional comment, there is an improved 20% chance that ideation quality will improve up a notch. However, one additional commenter will have a slight chance of reducing the ideation quality, as was with the interacting variable. Interestingly, the presence of a facilitator has a 4 time greater odds of improving ideation quality, although it was not significant at the 0.1 level. It needs to be reminded that these numbers are however not additive. In other words, 2

additional comments (instead of 1) cannot be said to double the 20% odds of improving ideation quality by one level. While the final model made use of only four predictor variables, none except two of the predictor variables in the original model was significant. As such, this model is considered more useful in predicting the ideation quality, and thus helps to answer the question of what factors contribute to ideation quality.

To recap, this chapter presented the results of the quantitative analysis of the comments dataset, bivariate correlations, and regression analyses. The results were used to test the previously established hypotheses. Polyserial correlations showed that functional diversity, hierarchical diversity, thread duration, thread length, and number of commenters all had positive relationships with ideation quality. Hence, H1 (functional diversity), H3 (thread duration), H4 (thread length) and H5 (number of commenters) were supported, but H2 (hierarchical diversity) was not. Ordinal logistic regression showed that functional diversity, thread length, and number of commenters were the important predictors of ideation quality, as other predictor variables were not significant and had low odds of improving ideation quality. Additionally, the presence of facilitator and thread length together was found to significantly influence ideation quality.

CHAPTER FIVE: FINDINGS FROM QUALITATIVE ANALYSIS

This chapter presents the findings from the qualitative analysis from both the comments data in the ESM server log file and the interviews. The findings intend to answer the two research questions developed in an earlier chapter, namely, to identify the enabling conditions for large-scale online ideation as compared to small group brainstorming, and to identify the ESM affordances for ideation.

5.1. Findings on the enabling conditions for large-scale online ideation

The study found three main themes to answer the first research question on the enabling conditions for large-scale online ideation. They were non-handpicked participation, longer or rolling deadlines, and emergent facilitation. Together, these conditions help ensure large-scale online ideation could take place, distinguishing it from small group brainstorming.

5.1.1. Non-handpicked participation

First, this study found that in instances in which large-scale online ideation occurred, the participants were not handpicked or predetermined. This opening of participation to all, enabled more employees to be involved, or at least to be aware of the problem that needed ideas, even if it was only concerned with a small part of the organizational population. This is different than traditional brainstorming in which particular individuals were identified and chosen to be in the group. In large-scale online ideation, anyone who was willing to contribute could share ideas towards resolving the problem and/or join in the discussion and argumentation. There wasn't even a condition set on the capability of employees in order to participate, such as having knowledge of the subject matter, which instead is a typical condition for small group brainstorming. In

fact, as shown in Tables 4.1 and 4.2 in the previous chapter, ideation participants came from diverse hierarchical positions and organizational functions.

Willingness to participate and share ideas was driven by the motivation to improve things, as mentioned by several interviewees. For example, P2 said, "when I see things that can be improved, I will not hesitate to suggest," or P1 who said, "I comment and give idea because I have something to say about the event, how it was run, … to add to the discussion about how it can be better for next year." Other interviewees said that they self-selected the issues they were interested in, and voluntarily shared ideas based on their familiarity with the subject matter. P1 for example said, "Some problems are a bit too technical for me to comment. And by technical, I mean I need specialized knowledge to be able to comment or give good ideas." Or P5, in response to a question about what triggered him to share ideas, who said, "the problem itself, the nature of the problem, and what other people have said about it." In short, any employee who wanted to contribute ideas and opinions could do so on the ESM without being asked or asking for permission.

In fact, one situation exemplified the scaling-up of the ideation process, when a small brainstorming group decided to open up participation to all employees in order to address a problem that impacted the whole organization. P14, who was involved in the initiative to explore cost-cutting measures for the organization, said that initially her team of six was tasked to brainstorm ways to reduce organizational spending, but then:

> We felt [that] ... we shouldn't be the only ones thinking of ideas to save cost, when everyone in the Company will be impacted. ... One of us suggested to expand the task force ... to get one rep from each department. But we argued that it still won't be good enough, because 40 out of almost 3,000 staff leaves out a lot of people. ... then someone suggested that we should just get all staff to be involved.

In this case, limiting participation to only a few, leaves out many, and starves them of the opportunity to participate in the process and contribute ideas to the organization. So everyone was roped in. P14 continued to explain how the ESM came into the picture:

> We were not sure how [to do it] initially. We thought of sending out an email blast, and then asking people to email back their ideas. But then, we thought surely there will be duplicate ideas if no one knows what others are doing. So we thought of displaying ideas on a website, and that's when someone suggested we use K*net, because it can get people to give their ideas, and display it also. … We talked to the IT department to help us create a page for the contest. … They did that, and away we go! … People then started giving ideas on K*net.

Here, email was initially considered, but its limitation prompted the suggestion for the team to use the ESM. More importantly, this case demonstrated the non-predetermined nature of participation in large-scale online ideation, as it was opened to all employees without conditions. This is akin to the concept of "democratized participation" in social media (Campbell et al., 2014; Klang & Nolin, 2011) in which anyone could voice their opinions, but the focus here was not so much on the population having the power, but more on the problem owner who did not need to find people to give ideas. As P9 who managed the Koperasi said:

> Most members choose to come to the office to talk to us. They can directly ask questions and get answers immediately. With K*net, it's another channel to reach us, and many choose to talk to us that way. … And [they shared] ideas not just on the timing of advertisements, but on the kinds of products and services we should bring next time [for the sales event]. … I told them I would take the ideas into consideration for future sales events.

Other issues that concerned the whole organization included the revised career progression policy (T15658133) issued by the human resource (HR) department, or the company's annual dinner (T16308485), and the implementation of a new visitor management procedure (T14949397). This kind of issues, when raised, naturally attracted the attention of the majority of the organization, as it affected all of them.

However, there were several issues in the study that were specifically concerned with only a small segment of the organizational population, such as the date change for a bowling tournament (T15841810) and the Koperasi's special withdrawal scheme (T16059639). Through ESM, these issues became widely known to other ESM users in the organization, namely those who did not bowl or those who were not a member of the Koperasi, as evidenced by the following comments: "I'm not a member of the Persatuan, but from what I heard, the original date conflicted with another event. But Persatuan should have been more transparent about it," (C11850) and "This is a good move by the Koperasi to allow special cash withdrawal for Eid. I wish I could benefit, but I'm not a member," (C12196). In other words, the non-handpicking of participants freed up more people to be involved in the ideation process.

Interestingly, there was not an issue with regard to managing the large number of participants, which is known to be a challenge in face-to-face settings, as CMC has alleviated much of the physical coordination issue. Furthermore, the large-scale ideation process was made more manageable by scoping down the topic for ideation, as was done with the cost-cutting project or the sales events of the Koperasi, which helped to narrow the focus and create clearer boundaries for problem-solving. Consequently, this played a part in making the ideation process more successful, as with the cost-cutting project that saw almost 50 ideas being contributed, or the Koperasi that accepted the idea to change the timing of its advertising.

In sum, large-scale online ideation was enabled when participants were not handpicked by problem owners like brainstorming groups, but allowed to participate on their own volition. This is especially important in ideation projects that impacted a large

part of, or even the whole organization, where limiting participation would rob employees of the opportunity to take part in organizational-level process and decision-making that would ultimately impact themselves.

5.1.2. Longer or rolling deadlines

Second, this study found that in the large-scale online ideation cases, there was a longer deadline set for ideas to come in, relative to small group brainstorming. This time limit was in terms of days or weeks, as compared to small group brainstorming which deadline is usually limited to a few hours. One evidence is the cost-cutting project that had three months to deliver its proposals to management, and so the team gave employees one month to share ideas on the ESM because they were already a few weeks into the project. One reason why the deadline was longer is the asynchronicity of the ESM. Unlike face-to-face or instant messaging, in which users expect an almost immediate response (Gibbs et al., 2015), the ESM were not used continuously by individuals and the interactions were not in real-time. P2 for example, said he used the ESM five or more times a day, while P12 said after the first session of using the ESM in the morning, he came back on only later in the day. Due to this non-continuous, intermittent usage of the ESM, the conversations within which were also slow to develop, even when aggregated across individuals. As a result, it was more practical for problem owners to set a longer deadline for ideation on the ESM than they would otherwise set for small brainstorming groups.

That said, there was a case in which there was seemingly no set deadline for receiving ideas, but that ideas were "welcomed anytime." As the Koperasi manager (P9) said:

> No, there is no deadline. Whenever anyone has an idea on how to improve what the Co-op does, they can give it to us anytime. For the sales promotion for example, [it is done] quite regularly, at least once or twice a month, … So when there are problems, we welcome suggestions anytime, so that we can improve them in the next round. … And yes, [members] did give ideas on K*net afterwards [after the sales event]. … And I told them I would take the ideas into consideration for future sales events.

Despite claiming to have no deadline, the situation as explained showed that the activities were ongoing, so it did not make sense to have a fixed deadline, because ideas received in one cycle was considered for implementation in a future cycle. Effectively, this made it a rolling deadline. After all, ideas can come anytime, and not forcing participants to give ideas on the spot like in small group brainstorming but giving ideation some time, enables more participants to be involved and more ideas to come in.

In sum, longer deadlines -- that spanned days or weeks, compared to hours in typical brainstorming groups -- were important for ideation because it enabled large-scale ideation to occur. This is not by choice but by design, because the asynchronicity of the ESM made conversations develop more slowly, which made setting a brief deadline for ideation on the ESM impractical.

5.1.3. Emergent facilitation

Third, this study found that in many cases of large-scale online ideation that progressed beyond the idea generation stage, there was usually someone who assumed the role of a facilitator, who tried to encourage participants to share ideas and/or discuss them, or moderate the negative comments from derailing the discussion. Interestingly, some of these facilitators were not someone who was formally assigned to the role, but emergent from the participants involved. This is different than in brainstorming groups in which the facilitator role is formally assigned to someone who is usually an independent

party. For example, P4 emerged as a facilitator to encourage more people to share ideas about the places to visit for a trip that the Puspanita was planning:

> There was a trip being organized to go somewhere, like Johor or Korea, and I saw people asking about places to visit. Some shared about what places to go and what places to skip. … I joined [the conversation] to ask for the reasons. I also asked others for more ideas. And then I brought them up to the organizing committee as a member, and they liked it. … But I think the ideas are … not really proper ideas. It's like, … fleeting, one liners. You have to follow up to get the details, and then you can get a clearer picture of the idea.

The facilitator emerged because of an interest to get the details in the subject matter, and because the ideas were originally not well formed. Meanwhile for P2, the facilitator role was assumed because he was in charge of communication for the Persatuan, but it was still emergent because he did not initiate the process:

> In Persatuan, I'm in charge of communication, so whenever we put up something and people comment [on the emergent issues], I compiled them for our committee meeting to discuss what to do with them. Some comments of course are just for the sake of commenting, so I ignored them. But for others, if I see there [can be] a potential improvement that can be done based on the suggestion, I go in to ask for details, and then I will take it up [to the committee] for consideration.

Similarly for P14, who was part of the cost-cutting project team, was tasked to oversee the ideation process, but to come in only when necessary to prompt participation from employees:

> [Team members] were expected to join in the conversation and prompt whenever we see that things are not moving, or rather that ideas are not getting a fair amount of discussion. I mean, it's on us to get ideas to present to management. So, when we saw any good ideas, we challenged them, asked questions -- What about this and that? Will that work? and such. … We got a lot of people to contribute, about 50 good ideas altogether.

In short, the facilitators emerged for various motivations -- interested, invested, and assigned -- but they had the same goal of encouraging ideas to be developed, and in doing so, helped to get more people involved.

Facilitators also emerged to moderate the negative comments from derailing the discussion. P4 reported her experience in trying to diffuse an argument from “religious” people about an idea to organize a singing competition:

> There was a singing competition being organized, and people were discussing ideas for it. … That was a social kind of event, so in the comments you saw several people becoming "ustazah" (religious gurus) saying things like we shouldn't be courting disaster from God because the event is distracting from worship. So I went in to say that other people may have different views, and we should respect the views of others. … [I did it because] I don't want the so-called "conflict" to continue. There are so many keyboard warriors in the Company, and they can be very spirited.

Although the facilitator in this case did not encourage idea contribution or discussion per se, the intervention helped to stop the ideation process from being derailed, while remaining neutral. Similarly, P5 also used to intervene in the ESM to “urge [participants] to be rational and sensible, to actually mind their language. … [and] mind the sensitivities.” P3 also intervened as a neutral party to try to correct the misperceptions perpetuated by some people, when she said:

> They commented about HR is this and that, but we don't really know the goings-on in HR. So we need to correct that. We can't agree with things that we don't know. … In my opinion, we have to get the facts first, we can't just criticize freely. … I do this based on my experience. You know HR is busy, and whenever I deal with them, I would call them up and discuss. So I understand better about HR things. These people on K*net comment without checking with HR.

The facilitator that emerged in this case was driven by her sense of responsibility to correct a situation based on her own experience in dealing with the HR department. In short, facilitation is not just about encouraging more ideas to be shared and more people to join in the discussion, but also to discourage turns that could otherwise inhibit the ideation process from progressing.

In sum, large-scale online ideation was enabled by the active role played by the facilitator to get more people involved and to keep the process running healthily. While facilitators could be someone formally assigned to take up the role, such as in some of the cases above and in brainstorming groups, it was also interesting to observe that the role was also assumed informally by some of the involved participants on the ESM. These individuals were interested and invested in achieving a greater outcome for the ideation process -- but more importantly, they were not the problem owners.

Hence, with respect to the first research question, the above findings showed that non-handpicked participation, longer or rolling deadlines, and emergent facilitation were the important conditions needed to enable large-scale online ideation, as compared to small group brainstorming. Without these conditions, it was difficult for the problem owners to scale up the ideation process to involve a larger number of participants to share and discuss the ideas, despite the technology. That said, technology -- and in this case, the ESM -- did play an important role in this, and so the second research question intends to identify the affordances of ESM for ideation.

5.2. Findings on the affordances of ESM for ideation

The study found three new affordances of ESM for ideation, namely virality, informality, and asynchronicity. The ESM affordances supported the various phases of ideation, namely problem identification, idea sharing, idea development, and idea evaluation.

5.2.1. Virality

Evidence from the interviews showed that users felt that the ESM enabled them to create a wider awareness of their issues than they could with other platforms. This was

tied to a number of observations about how large-scale online ideation was performed on the ESM. First, the ESM enabled a large number of participants to openly and visibly share their diverse views in the ideation process, and especially so when the problem impacted a sizeable part of the organization. As P1 explained:

> If the issue concerns the whole organization as a whole, or a large part of it, then using K*net to brainstorm ideas makes sense, because then you get lots of inputs from various people. You get multiple angles on the issue. … So K*net is a good platform to discuss or see if the ideas are good or not. People have various points of views.

Second, ESM enabled idea contributors to be visible to a lot of people, which if the contribution was written carefully, could result in a better reputation, and thus an advantage in the workplace (DiMicco et al., 2008), as P2 said:

> When you share ideas in K*net, at the back of your mind, you know the whole Company is looking at it. So you will be motivated to be smarter in commenting, not just by saying simple things, but you want to be strategic in putting your ideas forward. …You want to improve things. So K*net being a place that you can share openly is a great advantage because it also gives you visibility offline and online.

