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The Role of Interpersonal Attitudes and Emotion in Democratic
Decision-Making

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Zusammenfassung

Emotionen spielen eine entscheidende Rolle in unserer Kognition und unserem Verhalten und beeinflussen Entscheidungsprozesse erheblich. Dennoch ist die Forschung zu ihrem Einfluss in sozialen und organisatorischen Kontexten bisher begrenzt. Diese Studie untersucht die Auswirkungen von Emotionen auf demokratische Entscheidungsprozesse, wobei der Fokus auf dem Zusammenspiel zwischen Emotionen und verschiedenen Organisationsstrukturen liegt. Durch die Integration verschiedener bestehender Modelle zu den emotionalen Effekten auf Kognition und Entscheidungsfindung entwickelt diese Masterarbeit einen neuen Rahmen, um den Veränderungsprozess in Organisationen zu untersuchen, in denen Individuen frei ihre bevorzugten Optionen wählen können. Die Emotionen Freude, Wut, Traurigkeit und Zufriedenheit werden in diesem Rahmen untersucht und nach Valenz und Intensität kategorisiert. Sie werden mit neutralen emotionalen Zuständen in sowohl dezentralen als auch zentralisierten Organisationsstrukturen verglichen.

Zu diesem Zweck wird ein modifiziertes Modell der Veränderungsdiffusion verwendet, das den Einfluss von Emotionen auf die Offenheit für Veränderungen (Explorationsfaktor) und die Verträglichkeit (Empfänglichkeit) der Individuen einbezieht. Die Ergebnisse zeigen, dass starke Emotionen, kombiniert mit Zufriedenheit, die höchsten Raten der Veränderungsakzeptanz in beiden Strukturtypen bewirken. Darüber hinaus stellt die Studie fest, dass das Zusammenspiel von Emotionen und Organisationsstrukturen am deutlichsten ist, wenn das Managementteam eine hohe Empfänglichkeit aufweist. Diese Erkenntnisse liefern wertvolle Einblicke in die Rolle von Emotionen in organisatorischen Veränderungsprozessen und unterstreichen die Bedeutung der Berücksichtigung emotionaler Dynamiken in der Organisationsgestaltung und -strategie.

Abstract

Emotions play a pivotal role in our cognition and behavior, influencing decision-making processes significantly. However, research on their impact within social and organizational settings remains limited. This study aims to explore the effects of emotions on democratic decision-making, focusing on the interplay between emotions and different organizational structures. By integrating various existing models of emotional effects on cognition and decision making, this Master thesis proposes a novel framework to investigate change adoption in organizations where individuals can freely choose their preferred options. The emotions of joy, anger, sadness, and contentment are examined within this framework, categorized by their valence and intensity, and compared to neutral emotional settings in both decentralized and centralized organizational structures.

To achieve this, a modified change diffusion model is utilized, incorporating the influence of emotions on individuals' openness to change (exploration factor) and agreeableness (susceptibility). The results suggest that strong emotions, when combined with contentment, lead to the highest rates of change acceptance in both types of structures. Additionally, the study finds that the interplay between emotions and organizational structures is most pronounced when the management team exhibits high susceptibility. These findings provide valuable insights into the role of emotions in organizational change processes, highlighting the importance of considering emotional dynamics in organizational design and management strategy.

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1. Introduction

The research on human behaviour and decision making has long left the concept of fully rational agents which evaluate choices based on the highest utility the outcomes of their choices can provide. One of the first researchers to acknowledge and define this shift was Herbert Simon and his concept of bounded rationality, stating that people are limited in their ability to make fully rational decisions. He enriched this research field with a significant framework that defines the settings and conditions under which humans make decisions (Simon, 1955). The simple model of the “homo economicus”, who possesses complete information, precisely calculates optimal outcomes and has stable preferences is an overly simplified model that fails to fully capture the complexities of human decision making, especially under emotional influences.

Contrary to what was believed for a long time, emotions help us make better decisions. Damasio (1994) has made a revolutionary discovery when he examined the patients who suffered from a head injury, disabling them from feeling emotions. What he found is that these individuals struggled with evaluating risks and benefits associated with different choices and underperformed the participants who could feel emotion and rely on their “gut feeling”. Because of this, understanding the interplay between emotions and decision-making processes is crucial to uncover what constitutes our decisions, which we have to bring on a daily basis.

The current research field on the impact of emotions on cognition and decision making is rather scarce and scattered across various disciplines. This is particularly the case in group decision-making, such as organizations, where decisions depend on dynamics and structures of the social network. The research on the effects of emotion provides various models and various approaches to measuring the effect of emotions. As introduction to the topic, this thesis seeks to gather and outline these effects in both a social and an individual context. It summarizes the consistent findings in the appraisal tendencies particular emotions carry and provides a framework for exploring these effects in an organizational setting.

Emotions play a significant role in determining our approaches to problem solving and interactions with other members of the group. To name a few, positive moods, for instance, induce creative thinking and

general acceptance of novel ideas. Both sadness and contentment, although different in their valence and experience, both enhance cooperativeness in the group. These findings are highly valuable in understanding how this translates on organizational decisions and results.

The study seeks to explore the delicate interplay between human interaction, expressed and felt emotions as well as susceptibility to opinions of others. It utilizes the existing change diffusion model, by modifying the Python code and designating emotional states for each agent defined in the code. The resulting simulations allow a comparison between different configurations and provide valuable insight into the efficiency and effectiveness of emotions in spreading change throughout the organization. The simulation runs were conducted on various combinations of emotional distribution, susceptibilities and on two organizational structures. The structures in question are a circular centralized structure and a fully decentralized structure. The agents were divided into teams, with one team chosen to mimic a management team. This team was treated with emotions that are high in arousal, either joy or anger, while other agents were given treatments of neutral, sad or content affective states. To further make sense of the social influence, all emotional and organizational structures were further tested on three different variations of susceptibility scores.

For instance, observations and analysis of the results have shown that teams which yielded the highest rates of change acceptance were centralized, managers were highly cooperative, and employees were either content or neutral. Similarly, although centralized structures showed higher overall last period change acceptance, the change is introduced at a higher pace in decentralized organizations, making them more beneficial for prompt changes and quick reactions to market changes. This is attributed to the number of connections and simultaneous influence of all agents within the network. In the long run, however, the centralized structures proved more effective, especially when managers exhibited high susceptibility to others' opinions. Understanding these dynamics can help managers and policymakers design strategies that foster positive change and innovation, ultimately enhancing organizational performance and competitiveness.

2. Decision-Making Process

In traditional economic theory, decisions are brought by a homo economicus, who fully rationally brings economic decisions. He possesses complete, or extensive information about the environment and the task at hand, has a very stable system of preferences and can very accurately calculate the course of action that brings him the highest personal benefit. These general models of rational choice all carry the same set of assumptions and constraints. Understanding these assumptions helps better understand the settings of the model employed in the course of this thesis. According to Simon (1955, p. 37), the assumptions underlying general rational choice models encompass the following elements:

- **Behavioral Alternatives:** The range of actions that an agent can take.
- **Perceived Behavioral Alternatives:** The subset of actions that the agent actually considers or recognizes as possible.
- **Possible Future States:** The various outcomes that could result from different actions.
- **Outcome Information:** Knowledge about which actions lead to which outcomes.
- **Pay-off Function:** The utility or value that the agent derives from each potential outcome.
- **State Probabilities:** The likelihood of each outcome occurring, given a specific action.

Understanding what constitutes a decision and how humans make them is greatly important for understanding all social phenomena that surround us, including our daily politics, economics and well-being. As human species, we are bound to live under, not only our own choices, yet also under those made for us. Knowing what differentiates decisions with positive outcomes as compared to those with negative, can help us all make decisions that provide the highest overall benefit. This is why these simplifying conditions do not provide a thorough enough understanding of how decisions are made. Advances in the fields of behavioural and organisational sciences have created a shift towards models which incorporate irrational human behaviours, from effects that social settings induce in individuals, to those felt from within, our emotions and moods.

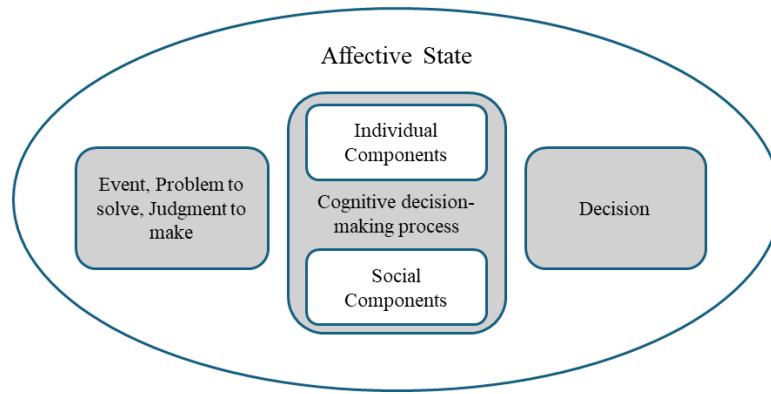


Figure 1: Cognitive process in an affective state

Figure 1 helps visualize the decision-making process under affective states. Namely, the affects surround the whole cognitive and action process, influencing some of its aspects and ultimately shaping the outcomes. In the following chapters emotional influence on decision-making is explored in detail.

3. Role of Emotions in Decision Making

As noted, most research surrounding decision making has considered decisions to be a product of logical thought (8). It is however inevitable that humans are rarely fully rational, leading to a conclusion that this cognitive process revolves around factors much more complex than mere rational optimization of outcomes. Some of the most influential behavioural theories confirming this idea are the theory of bounded rationality (Simon, 1955), the prospect theory (Kahnemann, & Tversky, 1979) as well as the heuristic and biased decision-making (Kahnemann, & Tversky 1974; Kahnemann, & Tversky, 1979). These studies have marked a significant shift in behavioural sciences. Among other themes, this shift was characterized by a growing number of research focused on the role of emotion in various cognitive processes, and so, in decision making as well (Beach, & Connolly, 2005).

The extent of these emotional effects is highly dependent on demands and conditions surrounding the task or problem at hand (Payne, 1982; Ross, & Ellard, 1986). More precisely, task complexity, and personal relevance of the task, influence the extent to which moods and underlying affects influence our choices. Jointly, these factors determine the decision speed, decision efficiency, as well as information that is preferred to make a decision (Forgas, 1989). For instance, a high personal relevance of the task was shown to be less influenced by emotions. In this case, people lean towards task-related information, regardless of the valence or type of the emotion they feel.

3.1. Affects, Emotions and Moods

Empirical research has focused on two general categories of affect – **emotions** and **moods**. While emotion is a differentiated response to a specific situation, moods are considered a diffuse state. Moods are long-lasting and they occupy the background of our consciousness, while emotions are short-lived, personally significant and triggered by an identifiable event (Barry, 1999; Oatley, & Jenkins 1996; Rosenberg 1998). The emotions triggered by events can be both positive or negative in nature and a product of either conscious or unconscious evaluations of the event at hand (Frijda 1986; Lazarus, 1991). For instance, cheerfulness or depressions are types of diffuse moods, while anger or fear are types of acute emotions (Frijda, 1994).

Affects can further be either integral or incidental in the way they influence subjective experiences. Integral affects stem from the current choice and are relevant to the judgment to be made, while incidental affect influences judgment, but is irrelevant to the present choices. For example, good weather can translate to our judgement of unrelated topics (incidental affect), while anticipated regret, when evaluating a gamble, impacts whether or not we will carry on the gamble (integral affect) (Larrick, & Boles, 1995; Loomes, & Sugden, 1982; Clore, Schwarz, & Conway, 1994; Forgas, 1995; Schwarz, 1990; Schwarz, & Clore, 1996).

3.2. Mechanisms of Affect Infusion

One of the assumptions is that emotions activate memories associated with that emotion (Bower, 1981), further aiding the encoding, retrieval, and selective use of information during social judgment processes. These judgments are, on the one side, shaped by the constructive nature of the judgment itself, i.e. its objective characteristics, and on the other, by the ideas, memories and interpretations that arise during exposure to the situational stimuli. These cognitive structures are crucial for perceiving, learning, and interpreting these social stimuli (Forgas, 1995).

This infusion of affect in human cognitive processes happens via two mechanisms: **affect-priming** and **affect-as-information**.

The affect-priming principle proposes that emotions indirectly influence judgments by facilitating access to associated cognitive categories (Forgas, 1995). In affect priming, the exposure to a stimulus

indirectly influences the person's subsequent emotional response or evaluation of another stimulus. In experimental settings, this is, for instance, achieved through showing participants a series of positive or negative stimuli (primes) and asking them to evaluate a subsequent neutral object such as a face or a product.

Affect-as-information, on the other hand, is a cognitive process where individuals use their current affect state as a source of information to make judgments or decisions. The emotions that arise during the process serve as signals that people rely on to guide their behaviour. As opposed to affect-priming, which uses external emotional stimuli on subsequent cognitive processes, affect-as-information uses emotions that arise during the evaluation of the stimuli subject to decision-making.

These mechanisms serve as a testament to the intertemporal nature of emotional effects. Emotions assist in anticipating feelings before decisions are made (past), experiencing them upon receiving outcomes (present), and recalling them when reflecting on past decisions (memory) (Sevdalis, Petrides, & Harvey, 2007). Similarly, Mellers, Schwartz, and Ritov (1999) concluded that the emotions individuals anticipate or have experienced due to their decisions significantly influence their present and future behaviour.

Important to note however, is that, while the set of emotions people feel remains the same, individuals systematically differ in how they perceive emotions, as well as in their capacity to process emotional information (Winter, & Kuiper, 1997).

3.3. Individual (Intrapersonal level) Effects of Emotion

The focus of this thesis is on emotions, which as Pekrun and Frese (1992) define them, are subjective experiences that typically comprise of **(a)** emotion-specific feeling states (affective components), **(b)** perceptions of physiological and expressive processes (body-perceptual components), and **(c)** emotion-specific cognitions (cognitive components). Of particular interest for the emotional effects on democratic decision-making in organizations are the cognitive components.

Most importantly, the cognitive processes triggered by emotions provoke a sense of action readiness (Frijda, 1986), known as **affect reactivity** (Seo, Barrett, & Bartunek, 2004). The emotion-related cognitions interrupt the ongoing cognitive processes and direct attention, memory, and judgement to

address the event and circumstances that caused the emotion. In particular, the intensity of the emotion determines the level of activation generated towards the given task. (Lazarus, 1991; Schwarz, 1990; Simon, 1967).

Given all that has been discussed, affective states clearly play a crucial role in decision-making, primarily through their interaction with our cognitive processes (Lerner, Li, Valdesolo, & Kassam, 2015). Despite this, research on how emotions influence decision-making has been relatively limited.