These two quotes allude to the visibility affordance of ESM (Treem & Leonardi, 2012) but the focus of the latter quote is on the contributor rather than on the content in the ESM. P4 shared the same sentiment about the visibility of ESM when she said, "K*net has a large audience. If we give ideas there, many people can see it [because] everyone has it on their PCs." What these quotes suggest is that ESM may also exhibit a different affordance for large-scale online ideation, namely that of virality, in which the technology lets users to widely disseminate and promote their issues and ideas to a large audience. As P9 said:

> K*net is just the right platform for us to easily reach out to the members. We can broadcast about our sales activities, our notices for meetings, changes to loan rules, and so forth. They can also easily reply to provide feedback. Of course, it is

> also as easy to criticize us, and we receive that a lot, but we focus on the suggestions they give to improve the Co-op instead.

In other words, the ESM's virality allowed problem owners to reach participants more easily and quickly, but unlike traditional broadcast media, the audience could immediately provide in-context feedback, including ideas and complaints.

That said, it may be argued that email as a CMC also shares the same affordance of virality as ESM. While true by design, evidence from this study shows that for large-scale ideation, email is not suitable because of organizational norms, in that it was not acceptable for employees to exchange emails with everyone when sharing and discussing ideas, unlike on the ESM. As P14 said,

> We thought of sending out an email blast, and then asking people to email back their ideas. ... At the same time, we don't want staff to send emails to everybody. It would be a mess, and [the IT department] won't allow that. Maybe emails can work for the [few in the] task force, but not when it involves all staff.

It was the same with P2 who said emailing and cc-ing everyone about ideas "will screw up your life in the Company," alluding to the unacceptability of the practice.

In short, the virality affordance of ESM enabled problem owners to reach out widely to potential participants. With the same affordance, participants were also creating greater awareness to others about their contribution. Together, the affordance made the ideation process visible to everyone. This increased degree of transparency had some unintended outcome, by creating some pressure on the problem owners to act, as P9 confessed:

> When there are complaints about Co-op on K*net, they actually are seen by many people, including the bosses. Especially when there is a lot of talk about it. It creates pressure or a sense of urgency on me to respond. Several times, one of the Board members … asked me what I was going to do about the comments. … [He] also suggested that I respond to the comment on K*net to at least show that [the

> Co-op was] listening. So I did that, even if it was to say that we will look into the problem.

In other words, the virality of ESM have the potential to progress the ideation process by prompting action from outside the system, which also reflected the extent to which the ESM were integrated in the organizational environment.

Overall, virality is an important affordance in the ideation process because users could use the ESM to establish issues and elevate them to the whole organization to gain wider awareness or attention. While organizational level issues would readily attract the attention of many, relatively smaller or localized issues that would otherwise only be of concern to a small segment of the organizational population, could also be "viralled" to the whole organization, but only if it resonated with other users, perhaps due to a shared experience, or a shared or opposing sentiment about the matter. In turn, this enabled participants to meaningfully start contributing ideas to address the issue. The increased online interactions technically caused the ESM to algorithmically identify the discussion as one of the most active, and indicated it as such on the home page, not unlike how Facebook configures its Top Stories newsfeed. Consequently, this prominence attracted even more attention to it. It was also possible for an issue to spill over into the physical realm as and when the issue was discussed offline in the physical workplace, attracting the attention of other employees in the rest of the organization. As an upper management interviewee (P19) commented, "I rarely read the comments in K*net, but so many people were talking about it in the office, that I had to see for myself what the hoo-ha was all about," when referring to the revised career progression policy announcement (T15658133). Although this was outside the ESM, the virality certainly enabled this to happen. Furthermore, this increased attention online and offline further improved the

chances for the issue to be addressed, even though not all issues raised on the ESM were highlighted or even received a response.

5.2.3. Informality

The study also found that the ESM were used for ideation in ways that did not necessarily follow the formally established structure, rules, and procedures in the organization, including that of conventional brainstorming. In many organizations, there are established rules and procedures to bring attention to issues or problems. There are also certain expectations of formality that accompany such rules, such as writing the issue or suggestion properly, and escalating it to the right person in the correct order. Even conventional brainstorming has certain procedures established for it, including assigning facilitator, selecting participants, and setting deadlines. Evidence from this study showed that practically anyone in the organization could contribute ideas, and as mentioned in the previous section, they were quite diverse in terms of hierarchy and function. Furthermore, there was generally no organizing beforehand such as calling for ideas, selecting participants, and appointing a facilitator, as highlighted earlier. Additionally, several interviewees mentioned that the virtuality of the ESM, as opposed to face-to-face, made them feel they could contribute ideas without much consideration in terms of protocol or formality. For example, P12 said:

> On K*net, I don't have to wait for a meeting to give ideas. I don't have to know whom I'm writing to. I don't have to bother writing formally. I also don't have to think too much about my idea. I just write and click submit.

Technically, the ESM enabled this behavior by allowing users to easily review and respond to the issues by providing a comment box, which is not unlike how public social media sites like Facebook or Twitter provide a prompt for users to quickly reply to a post

or comment. In other words, contributing ideas was relatively easily done on the ESM. This was echoed by P4 who said that ideas were sometimes "fleeting, one liners" and not elaborately written. Some examples were the following ideas: "Start it on the first day of school holidays," (C10801) when discussing the book sale timing issue; "Publish the names of the top eight bowlers," (C10307) when discussing the issue of player selection to a bowling tournament; or "Have one in the regional office," (C11834) in response to an issue about the Koperasi promotional activities being held only in the head office. However, these terse comments were well understood given the context of the thread within which they appeared, and were enough for others to start discussing them as well. More importantly, all these evidence suggested that there was a large degree of informality when the ESM were used for ideation.

Additionally, when using the ESM for ideation, it did not matter that the participants did not know who the problem owner was. For them, posting on the ESM was sufficient, and the expectations was for the relevant problem owner to also use the ESM and read the discussion about the issue and the ideas. As P12 said, "It's not difficult. When you post the article, you are responsible for it. You're responsible for reading the comments, and discovering the issues, and getting the ideas." This was echoed by P5 who said, "The problem owner should take accountability and responsibility to read the feedback, and consider those feedback for whatever future things they do." In other words, these quotes suggested that the ESM allowed employees to bypass the traditional organizational communication protocol, of going through the proper channels and following formal reporting procedures in order to bring a problem and related ideas to attention. It also meant that the contributors did not care that the ideas

were unsolicited. For them, it was the responsibility of the problem owner to deal with it. That said, if the problem owner was known or familiar to the complainant, it was better to contact them direct, because it had a better chance of getting a response. As P2 explained:

> If you knew the supervisor, better for you to directly email or call [that person]. For the cafe case for example, I emailed the supervisor direct, because I knew who was in charge. I won't post it on K*net. Although there are lots of comments about the cafe problems in K*net, I think the best is to tell them direct. … After a week, the cafe management called me. They tracked me and asked what happened. So I related my experience, my sour experience.

In this case, email was used instead of the ESM, but it was because the problem owner was known. In general, it was just easier to use the ESM to highlight an issue and share ideas and solutions due to the virality affordance. This was echoed by P9:

> I think K*net is easy enough already for people to give ideas. I think what is more important is for some sort of control, so that people don't just complain but also give ideas. … Make it more civil, instead of just complaining to no end.

In other words, the informality of the ESM is a double-edged sword; it allows not just for ideas to be shared easily, but also the problems, with the problems seemingly more forthcoming than the ideas.

In short, the informality affordance alluded to the ability of ESM users to bypass certain formal protocols to highlight issues and send ideas to problem owners. Using the virality and informality affordances of ESM, users can perform ideation without strictly following the rules established in conventional brainstorming. And due to the way ESM is used, especially how users can easily write and broadcast their contribution and comments to a large audience, many of the formal rules and procedures become difficult to enforce. Save for the potential chaos, the resulting informality affects the way ideation is implemented on the ESM. For instance, it may not be necessary to assign a facilitator to oversee the ideation process, but as evidenced in this study as discussed previously, the

role may emerge organically from amongst the participants, but depending on the topic. Additionally, problem owners may directly receive the complaints and ideas from the users without solicitation when they use the ESM, because the technology allows users to transcend traditional boundaries when communicating with the problem owners. Even if the problem owners were not an active ESM user, he or she may eventually know it through "social escalation" of the issue and ideas by others who were ESM users, again as evidenced earlier. Additionally, it did not matter that the problem owners were relatively unknown to a large segment of the organizational population, because they were expected to also use the ESM and thus be aware of the messages directed to them. In short, this informality allowed ESM users to bypass formal organizational hierarchy when communicating, to deliver the messages directly to the problem owners.

5.2.3. Asynchronicity

As identified in an earlier section, the ESM exhibited the asynchronicity affordance because it was not used by the users in real-time. Unlike instant messaging in which usage is typically continuous for a period of time and the response is often real-time, the ESM usage by individuals was intermittent, with responses to comments occurring at an unpredictable rate. P6 for example used the ESM "many times a day" whereas P8 used it "once in the morning and once in the afternoon before [he goes] home." P4 meanwhile reported that after she commented on the ESM, she "would wait for half an hour or so before refreshing [to see if anyone replied]." As a result, conversations on the ESM did not always happen in real-time, and as P14 remarked when she observed a hot topic conversation developing, "It's almost like watching a drama, but in slow motion." As to the possible reason why the ESM usage was as such, P4 said,

"With K*net, people don't comment much, [because] perhaps they don't have time and have work to do. Some people open it once in the morning and that's it." In other words, while the ESM was ubiquitous and regularly accessed, its use in the organization was constrained by work, so conversations on the ESM developed more slowly.

For ideation, however, the asynchronicity of ESM and the unhurried pace of turn-taking in conversations meant that there was time in between comments. Compared to small group brainstorming, this slow turn-taking became a benefit for ideation, namely to improve the ideas, as P1 explained:

> In [face-to-face] meetings, … usually you have to say it out first whatever you're thinking. Here [on K*net], you can kind of wait and see how things go, how ideas develop. … But I wouldn't say [if I waited,] my idea or opinion would be better than others, but it will be a more informed one.

In effect, the ESM's asynchronicity had resulted in ideas having a protracted gestation or discussion period, which translated into the ideas having a potentially higher quality. P2 however disagreed with this approach of waiting before contributing, and argued that the resulting idea would not be original enough, or the idea would even be abandoned:

> A lot of people say let's wait and see how it evolves, how it developed… But then you're influenced, it's not natural, not original. What comes first to your mind is probably the best, but write it properly. If you wait, you'll start to change your perspective…. If you see 10 other comments that are totally opposite to what you're thinking, you will either abandon giving the idea, or try to change it. … So that is why I don't wait.

Ultimately, it did not matter whether an idea was the first to be shared, or that it was not the original, because as long as the conversation progressed past the idea generation phase, the quality of the ideation process would be improved.

In short, the asynchronicity affordance allowed users to slow down the online conversations. For ideation, this meant that participants had more time with the ideas,

either as the original contributor who interacted with others in order to improve the ideas, or as the informed contributor who waited to observe and improve their own ideas. Either way, this affordance helped to progress the ideation process on the ESM past the idea generation phase.

In the subsequent phase of ideation, given the freedom to participate in the ideation process on the ESM, studies have shown that there could be numerous ideas shared by the users that made processing them a difficult task (Bjelland & Wood, 2008; Di Gangi & Wasko, 2009). There are however several ways of dealing with this issue. In the IBM case for example, the large number of contributed ideas was taken offline for a committee discussion before they arrived at a few thematic suggestions about the areas of focus (Bjelland & Wood, 2008). Meanwhile, public social media, certain discussion-based websites like Reddit, and some ESM come with a feature to "like" a post or comment. This feature may be used as an indicator of preference, or collectively for voting. In effect, this can be used as a social filter for ideas, like crowdsourcing, so that only interesting or quality ones rise up in prominence and visibility, and have a better chance to be discussed and evaluated, while the rest become less visible. The ESM in this study however did not have that feature, although it was a frequently mentioned request, such as "I want to like that idea, but there's no button" (C11819) or "Where is the like button?" (C10616) or P14 who said:

> There wasn't a way to vote for the best ideas. Also, if you let people choose, it can be the best, but it can also go the opposite way, depending on the popularity or sensitivity of the topic. So, that's why the task force took over that job of choosing the best ideas.

In other words, the voting feature while may be useful to help surface ideas, it can also produce the opposite result, depending on the sentiment or popularity of the issue. That

notwithstanding, ideas that have been collectively surfaced to prominence can then be discussed by more people. Here, the asynchronicity of ESM helps to protract the discussion period for ideas, during which more thought and discussion can be put into the ideas, which may or may not result in the ideas being improved.

To complete the discussion, in the last phase of ideation, after ideas have been generated and discussed, action needs to be taken on the idea, whether to accept, reject, and keep it view. Acceptance in this context does not necessarily mean implementation, but also if it is brought up for consideration at the management level. The responsibility for taking such decision lies with the problem owners. Using the virality, visibility, and persistence affordances of ESM, users can persuade problem owners to take some kind of action. As evidenced in this study, this happened to the Koperasi manager who was pressured to act on the complaints and related suggestions being posted on the ESM, even if it meant replying to say that the suggestions were being taken into consideration. While the ESM in this study did not have a flag for accepted ideas unlike the study by Gibbs et al. (2013), the comments in the log data did provide some indication of status. This was in the form of in-context explicit statements like “Thank you for the suggestion. We will update it accordingly” (C10839) for ideas accepted and implemented, or "HCDC (the training center) will consider your ideas in our planning of future KBO Book Sales” (C10826) for ideas accepted but not implemented, or “Popular Bookstore is not participating in this Book Sale, thank you” (C10836) for a rejected idea in response to a suggestion to include a particular bookstore in the promotion.

In sum, the new affordances of ESM for ideation, namely virality, informality, and asynchronicity, helped ESM users to perform ideational activities differently across

ideation phases than in conventional brainstorming. Specifically, in the problem identification phase, users could viral their small group issues to the enterprise level for wider attention. In the idea generation phase, users could bypass certain protocols to reach problem owners. In the idea evaluation phase, users could socially surface up good ideas for discussion. Finally in the idea deliberation phase, users could collectively persuade problem owners to take action. Table 6.2 summarizes how each ESM affordance contributes to the ideation process across its phases.

Table 6.2: New affordances of ESM for large-scale online ideation

Ideation Phase	**Action**	**Affordance**
1. Problem Identification	Viral the issue: Highlight small group or localized issues to the whole organization	Virality
2. Idea Generation	Bypass the protocol: Easily contribute ideas directly and indirectly to the problem owner, without necessarily conforming to established rules	Informality
3. Idea Development	Collectively surface good ideas: Flag ideas that are worth discussing, and collectively develop them over time.	Asynchronicity
4. Idea Evaluation	Persuade the problem owner: Increase attention on certain issues and ideas to pressure problem owners to respond or take action	Virality

Hence, with respect to the second research question, three new affordances of ESM were found to support ideation, namely virality, informality, and asynchronicity. Summarily, virality describes the ability of ESM users to widely and quickly disseminate and promote their information to a large audience, such as the whole organization. Informality describes the way ESM users interact without necessarily following formally established organizational structure, rules, and procedures. Asynchronicity describes the non-real-time nature of user interaction on the ESM that allowed more time for ideas to

be developed. While some of these affordances could also be described for other CMC, ESM had the practical advantage in enabling users to undertake ideation throughout all its phases.