The most notable model for the role of affective states in thinking and judgments is the **Affect Infusion Model (AIM)**, developed by Joseph P. Forgas in 1995. Affect infusion, by definition, is the process in which affective information inputs become incorporated into the judgment process, and thus, influence the judgment outcome. The **AIM** identifies four judgmental strategies that aid our decision-making: (a) direct access, (b) motivated, (c) heuristic and (d) substantive processing. The model postulates that the degree of affect infusion, i.e. emotional impact, in our judgment varies based on the strategy employed in the process. Namely, the study found that judgments requiring heuristic or substantive processing are more prone to effects of emotion, than those using direct access or motivated judgments.

The direct access and motivated processing require little generative and constructive processing. They are retrospective and involve directed and predetermined search for information patterns. Since they require little conceptual and analytical thought, yet rather precise and clear information, they are less influenced by emotion and other affective states (Forgas, 1995). An example of a direct access judgmental strategy is recognizing a familiar face in a crowd. When a person sees someone they know well, such as a close friend or family member, the brain quickly retrieves stored information about that person's appearance without extensive analysis. This process involves a rapid, straightforward search in memory not influenced by current emotional states. Heuristic and substantive processing are, on the other hand, generative processing strategies, used to compute outcomes. They require some degree of open and constructive thinking (Fiedler, 1990; Fiedler, 1991; Forgas, 1992) and allow for the affect states to either indirectly (Forgas, & Bower, 1988) or directly (Schwarz, & Clore, 1988) influence the judgmental outcome. Their generative characteristics, and in case of substantive processing also the

complexity, make them more susceptible to affect infusions, and thus emotional effects in decision-making.

Focusing on emotions in work settings, Pekrun and Frese (1992) further divided emotions into four distinguishable categories:

- General emotions not specifically related to work,
- Job related emotions pertaining to one's job as a whole,
- Task-related emotions connected to specific tasks at work,
- Non-task emotions pertaining to social aspects of work.

Related to previously mentioned intertemporal characteristic of emotions, they further defined them as either process-related, prospective, or retrospective.

3.4. Social (Intrapersonal level) Effects of Emotion

So, emotions are subjective experiences, with physiological reactions, which trigger cognitive processes. However, emotions are also expressed, either intentionally or unintentionally through our facial expressions (Ekman, 1993). This expression of emotions implies that emotions also serve a social function (van Kleef, van Doorn, Heerdink, & Koning, 2011). Parkinson (1996) notes that not only are our emotions evoked by social interaction, they also influence the behaviour of the partners we are interacting with, by serving as a form of communication (Ekman, 1993; Frijda, 1986; Knutson, 1996). Most research has, however, neglected these social characteristics and has, in turn, explored the intrapersonal effects of affective states (Ashby, Isen, & Turken, 1999; Forgas, 1995; Isen, 1987; Schwarz, Bless, & Bohner, 1991; Wyer, Clore, & Isbell, 1999). Many of these studies have been set in social situations, yet the role of emotions has mostly been studied on an individual level, ignoring the interactions with others. Focusing solely on intrapersonal level of emotional experience fails to capture the whole story about decisions in social settings (van Kleef et al., 2011).

Lately, an increase in research surrounding emotional reactivity of individuals in group settings has been noted, yet these effects have rarely been addressed systematically. Clark, Pataki and Carver (1996) for instance found anecdotal evidence that people sometimes purposefully display sadness to call for help (van Kleef et al., 2011). This is because observers can react to emotional expressions of others,

which subsequently influences their behaviour. As noted, specific emotions emerge based on one's assessment of a given situation (Frijda 1986, Lazarus 1991). Consequently, witnessing someone express a specific emotion offers detailed information into that person's perception of the situation. So, if someone across expresses happiness in a situation, the person observing this, and participating in the same situation, may judge the situation as harmless, which could in turn, promote cooperation.

This means that displayed emotions convey information that impact our strategic information processing (Forgas, & George, 2001). Due to this significant impact emotional expression can have on others, they are often used as means of persuasion (Forgas, 2001). In an organizational setting, they may, therefore, also be used as a tool to manipulate, particularly in negotiation, leading the opposing party to act in a way they otherwise would not (van Kleef et al., 2011). Similarly, individuals might express anger as a means to intimidate and exert influence over others (Frank, 1988). For example, especially managers might intentionally express anger to affect their subordinates (Fitness, 2000). On the other hand, individuals may deliberately display happiness to be liked by others (Clark, Pataki & Carver, 1996).

One of the mechanisms that allows for this interpersonal effect of emotions is **emotional contagion**, which depicts the tendency to unintentionally process and adopt emotions of others around them. This happens through nonverbal cues, such as facial expressions, vocalizations, posture and bodily movements (Hawk, Van Kleef, Fischer, & Van der Schalk, 2009; Hess, & Blairy, 2001) or through verbal expression of emotion, such as the tone of voice. It can have a significant effect on the group dynamics and cohesion, influencing how emotions spread and affect individuals in social settings.

The general affect in a group setting may provide a basis for creating a certain type of environment. For instance, it has been shown that positive affects increase conformity (Tong, Tan, Latheef, Selamat, & Tan, 2008) and promote cooperation more so than displays of negative emotions.

Other way around, the interpersonal effects of emotions are dependent on whether the setting is cooperative or competitive (van Kleef, De Dreu, & Manstead, 2010). When the situation at hand requires future cooperation and trust, people may pay more attention to emotional expressions, whereas competitive settings call for a more calculative and strategic approach to others' apparent affect states

(Knutson, 1996). Therefore, the interpersonal effects of emotional expression in cooperative settings are best explained by **affective reactions** (i.e. emotional contagion, affect infusion, and mood management) (van Kleef, De Dreu, & Manstead, 2010; van Kleef, 2009) which involve automatic, emotion-based responses that influence one's thoughts and behaviors. Conversely, in competitive contexts, these effects are better understood through strategic inferences individuals draw from others' emotions (van Kleef, De Dreu, & Manstead, 2010), which involve deliberate, analytical assessments aimed at understanding and predicting others' intentions and actions.

From the arguments outlined above, one of the most notable models of emotions in social settings is the **emotions as social information model** developed by Van Kleef, De Dreu and Manstead in 2010. It posits that emotions serve two important roles in social interactions. First is that emotions help us make sense of unclear situation, by giving us intuitive guidance, while the second is that the interpersonal effects of these emotions are further shaped by the competitive or cooperative nature of the situation (van Kleef, De Dreu, & Manstead, 2010).

As much as this interpersonal emotional influence occurs in informal settings, it is present in organizations as well, where experienced and expressed emotions influence behaviours and attitudes of others in the team (Fisher, & Ashkanasy, 2000; Weiss, & Cropanzano, 1996). In organizational settings, however, the expression of emotion is often governed by organizational display rules, which require employees to manage and restrain their emotions. These rules and emotional thresholds are typically more defined and restrictive relative to informal contexts such as family or friendships (McManus, 2019; Blomfield, Troth, & Jordan, 2016). Typically, strong and excessive displays of emotion in work settings are perceived as inappropriate and ineffective (Ashforth, & Humphrey, 1993; Geddes, & Callister, 2007; Rafaeli, & Sutton, 1991)

The reasons for this restrictive and normative approach to emotional expression at work is that organizations find themselves in competitive environments, in which employees are required to express positive emotions such as happiness, enthusiasm, or engagement (Fineman, 2006). To thrive, organizations focus on creating cooperative environments, whose setting is achieved through positive emotions, rather than a negatively inclined work environment. Therefore, emotions at work, particularly

strong and negative emotions (e.g. anger), must be managed to foster cooperation and ensure effective work climate between employees over time (Boudens 2005).