To recap, this chapter aimed to answer the two research questions in this study, namely to identify the enabling conditions for large-scale online ideation, and the unique affordances of ESM for ideation. This study found that three conditions enabled large-scale online ideation, namely non-handpicked participation, longer or rolling deadlines, and emergent facilitation. Without any of these conditions, large-scale online ideation would be difficult to accomplish and be no different than small group brainstorming, especially from the perspective of problem owners. While CMC expectedly also played a role in enabling large-scale online ideation, this study found that ESM in particular had three new affordances that made it better suited for ideation compared to other CMC. Specifically, the affordances were virality, informality, and asynchronicity. These two research findings, taken together with the results from the quantitative analysis from the previous chapter, have implications for theory and practice.

CHAPTER SIX: DISCUSSION

The objectives of this study were to identify the enabling conditions for large-scale online ideation and the affordances of ESM for ideation. This study also intended to find out the factors that influenced the quality of the ideation process. This study used collective action theory as a theoretical foundation, but updated to explain how individuals appropriate CMC to create communal goods and share personalized experiences, in order to connect and organize themselves to take action collectively. The study also used brainstorming theory to understand how ideation works, but updated to explain how CMC enabled participants to interact differently online, making certain problems less concerning, while enabling ideation to be scaled up. The study also examined ESM, as a recent CMC, through the affordance lens, to understand how users appropriate the technology to perform large-scale online ideation. Lastly, the study looked at ideation quality as a measure of process outcome, and explored the factors that could influence the measure. Together these form the theoretical framework to investigate the phenomenon of large-scale online ideation. To that end, the study used a mixed-methods, single organization, case study approach that took advantage of access to the organization's ESM server log, in order to delve inside the organization unobtrusively, to understand how employees used the ESM for ideation. The study also used in-depth interviews for the same purpose. Both quantitative and qualitative analyses were performed on the data in order to answer the two research questions and test the five hypotheses, as restated below in Table 6.1.

Table 6.1: Summary of research questions and hypotheses

RQ1	What are the enabling conditions for large-scale online ideation?
RQ2	What are the affordances of ESM for large-scale ideation?
H1	The level of functional diversity of the participants in the ideation thread is positively correlated with ideation quality.
H2	The level of hierarchical diversity of the participants in the ideation thread is negatively correlated with ideation quality.
H3	The duration of the ideation discussion thread is positively correlated with ideation quality.
H4	The number of comments in the ideation thread is positively correlated with ideation quality.
H5	The number of participants in the ideation thread is positively correlated with ideation quality.

6.1. Summary of main results and findings

Analysis of the comments dataset showed that the participation rate in the ESM was 52.6% historically and 44.2% most recently. As all employees had access to the ESM, this suggested that around half of employees were lurkers or non-active users. Nonetheless, the distribution of ESM users by hierarchical and functional groupings was generally consistent with their proportion in the organizational population, suggesting the validity of studying this ESM as an enterprise-wide tool.

As the ideation quality dependent variable was a 4-level ordinal variable, and the independent variables of functional diversity, hierarchical diversity, thread duration, thread length, and commenter count were all continuous interval variables that did not satisfy the assumptions of the more typical correlation tests, polyserial correlation tests were performed. Results showed that functional diversity, hierarchical diversity, thread duration, thread length, and number of commenters all had positive and significant relationships with ideation quality. Hence, H1 (functional diversity), H3 (thread

duration), H4 (thread length), and H5 (number of commenters) were supported, but H2 (hierarchical diversity) was not supported. Lastly, results from the ordinal logistic regression showed that functional diversity, thread length, and number of commenters, were the important predictors of ideation quality, as other predictor variables were not significant and had low odds of improving ideation quality. Additionally, the presence of facilitator and thread length together was found to significantly influence ideation quality. Multiple iterations of the regression model that added and removed predictor variables confirmed this model as the highest ranked one.

Meanwhile, the qualitative analysis of the comments dataset and the 20 interviews found that three conditions enabled large-scale online ideation, namely non-handpicked participation, longer or rolling deadlines, and emergent facilitation. Without any of these conditions, large-scale online ideation would be difficult to accomplish and be no different than small group brainstorming, especially from the perspective of problem owners. While CMC expectedly also played a role in enabling large-scale online ideation, this study found that ESM in particular had three affordances that made it better suited for ideation compared to other CMC. Specifically, the affordances were virality, informality, and asynchronicity.

6.2. Theoretical implications

6.2.1. Ideation and brainstorming

This study adds to the ideation and brainstorming literature in several ways. First, this study demonstrates that ideation need not be limited to small groups in order for it to work, in contrast to Valacich et al. (1992) who suggested that ideation is most productive with small groups. While it may not be as proportionately productive -- in other words,

the number of ideas generated does not necessarily correspond to the larger number of participants involved -- the intent of the ideation process, which is to generate and develop ideas to solve a given or known problem, is not defeated. The fact is that free riders (Olson, 1965), lurkers (Muller, 2012), or non-contributing participants are only to be expected in activities that involve a large group, or activities done in a computer-mediated environment, due to the freedom of choice to participate as well as inefficiencies in monitoring and ensuring participation. Even if participation was made compulsory, with penalties for non-participation, that is a counter-productive effort, because quality will suffer and the challenge then goes back to identifying "good" ideas from among those generated. Similarly with the concerns about production blocking (Lamm & Trommsdorff, 1973) and evaluation apprehension (Diehl & Stroebe, 1987), which are said to reduce the potential for contributing ideas, these are traceable to research that focused solely on ideation productivity, hence the obsession with idea quantity. This study on the contrary, adds to the research balance by focusing not on the quantity of ideas produced, but on the quality of the ideation process. Nonetheless, identifying and evaluating the quality of the ideation process remained a problem. This study has attempted to address this problem by operationalizing ideation quality as a four-level measure comprising dichotomous variables of whether the ideas were discussed, voted, and acted upon. This study also tested several independent variables to see if they influenced ideation quality, and found that the functional and hierarchical diversity of participants, thread duration, thread length, and number of commenters all had significant positive correlations. This suggests that the characteristics of participants as a group, and the extent of the ideational conversations, both have a role to play in

influencing ideation quality. In terms of predicting the outcome, the ordinal logistic regression's final model showed that functional diversity, thread length, number of commenters, as well as threads that had facilitators were significant predictors in their own right, each having a good chance in improving ideation quality, especially for functional diversity. This finding about the model has several implications.

First, the model suggests the importance of having a diverse group of participants involved in the ideation process, particularly in terms of functional backgrounds, in improving the ideation quality. Indeed, the second way this study contributes to the ideation and brainstorming literature is by confirming that participant diversity is important for ideation, but adds that functional diversity is relatively more important as a predictor than hierarchical diversity in improving ideation quality. It has been established that diverse knowledge backgrounds contribute to more creative and quality ideas (Perry-Smith, 2006; Zhou et al. 2009). Arguably, functionally heterogeneous groups may be tougher to convince and achieve concurrence due to their different knowledge backgrounds, but participants in such a group interact more -- such as by asking more questions to clarify ideas, or to challenge the ideas -- thus adding to the improved understanding and validity about the contributed ideas. On the contrary, hierarchical differences are said to inhibit participation in heterogeneous groups especially if management is involved, due to evaluation apprehension, feeling of inferiority, or respect for authority (Diehl & Stroebe, 1987; Lamm & Trommsdorff, 1973), which can lead to groupthink (Janis, 1972). This study however did not find support for this argument because the positive correlation between hierarchical diversity and ideation quality suggests the opposite. That said, the Blau diversity variable in this study did not

differentiate the distance between groups -- for example, support staff (level 1) and top management (level 5) is 4 levels apart -- but merely that they are from different groups. In hindsight, there could have been a dichotomous variable for "top management involved" so that the hypothesis that in threads where top management is involved, ideation quality is lower, could be tested.

Second, the model suggests that ideation quality is likely to be improved when the participants are actively engaged in the online conversations and especially when a facilitator emerges from the group to steer the discussion towards helping decisions being made about the ideas. In fact, this is the third way this study contributes to the ideation and brainstorming literature, which is by affirming the importance of the facilitator's role in the ideation process, and extending it to large-scale online ideation. Brainstorming literature has established the need for a facilitator to manage the flow of discussion in the ideation process, so that ideas are free to be generated without criticisms that would otherwise curtail contribution (Osborn, 1963). But when the ideation process is scaled up to the whole organization, it creates a physical limit as to what the facilitator can do to manage participants, resulting in the drop in ideation productivity (Valacich et al., 1992), and the rise in free riders (Olson, 1965). With CMC, the physical management constraint is removed, but the issue of free riding ceases to be a concern because it stopped becoming a problem given the little effect free riders have on other participants. As a result, the focus of the facilitator shifts from managing participants to managing their contributions to ensure that the ideation process progresses. For an assigned facilitator, this need to shift in focus is well understood and taken in stride, as evidenced in this study with the case of the facilitator tasked with finding ideas for reducing organizational

spending. However, for cases in which there was no pre-assigned facilitator, this study makes a new contribution to the literature by suggesting that the facilitator role can actually emerge from amongst the existing participants. Some of the motivations found included having an interest in the problem and to see it resolved, and being invested in the outcome due to other related responsibilities that they hold. In those cases, this study found that ideation quality was higher and significant, compared to those without emergent facilitators, due to the level of progress achieved in the ideation process (See Table 4.6). That said, for other cases that did not have a facilitator -- whether assigned or emergent -- the ideation process was quite unpredictable and inconsistent, in that some problems have ideas contributed and discussed, while other problems did not even have any ideas contributed. Moreover, not all ideas were discussed and run completely through the nominal ideation phases, resulting in differing quality outcomes.

That said, a regression model is only as good as its predictors, and there could be other variables that may influence and predict an improvement in ideation quality, besides participant diversities and discussion thread characteristics, although as mentioned earlier, quality is not as easy as quantity to measure. This study attempted to measure the quality of the outcome of the ideation process by quantifying the presence of components, or completeness, of the ideation process. This is not too different than the industrial standard for process quality such as ISO 9000 in which seven quality principles are prescribed, that if met, shall make the process eligible to be certified for quality assurance. It is therefore not important to rename this study's dependent variable as "ideation process completeness" when quality is defined as meeting a set criteria. Nonetheless, the ideation quality variable in this study could be influenced by other

factors, such as the involvement of subject matter experts or senior management members in the discussion which is different than measuring the overall group diversity. It could also be influenced by the intensity of the discussion on a topic which is more complex than thread length, thread duration, and type of topic being discussed. How the technology is set up to enable the ideational discussion could also play a role, such as whether or not there is a formal ideation space. Having these variables in the regression model could improve the predictive power of the model, but it could also worsen it, depending on how the variables are constructed and measured. In short, while the current model may not be perfect, it is a starting point for research in this direction, and needs to be tested by further studies in order to crosscheck and widen its validity in different contexts.

In sum, this study makes a fresh contribution to the ideation and brainstorming literature in three ways. First, this study suggests that ideation need not be limited to small groups in order to be successful, but that CMC, especially ESM, is needed to support the large number of participants, and also that the focus should also be on ideation quality rather than just productivity. Second, this study affirms the importance of participant diversity in the ideation process, but adds that functional diversity and presence of an online facilitator are important factors in achieving higher ideation quality. Third, this study affirms and extends the importance of the facilitator's role in ideation -- whether pre-assigned or emergent -- and especially in large-scale online ideation, to help progress the ideation process and thus increasing its quality.

6.2.2. Affordances of ESM

This study contributes to the ESM literature in two ways: First, by adding to the affordances of ESM but in terms of large-scale online ideation, and second, by creating new understanding of how differently ESM afford users to interact during the various phases of ideation. As ESM is a relatively recent addition to the suite of technologies that comprise CMC, but which are increasingly being adopted by organizations (Brzozowski, 2009; Leonardi et al., 2013), there is a vast opportunity to learn about how ESM is used for various tasks. Instead of examining ESM through its features, namely by what it can do, the affordance approach (Gibson, 1986; Norman, 1988, 1990) is adopted to understand how the technology is used. This promises to be a more versatile approach, as the focus is not just on the technology (which can change), or the users (who can have diverse intents), but also on how the two parts interact to create possibilities for action (Gibson, 1986). ESM has been studied for knowledge sharing (Treem & Leonardi, 2012; Gibbs et al., 2013) and some affordances have been suggested as a result, such as visibility, editability, and persistence, to name a few. For large-scale online ideation however, extant studies on ESM for ideation (Bjelland & Wood, 2008; Di Gangi & Wasko, 2009) have not examined this aspect of affordances. Therefore, this study contributes to the ESM literature by identifying the new ESM affordances for ideation, namely virality, informality, and asynchronicity.

Virality builds upon the previously suggested visibility affordance of social media (Treem & Leonardi, 2012). The affordance however focuses more on what the problem owners can do with ESM than the participants, such as promoting their issues to the wider organization for attention, although the participants can also capitalize on this affordance for their own goals. The virality affordance is fundamental for ideation

because it is the starting point in the ideation process, when a large number of users are made aware of the problems that need ideas. Whether or not there is subsequent interaction is secondary.

Informality builds upon the understanding that ESM enables more communication across hierarchical boundaries (Gibbs et al., 2015). It adds to that understanding by suggesting that organizational rules and procedures may not always be strictly enforceable online. It has always been assumed that technology use would follow existing organizational practices closely or it will be incompatible with workplace norms (Treem et al., 2015). Email for example can be used to send direct messages across organizational boundaries, but in practice, it is unusual for email to be used that way unless with valid reasons such as for work. For example, a support staff in the finance department will not usually send an email to the director of the research department, unless it is for official reasons. Instead the communication will usually first go up and then laterally across the organization. Nonetheless, in using ESM for ideation, it is acceptable for communication to happen upward, downward, laterally, and diagonally. Even conventional brainstorming rules need not be followed when performing ideation on the ESM. Hence, the lack of formality and strict concordance with organizational rules suggest that ESM has the informality affordance.

Asynchronicity builds upon the persistence and visibility affordances of social media (Treem & Leonardi, 2012). In other words, contribution and comments made on the ESM will remain on the system and be accessible later on. As such, users do not need to use the ESM on a continuous and real-time basis as opposed to how instant messaging platforms are used, as ESM users can resume the use whenever they are available, such

as in between work periods. This affordance also results in online conversations on ESM to develop more slowly. However for ideation, this allows for a protracted gestation period for ideas, during which more thought and discussion can be put into the ideas, which may result in the ideas being improved.

Going forward, these affordances, when considered with respect to the evolving technology, or when a new technology is replaces it, should provide for a more stable understanding of how technology is being used for specific purposes. In other words, the virality affordance for instance should be valid across technologies as long they are used for ideation. Take for example a more recent communication technology such as mobile group messaging platforms -- such as Whatsapp or Telegram -- that are increasingly being used for communication by employees in the workplace alongside emails and web-based platforms. In terms of affordance, the question becomes whether or not these technologies are used in the same way as before for a specific purpose, namely for ideation. In other words, do the affordances endure the technological change or are they ephemeral? The answer to that question lies in how users appropriate the technology for the said purpose. Anecdotally, Whatsapp has been used to quickly viral messages to large groups of people, becoming a sort of social organizing tool for collective action, such as to boycott a product, or to alert certain populations about an event that was just happening. It bypasses the formal structure in the organization of users, if any, because there is no centralized control in the way messages are disseminated. Whatsapp however does not feature a discussion thread, which makes it difficult to follow or keep track of the conversations happening within the platform at any one time. Therefore in terms of ideation, the technology may afford virality of an issue or idea, as well as the informality

of the communication structure, but the lower degree of persistence in the technology makes it difficult to keep track of, or even hold a discussion about an idea. In other words, virality and informality may be enduring affordances for ideation, but asynchronicity may be an ephemeral one. Hence, the affordance approach helps to understand the tension between the enduring and the ephemeral characteristics of technology use.