A further layer of the social settings, next to competitiveness or cooperativeness of the group, is the conformity or deviance of the members. Although a confirmative, cooperative environment is good for maintaining the necessary outputs, in many situations, deviance is important for attaining group goals, particularly in situations that require creativity and out-of-the-box thinking (Kruglanski, & Webster, 1991). Several studies have indicated that conformity is more probable when individuals are motivated to gain acceptance from a group and when their conformity can be observed by that group. For example, Dittes and Kelley (1956) demonstrated that individuals who felt rejected by their group were more likely to conform publicly to their group's judgments compared to those who felt less rejected.

Some studies have found that the types of emotional displays determine the ability to create connections to others, with some showing to create unfavourable effects. Since different emotions of positive valence may exert different types of influence, it is beneficial to focus on the role of discrete emotions, rather than simply differentiation between positive and negative ones (Blomfield, Troth, & Jordan, 2016).

4. Models of Emotional Effects on Cognition and Decision-Making

While the affect infusion model explains the extent to which emotions influence our judgments, another crucial aspect to consider is the study of specific emotions and their distinct effects on our decisions. The affect infusion model focuses on the general processes and broad influences of emotions, whereas the models outlined below delve into analyzing and categorizing emotions based on their finer components, thereby identifying more nuanced and specific effects. For instance, research has shown that individuals experiencing happiness tend to prefer task-related information, focusing on details relevant to the task at hand. In contrast, individuals experiencing sadness were shown to prefer interpersonal information, paying greater attention to social and relational aspects (Forgas, 1989). This differentiation highlights how specific emotional states can shape cognitive processes and decision-making processes. By dissecting emotions into their components, we gain a deeper understanding of the unique influences of individual emotions on our cognition and judgments.

Emotions arise as a result of an individual's conscious or unconscious evaluation (appraisal) of some event as positively or negatively relevant to a particular concern or goal (Frijda, 1986; Lazarus, 1991).

4.1. Valence-based approach (Isen 1987, Schwarz 1990)

A large body of research that systemize the role of emotions in human cognition and-decision making is the valence-based approach, which distinguishes only between positive and negative emotions. According to this view, emotions of the same valence display some mutual effects on cognition.

An influential study by Isen (1987), has concentrated on effects of positive emotions in two areas, namely, (a) social behaviour and (b) cognition. The influences of positive affects on social behaviour were measured on four other dimensions, the degree of helpfulness, cooperativeness, benevolence to self, and risk preference. In terms of effects on cognition, Isen has identified emotional influence of same-valence emotions on memory, problem solving, and cognitive organization. He has found significant evidence that affective states exercise strong influence on social behaviour and cognitive processes. Although Isen focused on the effects of positive emotions in general, he recognized the potential differences that emotions of the same valence might have in terms of their effects on both cognition and social behaviour.

The studies based on the valence approach brought important insights into the areas influenced by our emotions. However they are of little value for a more thorough understanding, which could be put into practical use in organizational settings. Emotions of the same valence differ, not only in their intensity, appraisal tendencies (Smith, & Ellsworth, 1985), but also in the way we express them (Ekman, 1971). Because the valence-based approach oversimplifies our complex emotions, it is essential to introduce models that consider multiple dimensions of emotions and their effects, allowing for a more nuanced understanding.

4.2. Circumplex model of affect (Russel, 1980)

Compared to the valence-based approach, the circumplex model of affect introduces a two-dimensional model of emotions. Instead of using the notions of positive vs. negative valence, the model distinguishes between pleasant and unpleasant emotions. Further, the model includes the intensity of emotion as the second dimension, with the opposing end representing arousal and sleep, with arousal relating to the

intense emotions (Russel, 1980). Russel further defined eight categories, which he circularly ordered in the two-dimensional graphical representation, based on the weight assigned to each of them:

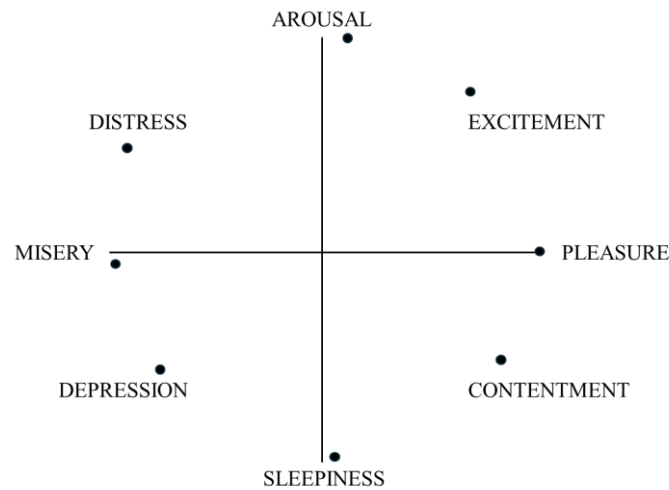


Figure 2: Circumplex Model of Affect (Russel, 1980)

Further, Russel identified 28 stimulus words, which participants of the study placed in the eight emotional categories. The frequency with which the stimulus words were put into the categories served as the basis for calculating the scores of each stimulus. This categorization was used as the foundation for the experimental part of this thesis, which will be explained in more detail in chapter 10.2.

In short, this model proposes a circle of emotional experience and maps it onto dimensions of valence and strength of arousal.

4.3. Appraisal Tendency Theory (Lerner, & Keltner, 2000)

Appraisal tendency theory is concerned with the emotion-specific influences on judgment and choice, postulating the idea that each emotion has unique effect on human behaviour. The theory is based on **cognitive-appraisal theories** of emotion and on the **functional (evolutionary) theories** of emotion (Lerner, & Keltner, 2000).

From cognitive-appraisal theories Lerner and Keltner (2000) borrowed the notions that emotions influence more than one cognitive dimension (valence). Namely, they based their approach on Smith and Ellsworth's (1985) six cognitive dimensions: certainty, pleasantness, attentional activity, control, anticipated effort, and responsibility. According to Smith and Ellsworth (1985), each emotion is defined

by central dimensions, which stand out the most in cognitive patterns. For instance, compared to other emotions, anger is characterised by a sense of control and certainty over what happened, and blaming others for the present outcome (Averill, 1983; Betancourt, & Blair, 1992; Smith, & Ellsworth, 1985).

From functional approaches to emotion, the theory employs the coordination role emotions play by interrupting the ongoing cognitive process and directing attention, memory and judgement to quickly solve the problem at hand (Frijda 1986, Schwarz 1990).

These two approaches serve as the basis for building the so-called **appraisal tendencies**, which are characterized by (a) a set of central dimensions and (b) directions given to cognition to address the specific problem or opportunities. So, each emotions elicit directed, predefined responses in line with the characteristic cognitive dimensions. In short, each emotion carries specific appraisal tendencies which are goal-oriented processes where emotions influence judgment and decision-making until the emotional situation is resolved.

The figure 2 depicts four outlined emotions which are highly differentiated in their central appraisal themes, with outlined appraisal tendencies of these emotions, as well as their influences on risk perception.