Going beyond the current technologies, such as artificial intelligence or bots that can generate content, or algorithms that can facilitate discussion or prioritize the topics or threads for discussion, the affordance approach requires the examination of the new or evolved technology in terms of usage, in order for the established affordances to be validated across technologies. That said, these new technological developments can potentially reshape and restructure the ideation process, such as by making it less reliant on having a diverse pool of participants, or making it less difficult and faster to find good ideas for implementation. Machine learning however requires the right inputs, so until that time when bots can help make a decision, it is pertinent on the human participants to communicate properly and wisely on the ideation platform.

6.2.3. Collective action theory

This study adds to the collective action literature in a number of ways. First, it adds to the literature by providing new understanding of how large-scale online collective action works in an organization whose employees perform large-scale online ideation using ESM. The study shows that even without formal organizing, the ideation process can happen. The lack of pre-identified roles, as mentioned earlier, did not inhibit ideation, and the emergence of role-taking by certain individuals support the claim by Bimber et

al. (2005) that less formal organizing would take shape in the absence of formal organization. Furthermore, the study shows that participants did not need to know who the others were in the ideation process before contributing. However, the largely uncoordinated manner in which online ideation occurs has resulted in a more varied outcomes to the collective action process.

Second, this study helps to identify the boundary conditions in which large-scale online ideation happens. It does this by freeforming the process, namely by not requiring problems to be predefined in most cases, and not assigning any roles to anyone, in order to see the extent to which large-scale online ideation can occur. The study showed that employees made a conscious decision on whether to participate in online ideation on the ESM, because the data showed that not all employees were actively participating, as about half were lurkers on the system. Lurkers in this case however may not necessarily be considered as free riders (Olson, 1965), because even though they do not seem to be making any contribution by commenting, they are making a contribution to the process by expanding the invisible audience (boyd, 2010) for the issues and ideas. This ties in to the finding that even non-active ESM users can be aware of an issue, such as that top management interviewee mentioned earlier. In short, while the lurkers may seem to be quiet, they do play a role in the process. That said, among those who participated, the study showed that there was some consideration made before joining, because ideation requires some thinking in order to generate an idea to solve a given problem, which is not quite effortless. It is especially effortful for those who are not familiar with the topic of the problem being discussed, which can help explain some non-participation. In this respect, boundaries for participation can be said to be firmer for some, and looser for

others (Bimber et al., 2005). Moreover, the decision to free ride remains valid and cannot be totally dismissed when there is some cost to participate, even though contributing in online systems itself is nearly costless.

On collective action more generally, one takeaway from this study is the concept of *decentralized collective action*. This study showed that collective action did not need a central authority to initiate and regulate the process when performed online. Large-scale ideation on the ESM at this site still occurred without a formally appointed leader at the onset, unlike a flash mob that still requires at least a coordinating figure in the online space (Bennett & Segerberg, 2012; Bimber et al., 2005). Some role-taking that emerged during the process was evidence that some individuals were already aware of what they needed to do once they started participating in the ideation process, and existing organizational practice of small group brainstorming have helped to explain it. What this means is that collective action can occur in a decentralized manner, if potential participants knew what to collectively do when presented with the opportunity to produce the collective good.

6.2.4. Organizational communication

This study contributes to the organizational communication literature in several ways. This study shows how ideation embodies knowledge sharing in all its phases, from how participants shared their problems to create awareness with other users, to how they shared ideas to solve the problem, and to how they shared opinions to discuss and evaluate the ideas. Importantly, the knowledge sharing was done without any extrinsic reward to motivate participation. Instead, participants shared their knowledge because they felt they could make a useful contribution, which is a kind of intrinsic motivation.

Additionally, the sharing of personalized content, be it a problem, idea or opinion, that then results in others joining in the conversation with their own content to help solve the problem, reflects the connective action (Bennett & Segerberg, 2012) inherent in the process. Certainly, it cannot be denied that ESM has a role in enabling this level of knowledge sharing, not just because it democratizes participation (Campbell et al, 2014; Klang & Nolin, 2011; O'Reilly, 2005) -- which gave everyone in the organization the opportunity to participate at their own volition without the need to handpick anyone -- but also because of the informality, or the lack of formality, expected in the actions that is more reflective of social settings. It was earlier thought that the informality or socialness of ESM is incompatible with workplace norms (Treem et al., 2013) but in this case it showed that ESM users embraced the socialness of ESM when they used it for ideation. This study even showed that certain organizational rules and protocols were bypassed in using the ESM for ideation, suggesting that users would negotiate their way around the more rigid organizational structures to accomplish their communication task goals.

This study also contributes to the literature by demonstrating how communication across formal organizational boundaries is greatly facilitated by ESM as found by earlier studies (e.g. Gibbs et al., 2015; Ellison et al., 2015). This study showed that lower ranked employees can communicatively interact with upper management more easily, vice versa, and at scale, which otherwise, would be very difficult to accomplish even when it is possible, such as with email and instant messaging. ESM also facilitated communication across functional groups on very diverse topics, which under normal circumstances, is difficult to happen due to the departmental silos that exist in many organizations. The ease at which communicative boundary-crossing happens on the ESM is a boon to

crowdsourcing (Brabham, 2013) because the process needs a large audience to reach the critical mass in order to work and be sustained. The study further showed how the bulk of the large-scale ideation process from idea generation to development being outsourced to the masses but ultimately passing on to the decision-makers for action, mirrors how crowdsourced projects typically work, in that participants know they are contributors but do not ultimately make the decisions. In the same vein, employee engagement is also made easier by the ESM, where management can engage with employees across the various organizational boundaries, to have a sort of "conversation" with the employees to get them to contribute and be involved in organizational-level projects, which in turn can improve job satisfaction and productivity (Miller & Monge, 1986). Lastly, this study shows that ESM can be used by organizations for more "productive" purposes such as ideation for innovation, although organizations should also be cognizant that the socialness of ESM (Treem et al., 2015) such as the nonwork-related chats, or seemingly distracting nonwork activities, may have a role in improving workplace morale and relationship with coworkers, that in turn may lead to better work outcomes.

6.3. Practical Implications

This study has some practical implications for both organizations and researchers. For organizations, this study firstly shows that organizations can use the ESM as a tool for problem solving and innovation -- by surfacing problems, finding ideas, and facilitating discussion and decision about the ideas -- even though the ultimate decision on which problem to address with which idea may lie with the organizational management. Second, this study shows that it is possible for organizations to undertake large-scale online ideation, subject to certain conditions as presented earlier. Indeed,

many organizations like IBM and HP have done this before. Even this research site has done crowdsourcing for ideas more recently, such as for its “Fintech Hacks” and “TN50 Finance” initiatives, which was open to the public using social media. Third, this study helps the organization to understand the boundaries or limits of large-scale online ideation by having no predefined problems in most cases, no pre-assigned roles, and no expectations of outcomes, in order to see the extent to which large-scale online ideation can occur. As a result, the findings of this study can be transformed into organizational guidelines for conducting large-scale online ideation, such as specifying the roles employees are expected to play if they were to become problem owners, facilitators, and commenters. The guidelines can also include expected behaviors on how the participants should articulate or express themselves, so that ideas are more easily understood, and so that discussions are more fruitful. The guidelines can also suggest the desirable composition of participants, such as by job position and function, in order to have a more diverse experience in discussing the ideas. Lastly, the guidelines can also include other tips and tricks for large-scale online ideation, such as the setting of deadlines, or the establishment of special "rooms" in the ESM to discuss specific topics or problems.

For researchers, this study shows that the comments data in the ESM can be a “goldmine” in that tremendous effort is needed to process and sieve through the materials, but the result would ultimately be rewarding. The richness of the ESM comments data also provide an unobtrusive look into the organizational life, at a different level than what a direct participant-observation or ethnography can provide. From this study in particular, researchers for example can “feel the pulse” or life at the organization from reading the comments in sequence, and be able to identify which topics were more

important to employees. In this study, social topics and human resources-related topics, such as compensation or working conditions, were actively discussed. On a related note, researchers can also explore how the comments data can be mined more efficiently and effectively, because line-by-line coding and processing of the rich text embedded in the comments requires tremendous energy. A computer algorithm to process the text in a qualitatively meaningful way (i.e. not just word counting) would be a valuable tool for researchers taking this route. The IBM study mentioned earlier did have an algorithm to classify suggestions by keywords, and indeed there are already big data and qualitative digital social science research in this area (e.g. Hand & Hillyard, 2014; Karamshuk et al., 2017) but the point here is that such tools should be made more widely available to researchers. Translation is also an issue that needs to be taken into consideration by multilingual research.

In sum, the practical implications from this study can help organizations appreciate the potential uses of ESM for both social and task purposes. Additionally, this study can be useful for communication and social science researchers to appreciate new data sources, such as the server log data of user comments and activity, that allows them to get an unprecedented level of access into understanding how the organization works.

6.4. Limitations and Future Research

This study is not without limitations. First, this study is based on a case study of a single organization. Generally speaking, a single organization is not good for generalizability, although a detailed case study can provide an in-depth look into in the organization, which cannot be accomplished with a multiple organization study if given the same constraints of time and resources. The use of interviews and ESM comments

data in this study however, provided it with the level of detail necessary to be a rich-data case study.

Second, the working dataset in this study looked relatively small compared to similar studies of ESM, such as Gibbs et al. (2015). Furthermore, when the working dataset was coded for ideation, the resulting dataset became even smaller. Ideation however is just one of the types of activities undertaken on the ESM, and it is not the most popular activity. Again, in similar studies of ESM (Bjelland & Wood, 2008; Gibbs et al., 2015), the proportion of activities related to ideation was also relatively small. Furthermore, ideation in those organizations was performed quite formally, which contributed to the larger dataset. So unfortunately, the dataset for this study is limited to what is available. Generally, a statistical analysis on this size dataset would result in reduced explanatory power. That said, the regression model produced was intended to be predictive rather than explanatory, and the small sample size was compensated in subsequent computational adjustments.

Third, the ESM in the research site did not have the full functionality of public social media platforms such as Facebook or Twitter. So the dataset did not have the data for certain measures. For example, it did not have a "like" or similar function to indicate a preference. As such, this study resorted to coding comments for words that indicated preference, which may not be as objective, but the interrater agreement rate was within the acceptable range. Consequently, this study was not able to enumerate certain independent variables based on the system, such as the number of votes for and against an idea, which thus cannot be included into the statistical analysis. Hence, the statistical model may lack certain variables that may confound the results.

Fourth, the study did not cover certain topics such as social network relationships among commenters, which could provide richer information about the participants. It also did not cover the use of mobile communication devices and mobile apps, such as Whatsapp, Instagram, and Wechat, which seemed to be the trend in many organizations these days, except briefly in the discussion. This decision to not do these things was deliberate in order to focus on answering the research questions and testing the hypotheses.

In order to address some or all of the limitations, future research may be done by restudying the same organization in new areas. For example, future research could focus on an updated ESM that has features similar to public social media, in order to provide more technical data for statistical analysis. Experiments could also be conducted using the ESM to compare ideation with a deadline and without, and on certain topics, and with certain combinations of participants. A dedicated section on the ESM could also be created to facilitate this, similar to that done in some other organizations. This would enlarge the data, and have more predictive power to illustrate the differences that various factors could have on ideation quality. Then, if more interviews were conducted, they could focus on understanding how ideation was done on other platforms or in other ways, including face-to-face meetings.

To recap, this chapter discussed the results and findings in terms of implications to theory and practice, for collective action, ideation, and CMC. For collective action, this study had implications on how large-scale online collective action is understood, bringing to light the more recent concepts of connective action into the explanation. This study also forwarded an argument about the concept of decentralized collective action. For

ideation, the study brought home the point that ideation can be performed quite successfully in larger groups, as opposed to the established understanding that ideation is best done in small groups, although it needs certain conditions to be in place. Further, the problems associated with large group ideation are argued to be critical only when the research focus is productivity, but when quality is the focus, those problems become less important. Participant diversity was also affirmed to be important for ideation, as was the role of the facilitator although now the role of the "online" facilitator is more emergent. For CMC, the three ESM affordances for large-scale ideation -- namely, virality, informality, and asynchronicity -- had implications on how ESM was understood to influence the ideation process. For organizational communication, this study affirms the understanding that ESM make cross-boundary communication easier. In terms of practical implications, organizations can benefit from this study in many ways but especially on the use ESM for crowdsourcing ideas. Researchers can also benefit from this study by appreciating the need to have better qualitative (rather than just quantitative) tools to research big data.

6.5. Conclusion

This study's purpose was to examine the enabling conditions for large-scale online ideation and the factors that may influence the quality of the ideation process. This study was grounded in collective action theory that was updated to better explain collective action and connective action in online setting. It also reexamined brainstorming theory in the context of a large group and using CMC to facilitate the online ideation process. The study also examined how ESM were used for ideation through the affordance lens.

The findings and results of the study provide a better understanding of how large-scale online ideation works, as well as the role of the ESM in the process. In particular, this study showed the importance of non-handpicked participation, longer deadlines, and emergent facilitation in enabling large-scale online ideation. It also showed that ESM has some unique affordances for large-scale online ideation, namely, virality, informality, and asynchronicity, that provided new insights into understanding how differently ESM influenced the way ideation is performed. Furthermore, this study showed the importance of participants' functional diversity, and the role of the facilitator in making the ideation process more predictable and with improved quality. The results and findings have important theoretical implications for ideation, enterprise social media use, and online collective action, as well as practical implications for organizations and researchers. Going forward, understanding large-scale online collective action processes will only become more important as personal mobile communication becomes more pervasive, creating a population that is continually connected and engaged, hence creating new opportunities for organizations to innovate.

REFERENCES

Aakhus, M. (2000). Constituting deliberation as "buy-in" through GDSS design and implementation. *The Electronic Journal of Communication/La Revue Electronique de Communication, 10*(1). http://www.cios.org/EJCPUBLIC/010/1/010110.html

Aakhus, M. (2001). Technocratic and design stances toward communication expertise: How GDSS facilitators understand their work. *Journal of Applied Communication Research, 29*(4), 341–371.

Aakhus, M. (2013). Managing conflict in information system design stakeholder conferences: The role of transparency work. In J.M. Carroll (ed.), *Creativity and Rationale: Enhancing Human Experience by Design (Human–Computer Interaction Series)* (e-Book). New York, NY: Springer. doi:10.1007/978-1-4471-4111-2_16

Adams, S. (1953). Status congruency as a variable in small group performance. *Social Forces, 32*(1), 16-22.

Agresti, A. (2010). *Analysis of Ordinal Categorical Data* (2nd ed.) New York, NY: Wiley.

Ahuja, G. (2000). Collaboration Networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly, 45*, 425-455.

Akaike, H. (1973). Information theory as an extension of the maximum likelihood principle. In B.N. Petrov & F. Csaki (Eds.), *Second International Symposium on Information Theory* (pp. 267-281). Budapest: Akademiai Kiado.

Amabile, T. M. (1983). *The social psychology of creativity*. New York: Springer-Verlag.

Aral, S. & Van Alstyne, M. (2007). Network structure & information advantage. In *Proceedings of the Academy of Management Conference*, Philadelphia, PA.

Attaran, M. & Van Laar, I. (1999). Privacy and security on the Internet: How to secure your personal information and company data. *Information Management & Computer Security, 7*(5), 241-247, doi:10.1108/09685229910292907

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Bastian, M. Heymann, S., & Jacomy, M. (2009). Gephi: An open source software for exploring and manipulating networks. In *Proceedings of 3rd International AAAI Conference on Weblogs and Social Media (ICWSM 2009)*, San Jose, CA.