	<i>Illustration with negative emotions</i>		<i>Illustration with positive emotions</i>	
	<i>Anger</i>	<i>Fear</i>	<i>Pride</i>	<i>Surprise</i>
Certainty	High	Low	Medium	Low
Pleasantness	Low	Low	High	High
Attentional Activity	Medium	Medium	Medium	Medium
Anticipated Effort	Medium	High	Medium	Medium
Control	High	Low	Medium	Medium
Responsibility	High	Medium	Low	High
Appraisal Tendency	Perceive negative events as predictable, under human control, & brought about by others	Perceive negative events as unpredictable & under situational control	Perceive positive events as brought about by self	Perceive positive events as unpredictable & brought about by others
Influence on Relevant Outcome	<i>Influence on risk perception</i>		<i>Influence on attribution</i>	
	Perceive low risk	Perceive high risk	Perceive self as responsible	Perceive others as responsible

Figure 3: Examples of an appraisal-tendency approach (Lerner & Keltner, 2000)

5. Behavioural Responses to Emotion in Decision-Making

Emotions are generally categorized into positive and negative types. Empirical research has predominantly focused on negative emotions, while the impacts of positive emotions have received comparatively little attention. The main reason is that negative emotions, especially when extreme, prolonged, or inappropriate, cause problems for both individuals and society, ranging from phobias, aggression and violence to depression, eating disorders, suicide etc. Although positive emotions are sometimes tied to problems, in case of mania or drug addiction for instance, they are given lower priority by psychologists and emotion researchers (Fredrickson, 2004).

For certain specific emotions, particularly those with negative valence, there is consistent and thorough research available. Most research, however, has focused on valence-based approaches, highlighting the differences between negative and positive emotions. Despite the scarcity of studies on individual emotions, some general conclusions about the impact of emotions on cognitive processes can still be drawn, and some consistent patterns for individual emotions have been identified across different studies. These patterns are gathered and outlined in detail in the following two chapters.

5.1. Behavioural Responses to Positive Emotions

Positive emotions were shown to activate general knowledge structures more than the negative emotions, which are particularly useful in tasks where new concepts should be generated. In this case, individuals draw inferences from existing knowledge structures, such as generic schematic knowledge, and they generate novel and creative solutions. (Fiske, & Neuberg, 1990, Bruner, 1957). In other words, instead of applying analytical and systematic thinking and focusing on finding new information about the task, positive emotions make use of their past experiences and teachings. This creates a path to exploration without boundaries of time-consuming research and analysis (Bless, & Fiedler, 1995). The proposition is that positive emotions broaden the momentary thought-action process (Fredrickson, 2004). The reason is that they signal that the situation is safe, and that simple processing is sufficient to solve the problem at hand (Bless, & Fiedler, 1995).

Tendency towards heuristic processing and cognitive flexibility

As stated, humans in a positive affective state employ heuristic and less systematic ways of thinking, allowing them to remain flexible and creative (Fiedler 1988, Isen 1987, Schwarz 1990, Schwarz, & Bless 1991). They are more confident in their knowledge, and the positive affect is linked to cognitive flexibility.

Positive emotions promote the exploration of new ideas and possibilities, as well as overall enjoyment in tasks. Consequently, individuals experiencing positive emotions tend to solve problems more efficiently. However, they may also become overly cautious in harmless situations to preserve their good feelings, indicating a higher tendency toward risk aversion (Isen, 1993). Isen and Patrick (1983) found that participants in a positive mood were more reluctant to participate in gambling and demanded better odds before they would do so. They were more sensitive to losses (Isen, Nygren, & Ashby, 1988) and were more persistent in finding a win-win solution in bargaining tasks (Carnevale, & Isen, 1986). Because of the proneness to creative solutions and loss aversion, positive participants were better in bargaining.

Creativity and novel approaches

The consequence of this “laid-back” approach to problem-solving is the creativity that arises with it. Positive affect is consistently linked to enhanced creativity across various tasks. Temporary workgroups in positive mood demonstrate increased creativity, as evidenced by higher idea generation and creative performance ratings (Grawitch, Munz, Elliott, & Mathis, 2003; Grawitch, Munz, & Kramer, 2003). Isen (1987) also supported the idea that positive mood facilitates creative problem-solving compared to neutral or sad moods. These findings highlight the positive impact of mood on creative processes.

Helpfulness and cooperativeness

Positive affect is closely linked to increased cooperativeness, helpfulness, and social problem-solving abilities (van Kleef, De Dreu, & Manstead, 2010; Frederickson, 1998; Frederickson, 2001). Research by Isen (1987), and Isen and Baron (1991) shows that a positive mood promotes helping behaviors and reduces aggression. Studies by Baron (1990), and Williams and Shiaw (1999) also demonstrate that

positive affect enhances cooperation in the workplace. This is because positive emotions are perceived as signals of safety and acceptance within the group (Klinnert et al., 1986; Cacioppo, & Gardner, 1999). Individuals experiencing positive affect show greater empathy and interpersonal perspective-taking, even with differing viewpoints (Nelson, 2009). In group settings, people experiencing positive emotions exhibit more effective social problem-solving skills and generate more relevant steps and solutions (Isen, Daubman, & Nowicki, 1987). Additionally, positive affect leads to better negotiation outcomes, often resulting in agreements beneficial to all participants (Carnevale & Isen, 1986). This aligns with research indicating that positive affect enhances creative and flexible thinking (Isen, Daubman, & Nowicki, 1987) and improves social cognition, such as interpersonal perspective-taking (Nelson, 2009). The promotion of helpfulness by positive moods is mainly explained through **priming theory** and **mood maintenance hypothesis** (Carlson, Charin, & Miller, 1988). Priming enhances activation of positive cognitions, inducing positive interpretations of helping, while mood maintenance produces motivation to maintain the status-quo and remain in the positive affective state. Both reasons in turn promote likelihood of helpful behaviour. (Pekrun, & Frese, 1992).

Characteristics of Specific Positive Emotions

The positive emotions—joy, interest, contentment, and love—are associated with specific cognitive and behavioral tendencies as described by the broaden-and-build theory created by Fredrickson (1998; 2001):

- **Joy:** Sparks the urge to play, push limits, and be creative; evident in social, physical, intellectual, and artistic behaviors.
- **Interest:** Creates the urge to explore, take in new information and experiences, and expand the self-concept through learning.
- **Contentment:** encourages reflection, the need to savour current life circumstances and integrate them into future.
- **Love:** Initiates a recurring cycle of playful, exploratory, and integrative urges within safe, close relationships.

5.2. Behavioural Responses to Negative Emotions

On a general note, compared to positive affects, negative emotions tend to promote a more effortful, analytic, and vigilant processing styles (Isen, 1987; Schwarz 1990). They signal that the situation at hand is not safe and that systematic, detail-oriented processing styles are necessary to overcome the situation. In situations where information conservation is necessary, participants with negative affects tend to outperform their positive counterparts. This is due to the precision and attention paid to newly obtained information, in contrast with the reliance on general knowledge structures typical for participants in positive affective states.

As mentioned, the influences of specific negative emotions have been more closely studied, than of positive affective states, allowing for a more precise and consistent differentiation between negative emotional states.

Anger

The main characteristics of anger are an increased likelihood of impulsive behaviour (Parrott, & Zeichner, 2003), including partaking socially or personally risky behaviour (Harmon-Jones, 2003). This is due to a more optimistic assessment of the environment and underlying risks (Lerner, & Keltner, 2001) and a perceived control over the outcomes of decisions (Lerner, & Keltner, 2000). Further, anger arises as an outcome of one's goals being blocked, so it typically produces an appraisal response of blaming others for the current outcomes (Lerner, & Keltner, 2000; Averill, 1982; Averill, 1983).