Becker, P. H. (1993) Common pitfalls in published grounded theory research. *Qualitative Health Research, 3*(2), 254-260.

Bennett, W. L. & Segerberg, A. (2012). The logic of connective action: Digital media and the personalization of contentious politics. *Information, Communication & Society, 15*(4), 739-768, doi:10.1080/1369118X.2012.670661

Berry, L. L. & Parasuraman, A. (1997). Listening to the customer -- The concept of a service-quality information system. *Sloan Management Review* (*Spring*), 65-76.

Bimber, B., Flanagin, A. J., & Stohl, C. (2005). Reconceptualizing collective action in the contemporary media environment. *Communication Theory, 15*(4), 365-388.

Bjelland, O. M., & Wood, R. C. (2008). An inside view of IBM's Innovation Jam. MIT *Sloan Management Review, 50*(1), 32-40.

Bjork, J. & Magnusson, M. (2009). Where do good innovation ideas come from? Exploring the influence of network connectivity on innovation idea quality. *Journal of Productivity Innovation Management, 26*, 662–670.

Blau, P. M. (1977). *Inequality and heterogeneity*. New York, NY: Free Press.

Bonn, I., & Rundle-Thiele, S. (2007). Do or die—Strategic decision-making following a shock event. *Tourism Management, 28*(2), 615–620, doi:10.1016/j.tourman.2006.04.021

Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). *UCINET for Windows: Software for Social Network Analysis*. Harvard, MA: Analytic Technologies.

boyd, d. m. (2010). Social network sites as networked publics: Affordances, dynamics, and implications. In Z. Papacharissi (Ed.), *Networked Self: Identity, Community, and Culture on Social Network Sites* (pp. 39-58). New York, NY: Routledge.

boyd, d. m., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1), 210-230.

Bozdogan, H. (1987). Model selection and Akaike's Information Criterion (AIC): The general theory and its analytical extensions. *Psychometrika, 52*(3), 345-370.

Brabham, D. C. (2008). Crowdsourcing as a model for problem solving: An introduction and cases. *Convergence, 14*(75), doi:10.1177/1354856507084420

Brabham, D. C. (2013). *Crowdsourcing*. Cambridge, MA: MIT Press.

Briggs, R. O. & Reinig, B.A. (2007) Bounded ideation theory: A new model of the relationship between idea-quantity and idea-quality during ideation. In *Proceedings of the 40th Hawaii International Conference on System Sciences* (pp. 16b), Waikoloa, HI. http://www.computer.org/csdl/proceedings/hicss/2007/2755/00/27550016b.pdf

Brzozowski, M. J. (2009). WaterCooler: Exploring an organization through enterprise social media. In *Proceedings of International Conference on Supporting Group Work (GROUP '09)*, Sanibel Island, FL: ACM Press.

Bullinger, A. C. & Möslein, K. M. (2010). Innovation contests: Where are we? In *Proceedings of the Sixteenth Americas Conference of Computer Information Systems (AMCIS)*, Lima, Peru. http://aisel.aisnet.org/amcis2010/28

Bunderson, J. S. & Sutcliffe, K. M. (2002). Comparing alternative conceptualizations of functional diversity in management teams: Process and performance effects. *The Management Academy Journal, 45*(5), 875-893.

Burke, M., Marlow, C., & Lento, T. (2010). Social network activity and social well-being. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10)* (pp. 1909-1912). New York, NY: ACM Press. doi:10.1145/1753326.1753613

Burt, R. S. (2004). Structural holes and good ideas. *American Journal of Sociology, 110*(2), 349-399.

Burt, R. S. (1992). *Structural Holes*. Cambridge, MA: Harvard University Press.

Burt, R. S. (1987). Social contagion and innovation: Cohesion versus structural equivalence. *American Journal of Sociology, 92*(6), 1287-1335.

Butts, C. T. (2014). *Package "sna": Tools for social network analysis*. http://cran.r-project.org/web/packages/sna/sna.pdf

Butts, C. T. (2008). network: a Package for Managing Relational Data in R. *Journal of Statistical Software, 24*(2). http://www.jstatsoft.org/v24/i02/

Calkins, K. G. (2005). *An Introduction to Statistics* (ch.13). http://bit.ly/1D4fUvD

Camacho, L. M., & Paulus, P. B. (1995). The role of social anxiousness in group brainstorming. *Journal of Personality and Social Psychology, 68*, 1071-1080.

Campbell, D. A., Lambright, K. T., & Wells, C. J. (2014). Looking for friends, fans, and followers? Social media use in public and nonprofit human services. *Public Administration Review, 74*(5), 655-663, doi:10.1111/puar.12261

Chamberlin, J. (1974). Provision of collective goods as a function of group size. *Political Science Review, 68*, 707–713.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Sage.

Cheney, G. (1995). Democracy in the workplace: Theory and practice from the perspective of communication. *Journal of Applied Communication Research, 23*, 167-200.

Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Cambridge, MA: Harvard Business Press

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 20*(1), 37-46, doi:10.1177/001316446002000104

Connolly, T., Routhieaux, R. L., & Schneider, S. K. (1993). On the effectiveness of group brainstorming: Test of on underlying cognitive mechanism. *Small Group Research, 24*, 490-503.

Cook, T. D., & Campbell, D. T. (1979). *Quasi-Experimentation: Design & Analysis Issues for Field Settings*. Boston, MA: Houghton Mifflin Company.

Cooper, W. H., Gallupe, R. B., Pollard, S., & Cadsby, J. (1998). Some Liberating Effects of Anonymous Electronic Brainstorming. *Small Group Research, 29*, 147-178. doi:10.1177/1046496498292001

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology, 13*, 3-21.

Cotton, J. L., Vollrath, D. A, Froggatt, K. L., Lengnick-Hall, M. L., & Jennings, K. R. (1988). Employee participation: Diverse forms and different outcomes. *The Academy of Management Review, 13*(1), 8-22.

Csardi, G. (2014). *Package 'igraph'*. http://cran.r-project.org/web/packages/igraph/igraph.pdf

Cummings, A., Schlosser, A., Arrow, H. (1995). Developing complex group products: Idea combination in computer-mediated and face-to-face groups. *Computer Supported Cooperative Work,* 4(2-3), 229-251, doi:10.1007/BF00749748

Daft, R. L. & Lengel, R. H. (1984). Information richness: a new approach to managerial behavior and organizational design. In Cummings, L. L. & Staw, B. M. (Eds.), *Research in organizational behavior,* 6, (pp. 191-233). Homewood, IL: JAI Press.

Dawson, S., Bakharia, A., & Heathcote, E. (2010). SNAPP: Realising the affordances of real-time SNA within networked learning environments. In L. Dirckinck-Holmfeld, V. Hodgson, C. Jones, M. de Laat, D. McConnell, & T. Ryberg (Eds.), *Proceedings of the 7th International Conference on Networked Learning* (pp. 125-133). Lancaster, UK: Lancaster University.

Dean, D. L., Hender, J. M., Rodgers, T. L., & Santanen, E. L. (2006). Identifying quality, novel, and creative ideas: Constructs and scales for idea evaluation. *Journal of the Association for Information Systems, 7*(10), 646-699.

Dennis, A. R., & Valacich, J. S. (1993). Computer brainstorms: More heads are better than one. *Journal of Applied Psychology, 78*(4), 531-537, doi:10.1037/0021-9010.78.4.531

Dennis, A. R., & Valacich, J. S. (1999). Research note. Electronic brainstorming: Illusions and patterns of productivity. *Information Systems Research, 10*(4), 375-377.

DeSanctis, G. & Gallupe, R. B. (1987). A foundation for the study of group decision support systems. *Management Science, 33*(5), 589-609.

Di Gangi, P. M., & Wasko, M. (2009). Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm. *Decision Support Systems, 48*(1), 303–312, doi:10.1016/j.dss.2009.04.004

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology, 53*(3), 497-509. doi:10.1037/0022-3514.53.3.497

DiMicco, J. M., Geyer, W., Dugan, C., Brownholtz, B, & Millen, D. R. (2009). People sensemaking and relationship building on an enterprise social networking site. In *Proceedings of the 42nd Hawaii International Conference on System Sciences (HICSS '09)*, Waikaloa, HI.

DiMicco, J. M., Millen, D. R., Geyer, W., Dugan, C., Brownholtz, B., & Muller, M. (2008). Motivations for social networking at work. In *Proceedings of the 2008 ACM conference on Computer Supported Cooperative Work* (pp. 711-720). New York, NY: ACM.

Donius, W. (2012). *Thought Revolution*. New York, NY: Atria Books.

Drury, G. (2008). Social media: Should marketers engage and how can it be done effectively? *Journal of Direct, Data and Digital Marketing Practice, 9*, 274-277.

Dutton, J. E. (1986). The processing of crisis and non-crisis strategic issues. *Journal of Management Studies, 23*(5), 501-517, doi:10.1111/j.1467-6486.1986.tb00434.x

Efimova, L., & Grudin, J. (2007). Crossing boundaries: A case study of employee blogging. In *Proceedings of the 40th Annual Hawaii International Conference on System Sciences (HICSS '07)* (pp. 86-95). Washington, DC: IEEE Computer Society, doi:10.1109/HICSS.2007.159.

Ehrlich, K., Lin, C.-Y., Griffiths-Fisher, V. (2007). Searching for experts in the enterprise: Combining text and social network analysis. In *Proceedings of International ACM Conference on Supporting Group (GROUP '07)* (pp. 117-126), New York, NY: ACM Press.

El-Shinnawy, M., & Vinze, A. S. (1998). Polarization and persuasive argumentation: A study of decision making in group settings. *MIS Quarterly, 22*(2), 165-198.

Ellison, N. B. & boyd, d. (2013). Sociality through social network sites. In W. H. Dutton (Ed.), *The Oxford Handbook of Internet Studies* (pp. 151-172). Oxford, UK: Oxford University Press.

Ellison, N. B., Gibbs, J. L., & Weber, M. S. (2015). The use of enterprise social network sites for knowledge sharing in distributed organizations: The role of organizational affordances. *American Behavioral Scientist, 59*, 103-123, doi:10.1177/0002764214540510

Ellison, N. B., Heino, R. D., & Gibbs, J. L. (2006). Managing impressions online: Self-presentation processes in the online dating environment. *Journal of Computer-Mediated Communication, 11*(2), 415-441.

Faust, K. (2010). A puzzle concerning triads in social networks: Graph constraints and the triad census. *Social Networks, 32*(3), 221-233.

Field, A. (2009). *Discovering Statistics Using SPSS*. (3rd. ed.). Thousand Oaks, CA: Sage Publications.

Feagin, J. R., Orum, A. M., & Sjoberg, G. (Eds.) (1991). *A Case for the Case Study*. Chapel Hill, NC: University of North Carolina Press.

Festinger, L. (1954). A theory of social comparison processes. *Human relations, 7*(2), 117-140.

Fulk, J. (1993). Social construction of communication technology. *Academy of Management Journal, 36*(5), 921-950.

Fulk, J., Flanagin, A. J., Kalman, M. E., Monge, P. R., & Ryan, T. (1996). Connective and communal public goods in interactive communication systems. *Communication Theory, 6*(1), 60-87.

Gallupe, R. B., Dennis, A. R., Cooper, W. H., Valacich, J. S., Bastianutti, L. M., & Nunamaker, Jr., J. F. (1992). Electronic brainstorming and group size. *The Academy of Management Journal, 35*(2), 350-369. doi:10.2307/256377

Gallupe, R. B., Bastianutti, L. M., & Cooper, W. H. (1991). Unblocking brainstorms. *Journal of Applied Psychology, 76*(1), 137-142, doi:10.1037/0021-9010.76.1.137

Gallupe, R. B., DeSanctis, G., & Dickson, G. W. (1988). Computer-based support for group problem-finding: An experimental investigation. *MIS Quarterly, 12*(2), 277-296.

Gaver, W. W. (1991). Technology affordances. In S. P. Robertson, G. M. Olson, & J. S. Olson (Eds.), *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '91)* (pp. 79-84), New York, NY: ACM Press, doi:10.1145/108844.108856

Gibbs, J. L., Eisenberg, J., Rozaidi, N. A., & Gryaznova, A. (2015). The "megapozitiv" role of enterprise social media in enabling cross-boundary communication in a distributed Russian organization. *American Behavioral Scientist, 59*, 75-102, doi:10.1177/0002764214540511

Gibbs, J. L., Rozaidi, N. A., & Eisenberg, J. (2013). Overcoming the "ideology of openness": Probing the affordances of social media for organizational knowledge sharing. *Journal of Computer Mediated Communication, 19*(1), 102–120.

Gibson, C. B., & Gibbs, J. L. (2006). Unpacking the concept of virtuality: The effects of geographic dispersion, electronic dependence, dynamic structure, and national diversity on team innovation. *Administrative Science Quarterly, 51*, 451-495.

Gibson, J. J. (1986). *The ecological approach to visual perception*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Gilbert, R. O. (1987). *Statistical Methods for Environmental Pollution Monitoring*. New York, NY: Wiley.

Gillespie, R. (1993). *Manufacturing Knowledge: A History of the Hawthorne Experiments*. New York, NY: Cambridge University Press.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory*. Chicago, IL: Aldine.

Goffman, E. (1959). *The Presentation of Self in Everyday Life*. New York: Doubleday.
Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78*, 1360-1380.
Hand, M., & Hillyard, S. (2014). *Big Data? Qualitative Approaches to Digital Research*. London, UK: Emerald.
Hansen, M. T. (1999). The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly, 44*(1),82-85.
Hardin, R. (1982). *Collective action*. Baltimore: Johns Hopkins University Press.
Harkins, S. G. (1987). Social loafing and social facilitation. *Journal of Experimental Social Psychology, 23*(1), 1-18. doi:10.1016/0022-1031(87)90022-9
Harris, L., & Rae, A. (2009). Social networks: the future of marketing for small business. *Journal of Business Strategy, 10*(5), 24-31, doi:10.1108/02756660910987581
Haythornthwaite, C. (2005). Social networks and internet connectivity effects. *Information, Communication & Society, 8*, 125-147.
Helander, M., Lawrence, R., Liu, Y., Perlich, C., Reddy, C., & Rosset, S. (2007). Looking for great ideas: Analyzing the Innovation Jam. In *Proceedings of the 9th WebKDD and 1st SNA-KDD 2007 Workshop on Web Mining and Social Network Analysis* (pp. 66-73). New York, NY: ACM Press. doi:10.1145/1348549.1348557
Hipel, K. W. & McLeod, A. I. (1994). *Time Series Modelling of Water Resources and Environmental Systems*. Amsterdam: Elsevier.
Holsti, O. R. (1969). *Content Analysis for the Social Sciences and Humanities*. Reading, MA: Addison-Wesley.
Howe, J. (2006). The Rise of Crowdsourcing. *Wired*, 14(6). http://www.wired.com/wired/archive/14.06/crowds.html
Huh, J., Jones, L., Erickson, T., Kellogg, W. A., Bellamy, R. K. E., & Thomas, J. C. (2007). BlogCentral: The role of internal blogs at work. In *CHI '07 Extended Abstracts on Human Factors in Computing Systems (CHI EA '07)* (pp. 2447-2452). New York, NY: ACM Press, doi:10.1145/1240866.1241022
Hurvich, C. & Tsai, C.-L. (1989). Regression and time series model selection in small samples. *Biometrica, 76*, 297–293.
Hutchby, I. (2001). Technologies, texts and affordances. *Sociology, 35*(2), 441-456. doi:10.1017/S0038038501000219
International Data Corporation (2012, Sep. 12). *As social business adoption and maturity escalates, new IDC research highlights the value of extending internal social initiatives beyond the company firewall*. Press release. http://bit.ly/1GDnwXZ
International Data Corporation (2013, Feb. 25). *IDC study confirms the growing acceptance of social media for business purposes among Western European SMBs*. Press release. http://bit.ly/1xxM7fp
Isaksen, S. G. (1998, June). *A review of brainstorming research: Six critical issues for inquiry*. Buffalo, NY: Creative Problem Solving Group. http://bit.ly/1HeLtn0
Jablin, F. M. & Seibold, D. R. (1978). Implications for problem-solving groups of empirical research on "brainstorming": A critical review of the literature. *Southern Speech Communication Journal, 43*(4), 327-356.
Jackson, M. H., & Poole, M. S. (2003). Idea-generation in naturally occurring contexts: Complex appropriation of a simple group procedure. *Human Communication Research, 29*(4), 560–591.