Expression of anger is often an attempt to change and manipulate others' behaviour (Averill, 1982; Clark et al., 1996; Fischer, & Manstead, 2008; Fischer, & Roseman, 2007). The expression of anger in a group setting can emphasize the existing disagreements in the group and often precedes and accompanies social exclusion in groups (Baumeister, & Leary, 1995; Kerr, & Levine, 2008). This is particularly evident when a majority of the group expresses anger, creating a perception that an individual's belonging in the group is under threat. This increased feeling of exclusion can lead a participant with divergent opinions to leave the group. However, when the need for belonging to the group is increased, anger expressed by the majority or dominant members usually results in the deviant

member conforming to the group's opinions (Baumeister, & Leary, 1995; Williams, 2007; Steinel et al., 2010).

Sadness

Sadness represents a perceived presence of loss, or a threat of loss (Ekman, 1984). It is best recognised by the resignation and disengagement that it awakens, as well as by the appraisal tendency for helplessness and perceived lack of control. It evokes an analytic, detail-oriented approach to problem-solving and decision making (Pekrun, & Frese, 2011). Sadness inherently carries a goal to better the personal circumstances (Lerner, Small, & Loewenstein, 2004; Loewenstein, & Lerner, 2002), which is usually achieved through leaning towards others and relying on their choices. Due to this need for change, they are often connected to the willingness to compulsively spend money (Faber, & Christenson, 1996), while at the same time increasing buying prices and decreasing selling prices (Lerner, Small, & Loewenstein, 2004). Concerning helpfulness, sadness seems to be in line with positive affects in promoting helpful behaviour. The reason is that helping often lifts one's spirit and creates good feelings. Relating to dimensions of arousal and valence, sadness is typically moderately low in arousal and negatively valenced (Mizrahi, Millgram, & Tamir, 2023).

Fear and Anxiety

Anxiety results from ambiguity and is characterized by avoidant behaviour or the need to escape the current circumstances (Lerner, & Keltner, 2001; Smith, & Ellsworth, 1985). The difference between anxiety and fear is in that fear usually refers to a knowable object, whereas anxiety results from ambiguity. Often, anxiety provokes second-guessing and abandoning the efforts once the path slightly drifts off-track (Tsai, & Young, 2009). The evaluation of outcomes activates appraisals of pessimistic evaluations and risk-aversion.

Regret and Guilt

In terms of regret, usually its anticipation creates reasons to avoid excessive risk-taking (Loomes, & Sugden, 1982). Guilt, on the other hand, arises when a person feels he/she has crossed a social norm or their moral principles. Expressing and feeling guilt is a signal that one is aware of their, possibly bad, behaviour (Van Kleef, De Dreu, & Manstead, 2010)

Disgust

Disgust facilitates avoidance or prompt removal of an aversive stimuli that poses a threat to wellbeing (Keltner, & Haidt, 1999). In line with this strong desire to remove or avoid the stimuli, it creates an intense action readiness and an acute psycho-physiological response (Lazarus, 1991). It can further exaggerate the perception of risk, thus affecting strategic management decisions in organizations.

These effects often have debilitating effects on performance and outcomes, which is why prevalent negative affects in organizations pose a significant threat to outcomes and cooperativeness (Boudens, 2005). Although some might promote change and contribute to making difficult decisions, especially those related to impulsive behaviour, such as anger, there is little guarantee that the decision will bring overall benefit.

6. Innovation Diffusion Theory

In many fields characterized by social functions, such as organizational sciences or business, a question of change adoption arises, be it a new product on the market or a new company policy put in place. To study the process underlying societal change, researchers have focused on the speed and the degree to which new products, practices and ideas propagate through societal networks (Rogers, 1995). This process is known as **innovation diffusion theory** and its fundamentals were set by Bass (1969) who first modelled this process into an aggregate market level. In his model, the diffusion of innovation is a contagious process which happens through internal (e.g. word-of-mouth) and external (advertising) influences. More precisely, as Bass defines it, the probability that a person will adopt the change at time t depends on parameters that are related to previous adopters (internal influence) and parameters unrelated to previous adopters (external influence) (Bass, 1969).

In this model, the main element is not the social system as a whole, yet the individual, or agent. The agents are heterogenous, each make their own decisions and interact with other agents in the network. Ryan and Gross (1943) found that social contacts, social interaction and interpersonal communication greatly influenced the adoption of new behaviours. So, the main idea of innovation diffusion theory is that innovation is a dynamic process that is dominated by social influences (Ryan, & Gross 1943, Valente, & Rogers 1995). The adoption of change on a group level is thus determined by the aggregated

individual behaviour and the interaction between agents (Kiesling, Günther, Stummer, & Wakolbinger, 2014). The theory of innovation diffusion proposes that consumers vary in their number of social connections and the extent to which social influences impact their decision to adopt new innovations (Delre, Jager, Bijmolt, & Janssen, 2010).

The innovation diffusion theory describes the stages of innovation adoption: innovators, early adopters, early majority, late majority, and laggards. Each group has distinct characteristics and behaviours regarding how they interact with innovations. Additionally, the innovation diffusion theory has practical implications for marketers and policymakers who aim to promote new products or policies. Understanding the different categories and the role of social influences can help in designing strategies to enhance the adoption rate. For instance, leveraging early adopters and opinion leaders can accelerate the diffusion process within a community or market (Rogers, 1995).

Moreover, the innovation diffusion theory forms the basis for the change diffusion model used in agent-based modelling. These models simulate the behaviour of individuals (agents) within a network to predict how innovations spread. By incorporating principles of innovation diffusion, agent-based models can provide valuable insights into the dynamics of adoption processes, allowing the identification of key factors for promoting change (Gilbert, 2008; Valente, 1996).

7. Organizational Structures

To pursue strategic goals, organizations need a structure that serves as a guideline for organizational activities, and both enhances and constrains what an organization can do. It sets expectations and exchanges among both internal (e.g. managers, employees) and external parties (e.g. customers, competitors). The central function of structural design is to allocate work (differentiation) and to coordinate efforts between diverse responsibilities (integration). Secondly, the organization must ensure appropriate grouping of people into work units (Mintzberg, 1979).

The two most notable structuring strategies are (a) **vertical** and (b) **lateral**. Vertical structures include multiple layers of superiors responsible for planning, coordinating, and controlling the work of subordinates through authority, rules and policies. These are often hierarchical, authoritarian structures, that are efficient, but effective only depending on the willingness of employees to follow directives

from above. They are usually found in stable environments. Lateral coordination is largely flexible and informal, with little commands, rules, and systems. It employs formal and informal meeting, coordinating roles, networks etc. making them often simpler and quicker. Alternative forms of decentralized and lateral coordination are required to prevent top-down control from inhibiting initiative and creativity. Lateral coordination tends to be more effective but more costly compared to vertical methods. To ensure optimal performance, organizations should use both vertical and horizontal procedures for coordination. The interest towards new organizational designs, especially those that emphasize flexibility, participation and quality has particularly been accelerated by the dramatic changes in technology and the fast-paced business environment (Nadler, Gerstein, & Shaw, 1992; Bryan, & Joyce, 2007; Roberts, 2004).

The most notable outline of structural configurations was defined by Mintzberg (1979) and it includes simple structure, machine bureaucracy, professional bureaucracy, divisionalized form structure and adhocracy. His image of an organization consists of an operating *core* (provide services/products), *administrative component* (e.g. coordination) and *strategic apex* (e.g. senior executives), buffered by *support staff* (e.g. secretaries) and *technostructure* (specialists and technicians) from both sides. Each of the organizational structures by Mintzberg (1979) is defined by the following characteristics:

- **Simple structure:** Direct supervision, centralized decision-making, low formalization.
- **Machine bureaucracy:** Standardized tasks, formalized procedures, centralized authority.
- **Professional bureaucracy:** Highly skilled professionals, decentralized decision-making, loose hierarchy.
- **Divisional form:** Decentralized units (divisions), each resembling a simpler structure.
- **Adhocracy:** Flexible, dynamic, project-based teams, emphasis on innovation and creativity.

Since then, the study of organizational structures has developed, and new approaches emerged to match the growing and changing organizational needs. There are now different structural configurations defined, often focused on the information and task flows between five-member teams. To illustrate how different structural forms respond to variety of challenges, Bolman and Deal (2017) presented a few configurations that they have based on the existing studies of five-member teams.

The **one-boss** arrangement is a configuration where one person has authority over others. All decisions and information flow from the top and group members communicate primarily with the official leader, rather than with one another. This is efficient and fast, showing best results in simple and straightforward situations.

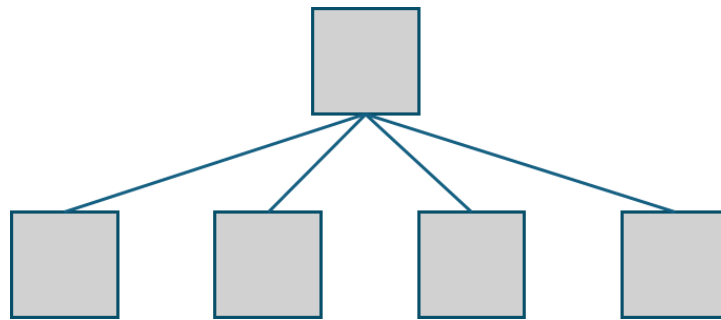


Figure 4: One-boss Arrangement (Bolman, & Deal, 2017)

The second arrangement, the **dual authority**, introduces another layer of management below the boss, so two individuals have authority over specific areas of the group's work. This configuration works when management tasks can be well divided, so it potentially reduces the manager's span of control, giving them more room to concentrate on specific aspects, such as mission, strategy, or relationships.

A further option is a **simple hierarchy** with a middle manager reporting to the boss and supervising his subordinates. While the dual authority divides tasks functionally between the managers, in a simple hierarchy, the whole division is supervised by another manager that reports back to the higher management level.

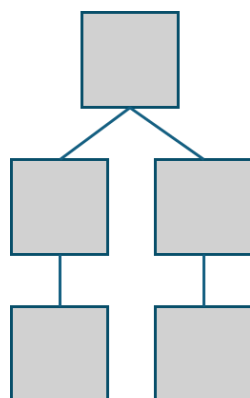


Figure 5: Dual authority (Bolman, & Deal, 2017)

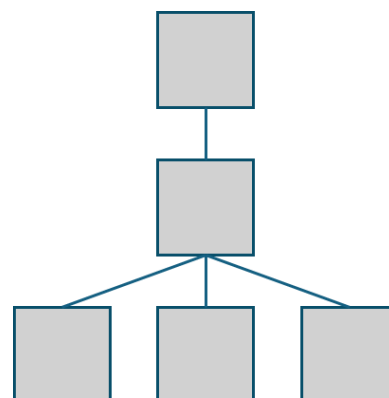
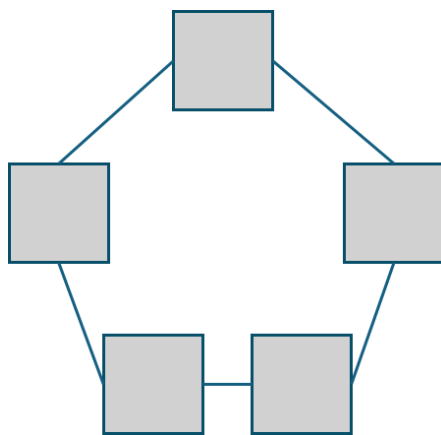
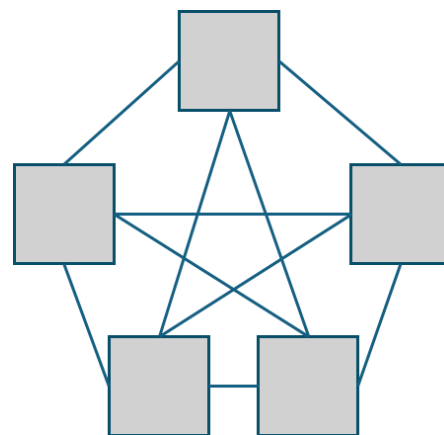


Figure 6: Simple hierarchy (Bolman, & Deal, 2017)

Instead of a top-down approach, the two further structures form a circular pattern of communication – the **circle network** and the **all-channel network**. In case of the former, information and decisions flow sequentially from one group member to another, where each member can modify or add to the work in process. It relies on lateral coordination and simplifies communication, since each person only deals with two other members of the group, making transactions easier to manage. The all-channel network, or star, is designed to connect each member of the group with one another. Information flows freely and decisions often must surpass multiple bases. It is most efficient in environments that are complicated and require substantial mutual adjustment, especially when each member brings a unique skillset. Although this form increases the group morale, it is very time-consuming, agreements may be difficult to find and decisions may be slow. These aspects can be counteracted if members bring developed communication skills, enjoy participation, tolerate ambiguity, embrace diversity, manage conflict well and agree on how the decisions should be made.



*Figure 7: Circle Network
(Bolman, & Deal, 2017)*



*Figure 8: All-channel network
(Bolman, & Deal, 2017)*

8. Research Gap

So far, the inevitable role that emotions play in our decision-making process was outlined. From the available research, it can be concluded that a solid and consistent systematization of emotions in cognition, especially in social settings, is necessary throughout the entire research field. There is a strong lack of general and mutually accepted models and approaches to emotions. This is in part explainable due to the complexity of human emotional experiences. Further, emotions are difficult to control for. Although there are general emotional experiences exist, they are often felt and lived

individually, provoking different approaches in different individuals. Nonetheless, the existing literature certainly provides valuable insight and fruitful ground for continuing to examine this important role in our daily lives.

To sum up, the research field about effects of emotions on our cognitive processes, and thus decision-making, has mainly concentrated on the appraisal tendencies that arise in emotionally driven situations. So far, we have come to understand the ways in which emotions motivate action and direct our attention towards solving the problem at hand.

Furthermore, some consistent results can be drawn for the cognitive and behavioural tendencies of different emotions, mostly in areas of risk taking and processing strategies they employ. For further systematization and more sophisticated insights, it is necessary to employ general models of emotion which would allow consistency and reproduction of results across studies, thus increasing both the reliability and validity of the findings. The current knowledge surrounding the effects of emotions in group settings gives only limited insight into the effects of each particular emotion. Rather, it explains the mechanisms of cognitive and behavioural reaction to emotions of others, such as **emotional contagion**. It confirms that emotions serve a social function yet fails to give a more detailed analysis into how specific emotions influence both an individual's emotional (and thus cognitive) state, and the outcomes of group decisions.

The problem is, not all group settings are equal. Group dynamics among friends and family differ significantly from dynamics at organizations and work. Especially in work settings, people tend to, not only express their emotions less freely, yet also react differently to emotional expressions of others, due to the unspoken norms of formal work environments. However, this can also vary across industries and companies, as some promote open and honest communication and foster the personal relationships among employees. The communication within a company is best enforced by organizational structures defining the responsibilities and workflow. This means that some structures may be more prone to effects of emotions on group members than the others. The role that an organizational structure plays in defining the emotional effect on decision-making, from both an individual and group perspective, has not yet been studied. It is still unknown how the size and structure of a communication network,

within an organization, impact an individual's ultimate choice of action, or the extent to which they do. To effectively address potential drawbacks or enhance positive influences of emotions in social interactions, it is necessary to understand how an organizational structure moderates this influence of emotions on individual and collective decision-making.