Janis, I. L. (1971). Groupthink. *Psychology Today, 5*(6), 43–46, 74–76.

Janssen, J., Erkens, G., Kirschner, P. A., & Kanselaar, G. (2009). Influence of group member familiarity on online collaborative learning. *Computers in Human Behavior, 25*(1), 161-170. doi:10.1016/j.chb.2008.08.010

Jessup, L. M., Connolly, T., & Galegher, J. (1990). The effects of anonymity on GDSS group process with an idea-generating task. *MIS Quarterly, 14*(3), 313-321, doi:10.2307/248893

Karamshuk, D., Shaw, F., Brownlie, J., & Sastrya, N. (2017). Bridging big data and qualitative methods in the social sciences: A case study of Twitter responses to high profile deaths by suicide, Online Social Networks and Media, 1, 33-43. doi:10.1016/j.osnem.2017.01.002

Katz, J. E., & Rice, R. E. (2002). *Social consequences of Internet use: Access, involvement and interaction*. Cambridge, MA: The MIT Press.

Kavadias, S., & Sommer, S. C. (2009). The effects of problem structure and team diversity on brainstorming effectiveness. *Management Science, 55*(12), 1899-1913.

Kelley, T., & Littman, J. (2001). *The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm*. New York, NY: Doubleday.

Kendall, M. G. (1975). *Rank Correlation Methods*. London: Griffin.

Kiesler, S., & Sproull, L. (1992). Group decision making and communication technology. *Organization Behavior and Human Decision Processes, 52*, 96-123.

Kittur, A., & Kraut, R. E. (2008). Harnessing the wisdom of crowds in wikipedia: quality through coordination. In *Proceedings of the 2008 ACM Conference on Computer-Supported Cooperative Work* (pp. 37-46). New York, NY: ACM Press. doi:10.1145/1460563.1460572

Klang, M., & Nolin, J. (2011). Disciplining social media: An analysis of social media policies in 26 Swedish municipalities. *First Monday, 16*(8), 1-24. http://firstmonday.org/ojs/index.php/fm/article/view/3490/3027

Klein, M. (2010). Using metrics to enable large-scale deliberation. Presented at *Collective Intelligence In Organizations: A Workshop of the ACM Group 2010 Conference*, Sanibel Island, FL. http://bit.ly/1sJ9ZpB

Knoll, S. W., & Horton, G. (2011). Changing the perspective: Using a cognitive model to improve thinkLets for ideation. *Journal of Management Information Systems, 28*(1), 85-114, doi:10.2753/MIS0742-1222280104

Lamm, H., & Trommsdorff, G. (1973). Group versus individual performance on tasks requiring ideational proficiency (brainstorming): A review. *European Journal of Social Psychology, 3*(4), 361-388.

Lampe, C., Vitak, J., & Ellison, N. (2013). Users and nonusers: Interactions between levels of Facebook adoption and social capital. In *Proceedings of the 2013 conference on Computer Supported Cooperative Work (CSCW '13)* (pp. 809-820), New York, NY: ACM Press, doi:10.1145/2441776.2441867

Latané, B., Williams, K., & Harkins, S. (1979). Many hands make light the work: The causes and consequences of social loafing, *Journal of Personality and Social Psychology, 37*, 822-832.

Leimeister, J. M., Huber, M., Bretschneider, U., & Krcmar, H. (2009). Leveraging crowdsourcing: Activation-supporting components for IT-based ideas

competition. *Journal of Management Information Systems, 26*, 197-224. doi:10.2753/MIS0742-1222260108

Leonardi, P. M. (2009). Why do people reject new technologies and stymie organizational changes of which they are in favor? Exploring misalignments between social interactions and materiality. *Human Communication Research, 35*, 407-441, doi:10.1111/j.1468-2958.2009.01357.x

Leonardi, P. M., Huysman, M., & Steinfield, C. (2013). Enterprise social media: Definition, history, and prospects for the study of social technologies in organizations. *Journal of Computer-Mediated Communication, 19*, 1-19. doi: 10.1111/jcc4.12029

Leonardi, P. M., Treem, J. W., & Jackson, M. H. (2010). The connectivity paradox: Using technology to both decrease and increase perceptions of distance in distributed work arrangements. *Journal of Applied Communication Research, 38*(1), 85-105.

Lindegaard, S. (2011). *Making Open Innovation Work*. North Charleston, SC: CreateSpace.

Lupia, A., & Sin, G. (2003). Which public goods are endangered? How evolving communication technologies affect the logic of collective action. *Public Choice, 117*, 315–331.

MacCrimmon, K. R., & Wagner, C. (1994). Stimulating ideas through creativity software. *Management Science, 40*(11), 1514-1532. doi:10.1287/mnsc.40.11.1514.

Majchrzak, A., Faraj, S., Kane, G. C., & Azad, B. (2013). The contradictory influence of social media affordances on online communal knowledge sharing. *Journal of Computer-Mediated Communication, 19*(1), 38–55. doi:10.1111/jcc4.12030

Majchrzak, A., Wagner, C., & Yates, D. (2013). The impact of shaping on knowledge reuse for organizational improvement with wikis. *MIS Quarterly, 37*(2), 455-469.

Malone, T. W. & Klein, M. (2007). Harnessing collective intelligence to address global climate change. *Innovations, 2*(3), 15-26. doi:10.1162/itgg.2007.2.3.15

Mann, H.B. (1945), Nonparametric tests against trend, *Econometrica, 13*, 245–259.

Markus, M. L. (1990). Toward a critical mass theory of interactive media. In J. Fulk & C. W. Steinfield (Eds.), *Organizations and communication technology* (pp. 194–218). Newbury Park, CA: Sage.

Marwell, G., & Oliver, P. (1993). *The critical mass in collective action: A micro-social theory*. New York: Cambridge University Press.

Marwick, A. & boyd, d. (2011). I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience. *New Media and Society, 13*, 96-113.

Mayo, G. E. (1975). *The social problems of an industrial civilisation*. London, U.K.: Routledge.

McCaughey, M., & Ayers, M. D. (2003). *Cyberactivism: Online activism in theory and practice*. New York: Routledge.

McCullagh, P. (1980). Regression models for ordinal data. *Journal of the Royal Statistical Society, Series B (Methodological), 42*(2), 109–142. JSTOR 2984952

McGrath, J. E. (1984). *Groups: Interaction and Performance*. Inglewood, NJ: Prentice Hall.

McQuail, D. (2005). *McQuail's Mass Communication Theory* (5th ed.). London, UK: Sage Publications.

Meyer, B. (2009, Aug 12). An R function for the Blau index of diversity. *Myowelt* (blog). Retrieved Jan 2, 2014 from http://myowelt.blogspot.com/2009/08/r-function-for-blau-index-of-diversity.html

Michinov, N., & Primois, C. (2005). Improving productivity and creativity in online groups through social comparison process: New evidence for asynchronous electronic brainstorming. *Computers in Human Behavior, 21*(1), 11-28. doi: 10.1016/j.chb.2004.02.004

Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Miller, K. I., & Monge, P. R. (1986). Participation, satisfaction, and productivity: A meta-analytic review. *Academy of Management Journal, 29*(4), 727-753. doi:10.2307/255942

Monge, P. R., Cozzens, M. D., & Contractor, N. S. (1992). Communication and motivational predictors of the dynamics of organizational innovation. *Organization Science, 3*, 250-274.

Muller, M. (2012). Lurking as personal trait or situational disposition? Lurking and contributing in enterprise social media. In *Proceedings of the 2012 ACM conference on Computer Supported Cooperative Work (CSCW '12)* (pp. 253-256). New York, NY: ACM Press.

Muller, M., Geyer, W., Soule, T., Daniels, S., & Cheng, L. T. (2013). Crowdfunding inside the enterprise: Employee-initiatives for innovation and collaboration. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)* (pp. 503-512). New York, NY: ACM Press. doi:10.1145/2470654.2470727.

Naaman, M., Boase, J., & Lai, C. H. (2010). Is it really about me?: Message content in social awareness streams. In *Proceedings of the 2010 ACM conference on Computer Supported Cooperative Work (CSCW '10)* (pp. 189-192). New York, NY: ACM Press. doi:10.1145/1718918.1718953

Norman, D. A. (1988). *The psychology of everyday things*. New York: Basic Books.

Norman, D. A. (1990). *The design of everyday things*. New York: Doubleday

Norusis, M. J. (2011). Ordinal regression. *IBM SPSS Statistics 19 Advanced Statistical Procedures Companion* (ch. 4). http://bit.ly/1Kvuots

Nunamaker, J. F., Dennis, A. R., Valacich, J. S., Vogel, D. R., & George, J.F. (1991). Electronic meeting systems to support group work. *Communications of the ACM, 34*(7), 40- 61.

O'Reilly, T. (2005). *What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software*. http://oreil.ly/1JyM7Q6

Obstfeld, D. 2005. Social networks, the tertius iungens and orientation involvement in innovation. *Administrative Science Quarterly, 50*(1), 100-130.

Oliver, P. (1980). Rewards and punishments as selective incentives for collective action: Theoretical investigations. *American Journal of Sociology, 85*, 1356–1375.

Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.

Olsson, U., Drasgow, F., Dorans, N. J. (1982). The polyserial correlation coefficient. *Econometrika, 47(3)*, 337-347, doi:10.1007/BF02294164.

Osborn, A. (1963). *Applied imagination: Principles and Procedures of Creative Problem Solving* (3rd ed.). New York: Charles Scribner's Sons.

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods* (2nd ed.). Newbury Park, CA: Sage Publications.

Perry-Smith, J. E. (2006). Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal, 49*, 85–101.

Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review, 28*, 89-106.

Pinsonneault, A., Barki, H., Gallupe, R. B., & Hoppen, N. (1999). Electronic brainstorming: The illusion of productivity. *Information Systems Research, 10*(3), 110-133.

Poole, M. S., DeSanctis, G., Kirsch, L. & Jackson, M. H. (1994). Group decision support systems as facilitators of quality team efforts. In L. Frey (Ed.), *Innovations in Group Facilitation* (pp. 282-298). Creskill, NJ: Hampton Press.

Price, K. H. (1985). Problem-solving strategies: A comparison by problem-solving phases. *Group & Organization Studies, 10*(3), 278-299.

R Development Core Team (2008). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation or Statistical Computing. http://www.R-project.org

Reagans, R. & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly, 48*, 240-267.

Reinig, B. A., & Briggs, R. O. (2008). On the relationship between idea-quantity and idea-quality during ideation. *Group Decision and Negotiation, 17*, 403–420. doi:10.1007/s10726-008-9105-2

Reinig, B. A., & Briggs, R. O. (2013). Putting quality first in ideation research. *Group Decision and Negotiation, 22*, 943-973. doi:10.1007/s10726-012-9338-y.

Reinig, B. A., Briggs, R. O., & Nunamaker, J. F., Jr. (2007). On the measurement of ideation quality. *Journal of Management Information Systems, 23*(4), 143-161.

Renzulli, J. S., Owen, S. V., & Callahan, C. M. (1974). Fluency, flexibility and originality as a function of group size. *The Journal of Creative Behavior, 8*, 107–113.

Rheingold, H. (2003). *Smart Mobs*. New York: Basic Books.

Rogers, E. M. (1983). *Diffusion of Innovations* (5th ed.). New York: Free Press.

Samuelson, P. A. (1954). The pure theory of public expenditure. *Review of Economics and Statistics, 36*, 387–390.

Sarle, W. S. (1995). Measurement theory: Frequently asked questions. *Disseminations of the International Statistical Applications Institute* (pp. 61-66), *1*(4), Wichita, KS: ACG Press. http://bit.ly/1HtNiye

Schatzman L. & Strauss A. L. (1973). *Field Research: Strategies for a Natural Sociology*. Englewood Cliffs, NJ: Prentice Hall.

Scott, J. (2000). *Social Network Analysis: A Handbook* (2nd ed.). Newbury Park, CA, Sage Publications. http://bit.ly/1KbQFw5

Seibold, D. R., & Shea, C. (2001). Participation and decision making. In F. M. Jablin & L. L. Putnam (Eds.), *The New Handbook of Organizational Communication: Advances in Theory, Research, and Methods* (pp. 664-703), Thousand Oaks, CA: Sage Publications.

Shmueli, G. (2010). To explain or to predict? *Statistical Science, 25*(3), 289-310. doi:10.1214/10-STS330.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. London, UK: John Wiley & Sons.

Skeels, M. M., & Grudin, J. (2009). When social networks cross boundaries: A case study of workplace use of Facebook and LinkedIn. In *Proceedings of GROUP 2009*.

Smith, J. H. (1998). The enduring legacy of Elton Mayo. *Human Relations, 51*(3), 221-249, doi:10.1177/001872679805100302

Smolensky, M. W., Carmody, M. A., & Halcomb, C. G. (1990). The influence of task type, group structure and extraversion on uninhibited speech in computer-mediated communication. *Computers in Human Behavior, 6*, 261-272.

Snow, D. A., & Anderson, L. (1991). Researching the homeless: The characteristic features and virtues of the case study. In J. Feagin, A. Orum, & G. Sjoberg (Eds.), *A Case for the Case Study* (pp. 148-173). Chapel Hill, NC: University of North Carolina Press.

Stake, R. (1995). *The Art of Case Study Research* (pp. 49-68). Thousand Oaks, CA: Sage.

Stohl, C. & Cheney, G. (2001). Participatory process / paradoxical practices: Communication and the dilemmas of organizational democracy. *Management Communication Quarterly, 14(*3), 349-407.

Surowiecki, J. (2004). *The wisdom of crowds. Why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*. New York, NY: Doubleday.

Taylor, D. W., Berry, P. C., & Block, C. H. (1958). Does group participation when using brainstorming facilitate or inhibit creative thinking? *Administrative Science Quarterly, 6*, 22-47.

Tellis, W. (1997). Introduction to case study. *The Qualitative Report, 3*(2), article 4. http://www.nova.edu/ssss/QR/QR3-2/tellis1.html

Thom, J, Helsley, S., Matthews, T., Daly, E., & Millen, D. (2011). What are you working on? Status message Q&A in an enterprise SNS. In *Proceedings of ECSCW 2011*.

Tierney, M. L. & Drury, J. (2013). Continuously improving innovation management through enterprise social media. *Journal of Social Media for Organizations, 1*(1), 1-16.

Treem, J. W., & Leonardi, P. M. (2012). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. *Communication Yearbook, 36*, 143-189.

Treem, J. W., Dailey, S. L. & Pierce, C. (2013). *Bringing technological frames to work: Why young employees do not want to use social media in the workplace*. Presented at the International Communication Association Conference 2013, London, UK.

Valacich, J. S., Dennis, A. R., & Connolly, T. (1994). Idea generation in computer-based groups: A new ending to an old story. *Organizational Behavior and Human Decision Processes, 57*(3), 448-467.

Valacich, J. S., Dennis, A. R., & Numamaker, J. F. (1992). Group size and anonymity effects on computer-mediated idea generation. *Small Group Research, 23*(1), 49-73.

Valacich, J., George, J., Nunamaker, J. F., & Vogel, D. (1994). Physical proximity effects on computer-mediated idea generation. *Small Group Research, 25*(1), 83-104.

van Someren, M. W., Barnard, Y. F., & Sandberg, J. A. C. (1994). *The Think Aloud Method: A Practical Guide to Modelling Cognitive Processes*. New York, NY: Academic Press.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Vitak, J., Lampe, C., Gray, R. & Ellison, N. (2012). "Why won't you be my Facebook friend?": Strategies for managing context collapse in the workplace. In *Proceedings of the 7th Annual iConference* (pp. 555-557). New York: ACM. doi: 10.1145/2132176.2132286

Vreede, de G. J., Briggs, R, & Reiter-Palmon, R (2010). Exploring asynchronous brainstorming in large groups: A field comparison of serial and parallel subgroups. *Human Factors, 52,* 189-202.

Wagner, J. A. (1994). Participation's effect on performance and satisfaction: A reconsideration of research evidence. *Academy of Management Review, 19*, 312-330.

Walther, J. B. (1992). interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research, 19*(1), 52-90. doi:10.1177/009365092019001003

Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. *Communication Research, 23*(1), 3-43. doi:10.1177/009365096023001001

Walther, J. B. (2011). Theories of computer-mediated communication and interpersonal relations. In M. L. Knapp & J. A. Daly (Eds.), *The handbook of interpersonal communication* (4th ed.) (pp. 443-479). Thousand Oaks, CA: Sage

Wellman, B. (1979). The community question: The intimate networks of East Yorkers. *American Journal of Sociology, 84*(5), 1201-1231.

Wirtz, J. & Tomlin, M. (2000). Institutionalising customer-driven learning through fully integrated customer feedback systems. *Managing Service Quality: An International Journal*, *10*(4), 205-215. doi:10.1108/09604520010341654

Wolfe, R. A. (1994). Organizational innovation: Review, critique and suggested research directions. Journal of Management Studies, 31(3), 405-431. doi: 10.1111/j.1467-6486.1994.tb00624.x

Yates, D., Wagner, C. & Majchrzak, A. (2010). Factors affecting shapers of organizational wikis. *Journal of the American Society for Information Science and Technology, 61*(3), 543-554. doi:10.1002/asi.21266

Yin, R. K. (1989). *Case Study Research: Design and Methods*. Newbury Park, CA: Sage Publications

Yin, R. K. (2009). *Case Study Research: Design and Methods* (4th ed.) (pp. 25-65). Thousand Oaks, CA: Sage.

Young, J. W. (1965). *A technique for producing ideas*. Chicago: Advertising Publications.

Yuan, Y., Fulk, J., Shumate, M., Monge, P. R., Bryant, J. A., & Matsaganis, M. (2005). Individual participation in organizational information commons: The impact of team-level social influence and technology-specific competence. *Human Communication Research, 31*(2), 212-240. doi:10.1111/j.1468-2958.2005.tb00870.x

Zhou, J., Shin, S. J., Brass, D. J., Choi, J., & Zhang, Z.-X. (2009). Social networks, personal values, and creativity: Evidence for curvilinear and interaction effects. *Journal of Applied Psychology, 94*, 1544–1552.

APPENDICES

Appendix 1: Interview Protocol

Greetings and thank you for agreeing to participate in this interview.

Let me start by briefly introducing myself and my research, and then I will explain how the interview will be conducted.

I am a Ph.D. candidate at Rutgers University in the United States in the School of Communication & Information. I am studying how employees use enterprise social media at work for sharing, discussing, and evaluating ideas, which together I call "the ideation process". I also want to understand how the technology can help or hinder that process.

As for the interview, you have been randomly selected from the list provided by the Human Resource department. I will be basically asking you questions about your work and your use of K*net. You may choose not to answer any questions, and you can stop at anytime. Your name and what you say will be kept confidential, and no one except myself and my adviser will be able to identify you, as I will mask any identifying information gathered from this research.

If you don't mind, I would like to record our conversation to help me with my reporting and transcription. Do you agree to be recorded?

Thank you! Before we begin, do you have any questions?
Let me start by asking about your work background.

<u>Work background</u>

1. How long have you been in the organization, and can you describe the kind of work that you do?

<u>Use of the collaborative tool (known as K*net)</u>

2. As a K*net user, can you tell me how often do you use the system?
3. In a typical day, if there is one, when do you use K*net?
4. What do you mainly use K*net for? Are there other uses of K*net for you?
5. Ideation in general
6. Do you like to share ideas generally? How have you done it before?
7. Have you noticed the posts on K*net that asked people for ideas?
8. Have you clicked on one? Why not?
9. Can you describe what you saw?
10. Did you go through and read all the ideas and comments? Why not?
11. What was good and not so good about that page (that asked for ideas)?

<u>Idea contribution/sharing</u>

12. Have you ever contributed an idea online on one of those posts? Why not?
13. Can you describe to me what was the idea about?
14. What motivated you to share the idea with others?

15. Did the page design or the comments on there play a role in your decision (to share idea)? How so?
16. What were your expectations when you decided to share the idea?
17. Have you ever had doubts about, or stopped yourself from sharing an idea? Why?
18. How did other people react to your idea? [negative/positive/neutral comments]
19. How would you describe the quantity of ideas there are on K*net? [few/a lot/etc]

Idea development

20. What do you think of the quality of ideas that other people gave?
21. Have you ever commented on an idea or replied to another comment? Why? Why not?
22. Have you tried to encourage others to comment on an idea? Or coordinate efforts to comment on an idea?
23. Can you describe how you went about looking for an idea to comment or evaluate?
24. What do you look for in an idea when evaluating if the quality is good or not?
25. What kinds of comments did you make?
26. Once you gave an idea or made a comment, have you ever gone back to the post? Why? Why not?
27. How much do you care about what will happen to your idea or comment?

Idea evaluation

28. Have you taken part in the process of deciding which ideas to accept or reject?
29. Have you tried to encourage others to decide on an idea? Or coordinate efforts to decide on an idea?
30. Who do you think should determine if an idea should be accepted or not? [all/mgmt]
31. Why would you "like" or "vote for" an idea? How do you choose the good ideas among the many?
32. Can you describe what happens next to the ideas after this process?

Overall experience

33. I want to know how far these ideation posts feature in people's conversations, so have you discussed any of the ideation posts with other people when you meet them? What did you talk about?
34. What do you think of the whole online ideation process? What did other people tell you about it?
35. What do you think were weaknesses or problems in the online ideation process?
36. What was something particularly interesting about the online ideation process?

So that was my last question I have for you. Before we end, do you have anything else you would like to add, or clarify, or change? If not, do you have any final questions? If not, then thank you very much for your participation.

Appendix 2: Informed Consent Form

You are invited to participate in a research study that is being conducted by Mr. Nik Rozaidi, a doctoral candidate in the School of Communication & Information at Rutgers University in the United States. The purpose of this research is to understand how employees use the social media platform at work for ideation, specifically for idea generation, development, and evaluation.

Approximately 30 employees will be interviewed for this study, and each interview will last approximately 30-60 minutes.

Participation in the study involves answering interview questions via Skype/telephone/in-person.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. Some of the information collected about you includes your job title, department, phone number, and email. Please note that we will keep this information confidential. No information linking the individual to the interviews will be published.

The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for at least three years.

There are no foreseeable risks for participating in this study. Participants may benefit from the awareness and knowledge of using the technology to participate in an important organizational process (the ideation and innovation process), that has been linked to improved job satisfaction and productivity.

Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions with which you are not comfortable.

If you have any questions about the study or study procedures, you may contact Mr. Nik Rozaidi at nrozaidi@rutgers.edu or call +1-231-769-2434, or you may contact his advisor, Dr. Jennifer Gibbs at jgibbs@rutgers.edu or call +1-848-932-8716. Both may also be reached by mail at School of Communication & Information, 4 Huntington Street, New Brunswick, NJ 08901, USA.

If you have any questions about your rights as a research subject, you may contact the IRB Administrator of Rutgers University at:

Rutgers, the State University of New Jersey
Institutional Review Board for the Protection of Human Subjects
Office of Research and Sponsored Programs
3 Rutgers Plaza, New Brunswick, NJ 08901-8559
Tel: +1-848-932-0150; Email: humansubjects@orsp.rutgers.edu

As the interview will be conducted electronically via Skype/telephone, if you consent to participate in this research study, please reply to the investigator's email (nrozaidi@rutgers.edu) and provide your written consent. Alternatively, you may sign below and email the scanned copy.

Subject name: _____
Subject signature:_____ Date: _____
Principal Investigator signature:_____ Date: _____

Appendix 3: Audio/Videotape Addendum To Consent Form

You have agreed to participate in a research study conducted by Nik Ahmad Rozaidi and supervised by Dr. Jennifer Gibbs. We are asking for your permission to allow us to record the audio part of the interview as part of that research study. You do not have to agree to be recorded in order to participate in the study.

The recording(s) will be used for analysis by the research team.

The recording(s) will NOT include your name or any other personally identifiable information.

The recording(s) will be encrypted, stored in a secured folder on the Internet (Dropbox.com), and protected by two-step authentication password. They will have no link to subjects' identity and will be destroyed upon publication of the study results.

As some of the interviews will be conducted electronically via Skype/telephone, if you consent to being recorded as described above during the above-referenced study, you may either (a) reply to the investigator's email (nrozaidi@rutgers.edu) and provide your written consent, or (b) sign below and email the scanned copy. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject name: _____
Subject signature:_____ Date: _____
Principal Investigator signature:_____ Date: _____

Appendix 4: R function for Blau's Index of Heterogeneity

Placed in Appendix for posterity.
Source: http://myowelt.blogspot.com/2009/08/r-function-for-blau-index-of-diversity.html
GroupID must start from 1.
Code follows:

```
blau.index <- function(groupid, feat){
 blau.index <- rep(0, length(levels(as.factor(groupid))))
 if (is.numeric(feat)) {
 # if the feature is denoted as a numeric ordinal variable
  for (i in 1:length(levels(as.factor(groupid)))){
   for (j in 1:length(levels(as.factor(feat)))){
    blau.index[i] <- blau.index[i] + ((sum(feat[groupid ==
    i & feat == j])/j)/ length(feat[groupid == i]))^2
   }
  }
 }
 else
 {
 # if the feature is denoted as as strings
  number.of.features <- length(levels(as.factor(feat)))
  feat.num <- rep(NA, times = length(as.factor(feat)))
  for (i in 1:number.of.features){
   feat.num[feat == levels(as.factor(feat))[i]] <- i
   feat.num[is.na(feat.num)] <- (number.of.features + 1)
  }
  for (i in 1:length(levels(as.factor(groupid)))){
   for (j in 1:length(levels(as.factor(feat.num)))){
    blau.index[i] <- blau.index[i] + ((sum(feat.num[groupid ==
    i & feat.num == j])/j)/length(feat.num[groupid == i]))^2
   }
  }
 }
 blau.index <- (1 - blau.index)
 return(blau.index)
}
```

Appendix 5: Codebook for First Round of Coding of Comments in the ESM

Code	Example Quote
Complaint	"How is it possible that after choosing the 13000 MaH powerbank for my door gift, I received a 9000 MaH instead?!" (#12716)
Problem	"Can you please assign someone who actually knows something to man the hotline?" (#12862)
Sarcasm	"Just install lots more road humps around the Company, surely it will make it even safer." (#10678)
Advice	"If you feel it's worth to buy [the Company's used cars], then buy. Otherwise don't buy. You don't have to ridicule the program." (#10991)
Reminder	"Everyone is reminded to use appropriate language when commenting; it reflects our professionalism." (#11577)
Suggestion	"The Company should acquire adjacent land and build a multi-storey car park. Staff is willing to pay. On weekends, open it to visitors to the nearby malls and charge them." (#12255)
Agreement	"I agree 100% with the suggestion." (#10326)
Disagreement	"Instead of asking to contact the 3 HR reps, why not do a townhall instead?" (#11556)
Tip	"Every month I would save $100. By the festive month, I would have $1200. That is more than the $700 advance given." (#12326)
Observation	"Company staff are a lucky lot. Almost everyone has a car. That's why we have the parking problem." (#12266)
Reflection	"Those days Company athletes have the capacity to win medals at various levels of competition. Nowadays it's a shame." (#10321)
Question	"Will the excess banknotes be returned into circulation after the festive period?" (#11937)
Answer	"Of course we will recirculate the banknotes, because we released more money than we should." (#11938)
Information	"Staff can go to the Company branch's departmental website to find the full list of resorts in [Borneo] that gives discount to the staff." (#10214)
Clarification	"The emergency phone number for [the Company's childcare center] is for parents with kids at Tunas." (#12370)
Chant	"Go Team!" (#11844)

Encouragement	“Let’s dig our albums and submit photos for the [photography] competition.” (#12345)
Support	“I’m willing to try out again to get the best [bowling] team to represent the Company.” (#10276)
Congratulation	“Congratulations to those selected to represent the Company’s bowling team.” (#10299)
Best wishes	“Compete healthily. Win or lose is secondary. Good luck to all athletes.” (#10342)
Condolence	“Condolences to the family. May God bless his soul.” (#12449)
Compliment	“Food was good. Thank you committee for ensuring the quality of this aspect of the event.” (#12613)
Gratitude	“Thank you Museum for organizing this. The kids loved the activities and the Company mascot.” (#12578)

Appendix 6: Ideation Threads on K*net (October 2012-October 2013)

- The 2,883 comments involved 284 threads, and found 101 ideation-related threads. Statistically, this sample size (n=101) gives a 90% confidence at a 6.5% margin of error.
- Note: √-idea accepted; x-idea rejected

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
1	14183769	2012-10	Athletics Carnival - Additional contest for best cheer team	9	5	0.20	0.52	1	Build own sports complex	4	0	5.15		y	y		2
2	14302760	2012-10	Inaugural Bankers' Conference on Green Technology Financing	6	6	0.72	0.78	0	Install LED lighting system	0	0	4.24					0
3	14323352	2012-10	Full report of 36th ICBG	57	39	0.66	0.90	1	√Transparency in results; Get new faces to participate; x-Recognize sports as work KPI; Organize internal competition for selection; √Conduct training earlier; Expand countries participating in ICBG	5	8	8.1	Y	y	y	y	3
4	14375998	2012-10	Launching of childcare center	7	6	0.49	0.82	1	√Create online album to share photos	1	0	3.69			y	y	2
5	14383853	2012-10	Addition of panel hotel resorts in Borneo	26	25	0.55	0.79	1	Add resorts in JB and rest of country	19	0	1.91		y	y		2
6	14386275	2012-10	Selection of players for bowling in Ministry of Finance Inter-Agency Games	85	28	0.33	0.87	1	√Revise selection criteria to be fairer	24	24	7.1	Y	y	y	y	3

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
7	14388059	2012-10	Report on teambuilding at Mint	8	8	0.41	0.69	1	Repeat program at HQ	2	0	0.27		y	y		2
8	14402200	2012-10	Latest results on Sports Carnival	24	22	0.63	0.88	1	Shuffle sports team members every few years	4	0	6.19	Y	y	y		2
9	14430009	2012-10	Treasure Hunt is coming	10	10	0.54	0.78	1	Theme suggestions	7	0	5.89			y		1
10	14438017	2012-10	Fitness activities at satellite office	1	1	-	-	1	Organize activities at HQ also; do it after 6pm	0	0	0					0
11	14441774	2012-10	Bikerz Cross-Border Mission: Kuala Lumpur to Krabi, Thailand	16	10	0.48	0.77	1	Do corporate social responsibilities (CSR) activities while on trip	1	0	1.71		y	y		2
12	14449456	2012-10	Training on handling polymer banknotes correctly	13	11	0.70	0.84	0	Share tips with public	2	0	4.36		y	y		2
13	14486753	2012-11	Staff Association 47th Annual General Meeting	12	8	0.57	0.72	1	Revise balloting system for resort reservation	5	3	5.95		y	y		2
14	14541236	2012-10	Lecture on Takaful (Islamic insurance)	4	4	0.63	0.75	0	Record the session and share the video	0	0	0.94					0
15	14558370	2012-11	Treasure Hunt - competition details	32	23	0.57	0.85	1	Replace destination hotel; organize by departmental teams not open teams	8	11	5.95	Y	y	y		2

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
16	14570476	2012-11	Koperasi promotion; Pies and inner shoe soles	1	1	-	-	1	Photos of products on offer	0	0	0					0
17	14582654	2012-11	Transfor-mation of JB City Centre	4	4	0.38	0.63	1	Add panel holiday resort in Johor	1	1	1.37		y	y		2
18	14594316	2012-11	Report on 15th Senior Management Conference	4	4	0.38	0.75	0	Open conference to all staff	1	0	3.88		y	y		2
19	14683622	2012-11	Koperasi promotion: Engine oil and others	3	3	0.44	0.67	1	Install massage chairs for extra Cooperative income	0	0	1.28					0
20	14709284	2012-11	Gaza emergency medical aid appeal	2	2	-	0.50	1	Use electronic fund transfer not cash	0	0	0.64					0
21	14750630	2012-11	Competition for creative writing in BM	11	11	0.60	0.83	1	Offer better prizes	1	2	2.03	Y	y	y		2
22	14765141	2012-11	Temporary closure of Staff Center Cafe	7	7	0.57	0.78	1	√HR should allow comments in K*net	2	0	5.16		y	y	y	3
23	14772130	2012-11	December lunch promotions at Staff Centre Cafe	7	6	0.57	0.82	1	√Improve HQ cafe hours/service/food	4	0	6.23		y	y	y	3
24	14799888	2012-12	Blood donation campaign	5	5	0.56	0.72	1	Rectify attached document format	3	0	1.71		y	y		2
25	14800528	2012-12	Corporate e-greeting card for new year	1	1	-	-	1	Allow batch uploading of emails for e-card delivery	0	0	0					0

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
26	14808931	2012-12	Results of Treasure Hunt	18	14	0.57	0.88	1	Continue Treasure Hunt next year	2	0	5.85		y	y		2
27	14825337	2012-12	KBO Book Sale is Back (with updated FAQ)	39	31	0.67	0.85	1	√Extend sale period; √Add participating bookstores	6	3	27.76	Y	y	y	y	3
28	14834070	2012-12	Installation of road humps	30	28	0.68	0.87	1	Install even more road humps for safety, but paint them early	17	6	6.78	Y	y	y		2
29	14863208	2012-12	Visiting Scholar Program	1	1	-	-	0	Extend program to SEACEN and other departments	0	0	0					0
30	14939255	2012-12	Koperasi promotion: Vitagen health drink	2	2	0.50	0.50	1	Do promotion during school holidays	0	0	0.11					0
31	14948387	2012-12	New visitor management procedures and system	92	52	0.66	0.81	0	x-More flexible visitor handling; √better system implementation	16	22	18.13	Y	y	y	y	3
32	14995498	2012-12	Book donation drive for the Chemor Library	4	4	0.38	0.63	1	Extra collection place	0	0	7.36					0
33	15096980	2013-01	Contingent selection for parade at National level celebration of Prophet's Birthday	34	22	0.52	0.85	1	x-Publish list of successful participants	9	2	9.72	Y	y	y	y	3
34	15145085	2013-01	Exchange of banknotes for Chinese New Year	17	10	0.73	0.52	1	Allow electronic fund transfers instead of cash	9	2	2.08	Y	y	y		2

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
35	15158925	2013-01	Temporary closure of cafeteria	20	18	0.71	0.86	1	Create more seats/indoor area; more van to satellite office during closure	0	0	6.91	Y				0
36	15184529	2013-01	Koperasi promotion: Mini sales carnival	11	9	0.63	0.73	1	x-Allow Cooperative savings to be used to repay loan	2	0	9.8	Y	y	y	y	3
37	15202891	2013-01	Sale of used vehicles	30	25	0.55	0.82	1	Put photos of cars for sale	0	0	14.07	Y				0
38	15264720	2013-01	Special menu for February at Staff Centre Cafe	5	4	0.64	0.56	1	Offer healthier food options that reduce stress	0	3	2.17		y	y		2
39	15374903	2013-02	Koperasi financing offer	25	22	0.54	0.86	1	x-Do away with Director approval for loan applications	8	2	4.02		y	y	y	3
40	15408091	2013-02	Sports Carnival	18	16	0.69	0.77	1	Recognize sports as a work key performance indicator (KPI)	3	1	0.9		y	y		2
41	15420000	2013-02	Discussion on the Quran with Ustaz Don	23	21	0.64	0.81	1	Bigger venue; streaming video	4	1	6.04		y	y		2
42	15438198	2013-02	Talent Search is coming	10	7	0.32	0.64	1	Announce prize categories early	0	0	4					0
43	15449921	2013-02	Special menu for March at Centre Cafe	3	3	0.44	-	1	Offer newer food choices	0	0	12.81					0
44	15482511	2013-03	Promotion and reassignment of senior officers	10	10	0.66	0.84	0	√Use updated staff photos	4	0	5.04		y	y	y	3

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
45	15502290	2013-03	Briefing to staff on Annual Report	10	10	0.66	0.84	0	Upgrade video streaming service	5	1	0.11		y	y		2
46	15507284	2013-03	Governor's interview with Chinese television (CCTV)	2	2	0.50	0.50	0	Improve video quality	0	0	0.18					0
47	15528929	2013-03	Talent Search singing competition	18	12	0.29	0.77	1	Get new staff to join	3	0	7.02		y	y		2
48	15532624	2013-03	Unrecorded leave for the sikhs' Vaisakhi celebrations	29	19	0.65	0.80	0	Give 1 day unrecorded leave to all and not just one community group	12	5	2.64	Y	y	y		2
49	15538435	2013-03	Dress code	65	50	0.62	0.85	0	Extend dress code to vendors	2	0	9.19	Y	y	y		2
50	15541914	2013-03	Introduction of e-payments for internal outlets	5	5	0.48	-	0	Ways to promote e-payments more broadly	3	1	4.24		y	y		2
51	15543337	2013-03	Celebration of Earth Hour: Uniting people to protect the planet	8	8	0.47	0.72	1	Ways to help save the environment in the workplace	3	1	4.82		y	y		2
52	15572244	2013-03	Koperasi promotion: Pies, lasagna, and honey	2	2	0.50	0.50	1	Give advance notice of promo	0	0	5.02					0
53	15606702	2013-04	Koperasi promotion: Easecox products	2	2	0.50	0.50	1	Give advance notice of promo	1	0	0.21		y	y		2
54	15624700	2013-04	Demise of staff member	71	65	0.73	0.90	1	Print out obituary and share with family	1	0	3.22		y	y		2

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
55	15625764	2013-04	Talent Search singing competition	7	7	0.57	0.61	1	Do more religious activities	1	0	3.05		y	y		2
56	15658133	2013-04	New career progression principles for staff	73	53	0.40	0.88	0	Do townhall to explain	10	4	7.15	Y	y	y		2
57	15686613	2013-04	International reserves	5	2	0.48	0.48	0	Publish name of author	0	1	6.82		y	y		2
58	15697124	2013-04	Koperasi promotion: Celcom products	5	5	0.32	0.80	1	Ease loan conditions to increase Cooperative income	1	1	4.66		y	y		2
59	15708989	2013-04	Report on official staff activity	6	5	0.61	0.50	0	Check grammar before publishing	0	0	0.08					0
60	15709197	2013-04	Pre-selection of players for virtual games at ICBG	10	7	0.46	0.74	1	Include more virtual games	2	0	7.07		y	y		2
61	15721000	2013-05	Use of e-payments at internal outlets: Why use cash?	6	6	0.28	0.72	0	Discounts to promote e-purse	1	0	1.01		y	y		2
62	15721659	2013-05	Talk on balancing career and family life	1	1	-	-	1	Videotape the session	0	0	0					0
63	15727869	2013-05	Reopening of outdoor cafe	43	27	0.70	0.83	0	Create smoking space; Allow self service for food	5	4	10.77	Y	y	y		2
64	15744135	2013-05	^Museum sales promotion	8	7	0.53	0.75	1	√Mention stock status	0	0	4.92				y	1

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
65	15837630	2013-05	Sports Carnival: Badminton competition	6	6	0.67	0.78	1	Shuffle players in teams	0	0	0.24					0
66	15841796	2013-05	Blood donation drive	8	7	0.66	0.72	1	More frequent drives; add venues	0	0	4.91					0
67	15888826	2013-06	Survey on academic achievement of Puspanita members' children	3	3	0.44	0.67	1	Reduce threshold for prizes	0	1	0.14		y	y		2
68	15961268	2013-07	Food donation drive in conjunction with Ramadan	5	4	0.32	0.64	1	Revise poster ad to make activity more enticing	0	0	5.86					0
69	15966744	2013-06	Enhancements to services by healthcare provider PMCare	8	8	0.59	0.81	1	Extend validity of guarantee letter	1	0	4.63			y		1
70	15979892	2013-07	Koperasi promotion: Honey products	2	2	-	0.50	1	Give advance notice of promo	1	0	1.28		y	y		2
71	16003412	2013-07	Communica-tion Session on FSA & IFSA Acts of Parliament	10	9	0.42	0.82	0	√Record the session and share the video	3	0	1.76		y	y	y	3
72	16018543	2013-07	Launch of Going Green Campaign with recycled fit banknotes for Eid	7	4	0.57	0.24	0	Polish old coins for recirculation	3	1	4.31		y	y		2
73	16033122	2013-07	Special withdrawal of Koperasi savings for Eid	56	34	0.31	0.81	1	√Give loan not withdraw savings	13	6	6.18		y	y	y	3

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
74	16035742	2013-07	Annual dinner - Box Office Nite	63	45	0.61	0.90	1	Give portable prizes	0	4	8.01	Y	y	y		2
75	16046063	2013-07	Payment for banknote exchange for Eid through internet banking only	27	21	0.56	0.86	1	Shift deadline after payday; make payday earlier	2	1	6.98	Y	y	y		2
76	16059639	2013-07	Closing date for special savings withdrawal from Koperasi	28	20	0.31	0.81	1	See 16033122	6	0	2.9	Y		y		1
77	16062896	2013-07	Eid eCard	20	13	0.51	0.68	1	Use company eCard not third party	0	1	1.99		y	y		2
78	16071077	2013-07	Extension of van shuttle service from HQ to satellite office	20	14	0.62	0.83	1	Add more convenient parking for staff	2	1	5.01		y	y		2
79	16071852	2013-07	Financial assistance for support staff for Eid celebrations	67	52	0.38	0.91	1	Give cash/ not loan advance	0	3	6.84	Y	y	y		2
80	16073937	2013-07	Koperasi promotion: Ramadan sales carnival	2	2	0.50	0.50	1	Shift van shuttle service during carnival	0	0	0					0
81	16088622	2013-08	Annual dinner - Box Office Nite	45	37	0.64	0.83	1	Pay staff who perform	0	0	23	Y				0
82	16099365	2013-07	Risk Awareness Day photography competition	5	5	0.32	0.72	1	Raise prize money	0	0	13.44					0

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
83	16121727	2013-08	Onsite emergency ambulance service at HQ	15	15	0.70	0.88	1	x-Expand service to regional offices	0	2	10.02			y	y	2
84	16125042	2013-08	Risk Awareness Day: Tagline Competition	20	14	0.54	0.84	1	Revise prize rules to be fairer	5	0	9		y	y		2
85	16158426	2013-08	Risk Awareness Day: Crossword puzzle competition	1	1	-	-	1	Check grammar before publishing	0	0	0					0
86	16172958	2013-08	Invitation to Eid Open House	42	23	0.45	0.82	1	Label food served for dietary restrictions	0	0	9.13	Y				0
87	16180443	2013-08	Demise of staff	28	28	0.62	0.89	1	Mention cause of death	0	3	2.05		y	y		2
88	16231134	2013-09	Issuance of commemora-tive coins in conjunction with 50th Anniversary of Muzium Negara	11	10	0.58	0.83	0	Give priority to staff to purchase coins	2	1	2.29		y	y		2
89	16235494	2013-09	Koperasi promotion: ASB financing	6	5	0.50	0.72	1	Offer new loan type	0	0	0.84					0
90	16303133	2013-09	Issuance of Commemora-tive Coins in Conjunction with 50th Anniversary of the Formation of country	1	1	-	-	0	Allow to buy coin without casing	0	0	0					0

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
91	16308485	2013-09	Annual Dinner - Program updates	117	71	0.58	0.87	1	Let dinner partner be anyone; Publish winners afterwards	2	2	6.78	Y	y	y		2
92	16335767	2013-09	Lecture by Mindvalley CEO	10	6	0.54	0.70	0	Record the session and share the video	4	0	14.81			y	y	2
93	16342676	2013-09	Koperasi promotion: Clothings and Tupperware	13	12	0.70	0.88	1	√Give advance notice of promo	8	0	1.07		y	y	y	3
94	16348106	2013-09	Report on Annual Dinner	26	22	0.57	0.86	1	√Cover events on both nights/ not just first night	1	3	6.69	Y	y	y	y	3
95	16364247	2013-10	ICBG is coming	24	22	0.62	0.82	1	Do real sports not mind games	2	1	4.12		y	y		2
96	16368125	2013-10	Treasure Hunt is coming	18	18	0.50	0.75	1	Change date	7	5	2.8		y	y		2
97	16368805	2013-10	Toastmasters Club recruitment meeting	3	3	-	0.44	1	Change time	0	0	0.7					0
98	16379502	2013-10	Publication of Key Financial, Monetary and Economic Indicators (Travel Book) on K*net	2	2	-	0.50	0	x-Include some analysis	0	0	3.21		0		y	1
99	16380798	2013-10	Lecture by Groupon International VP for Asia Pacific	1	1	-	-	0	Record the session and share the video	0	0	0					0

Num	postID	PostDate	PostTitle	ThreadLen	Commenter Count	HierDiversity Blau	FuncDiversity Blau	Nonwork	IdeaDesc	NumLikes	NumDislikes	Thread Duration	Facilitated	IdeaDiscussed	IdeaVoted	IdeaDecided	Ideation QualityScore
100	16404117	2013-10	Live Streaming of Prime Minister Special Address	5	5	-	0.72	1	√Record the session and share the video	0	0	4.86				y	1
101	16409579	2013-10	Domestic debit card campaign with Starbucks	11	10	0.63	0.83	1	Open in-house Starbucks	1	1	5.92		y	y		2