9. Research Question

This thesis seeks to explore the ways in which emotions and the degree of centralization impact the diffusion of change in an organization by implementing the principles of the innovation diffusion theory. For the purposes of addressing this question, the research utilizes the change diffusion model, programmed in Python. The model is further adapted to simulate an environment where emotions play a pivotal role in the exploration tendencies of agents, as well as their proneness to emotional states and opinions of other agents in the network. The insights from the simulation runs will be valuable for understanding the configurations between structures and emotions that are particularly robust in accepting and diffusing change within the organization. The model is designed to address key components of change acceptance in a network, (a) overall acceptance and (b) speed of acceptance.

Namely, the thesis is directed towards answering the following questions:

- What role does the number of connections each agent has play in enhancing or reducing the impact of emotions on overall change acceptance in the organization? What type of structure is more efficient in spreading change across the organization? Are there significant differences between change acceptance of centralized and decentralized structures?
- Do some structures lead to a faster spread of change within an organization? Which structures are these?
- Do emotions determine the speed at which the change spreads within an organization? If so, which emotions lead to fastest change adoption?
- Do emotions impact the overall acceptance of change within an organization? If so, which emotions are these? Do certain organizational structures exist that particularly embrace the emotional contagion?

9.1. Importance of the Question

Contrary to popular belief, humans make better judgments when they are not fully rational, yet when their decisions are also influenced by their emotions and “gut feeling”. Damasio (1994) carried out one of the most influential works on the importance of emotions in choosing optimal decisions. Namely, he studied patients who suffered damage to specific parts of their brain, particularly the prefrontal cortex, a brain region associated with decision-making and emotional processing. He observed and compared their decision-making abilities and everyday behaviours to individuals who had brain damage in other areas or no brain damage at all. What he found was that individuals with injured prefrontal cortex often had difficulties in making decisions, especially those in which emotions play a significant role. They struggled with evaluating risks and benefits associated with different choices, although their intellectual activities were otherwise intact. The results of his study were that emotions are essential for making good decisions by providing valuable information that guide our decision-making process. This also served as proof of the important relationship between our emotions and cognition (Damasio, 1994).

From the arguments above, it can be easily deduced how essential it is to understand what constitutes good decisions and how emotions contribute to them. Which emotions enable us to make better judgments and under which conditions do these emotions particularly enhance these positive effects.

In organizational settings, accepting and embracing positive change and innovation is key to remaining competitive and securing long-term success. Because of this, it is important for management practitioners to gain deep understanding into how these changes are accepted and diffused within an organization. Especially diffusion models can help managers pre-estimate the market response to new products, allow them to assess new strategies or simply provide model-based decision-support (in40).

Furthermore, emotional and social dynamics of the group determine the degree of innovation and creativity of the group. More precisely, they often influence the level of convergence among group members, suppressing any deviance and inevitably leading towards an overly critical approach to new information and groupthink (Janis, 1982; Stasser, & Titus, 2003; van Knippenberg, De Dreu, & Homan, 2004). Deviance is required for creativity, for instance, an expert might seek influence over some group

members to pursue his idea, ultimately changing a group decision for the better (Moscovici, Mucchi-Faina, & Maass, 1994).

The outlined arguments ultimately highlight three important layers that this thesis aims to address: drivers of innovation, drivers of decisions, and the diffusion of innovation and change within an organization. The distribution of emotions among individuals in a group significantly determines the susceptibility of others to attitudes and opinions (Fitness, 2000; Frank, 1988). Emotions influence not only our tendency to accept other people's opinions, but also how we make decisions. These emotional dynamics are crucial drivers of the acceptance or rejection of change.

Understanding these layers is essential because they offer insights into the mechanisms behind change adoption in organizations. The change diffusion model allows us to incorporate various internal and external factors influencing decision-making. By simulating different configurations of network structures, emotional states, and exploration tendencies, the model can identify combinations that facilitate change particularly well. This approach provides a nuanced understanding of how emotions and organizational structures interact to influence change adoption, offering valuable insights for managers and policymakers aiming to foster innovation and positive organizational change.

9.2. Assumptions

By observing sixty management teams, Losada (1999) found that flourishing teams showed a dynamic structure with the highest ratio of positivity to negativity. These teams also showed more resilience when confronted with adverse conditions. According to his findings, his model can predict how flourishing the team is going to be based on the ratio of positivity to negativity (Losada, 1999).

Furthermore, emotions may evoke reciprocal experiences among other members through emotional contagion (Keltner, & Haidt, 1999). A study by Sy, Côté and Saavedra (2005) showed that leaders that expressed positive moods also created positive affects in their groups, leading the group to develop a cooperative environment and coordinated the task better than group treaded by a leader in a negative mood. A possible explanation is that participants of the team led by a "negative" leader interpreted the leader's affect as a signal of their poor and unsatisfactory performance. In centralized vs. decentralized organizational structures, these findings suggest that fully decentralized organizations are less likely to

be influenced by the emotions of group leaders because participants are connected to all agents in the network.

Emotions can, in turn, also determine how willing we are to explore new areas or accept other's opinions as our own. For instance, contentment can encourage us to remain on our current path, to preserve the positive circumstances, whereas anger may promote behavioural adjustments (Cacioppo, & Gardner, 1999; Fischer, & Roseman, 2007). This builds the arguments to create assumptions for the model employed in this thesis that anger prompts explorative behaviour and decreases one's susceptibility on opinions of others. Depending on the setting, this leaves participants, who do not experience anger, as more prone to listen to others. The assumption is that anger will increase explorative behaviour of the individual and increase the overall acceptance of change by the group and that the acceptance of change will happen faster than when participants are in neutral, or other affective states. On the other hand, contentment decreases our willingness to try out new possibilities as this may be conflicting with our current well-being (van Kleef, De Dreu & Manstead, 2010). However, it also sustains one's openness to new experiences and options, which is why it is assumed that contentment still increases explorative behaviour, but to a much lesser extent than anger. Further, positive emotion was found to increase cooperativeness, so it is assumed that content individuals are more willing to agree with other members in their network.

Sadness is known to increase analytical thinking, rather than openness to new possibilities and creative approaches, which is why the model for this thesis assumes that a sad participant leans towards conservative views. Further, a sad participant is also prone to influences of other participants in his search for comfort and acceptance, which is why it increases his/her susceptibility.

Joy on the other hand is known for open, creative approaches to problems, feelings of control and increased cooperative behaviour. Therefore, the model assumes that joy increases exploration but also increases the willingness to cooperate and agree with others (Fiske, & Neuberg, 1990; Bruner, 1957; Isen, & Baron, 1991).

Including these emotions in a two-dimensional view of arousal and valence, sadness is, for instance, considered to be an emotional state of negative valence and moderately low arousal, whereas joy is of

positive valence and moderately high arousal (Posner, Russell, & Peterson, 2005; Russell, 1980). This two-dimensional approach (the circumplex model of affect) is used as a basis for distinguishing between emotions in the model applied in the course of this thesis.

Some studies found that introducing new products in markets with highly influential participants brings more uncertainty regarding the final success of the innovation on the market, leaving the new product with fewer chances to spread (Kiesling et al., 2014). This market mimics a centralized organization, in which a few individuals hold large social power by carrying many connections, while other agents hold very few connections. Because of this, the chances that the product “catches on” and starts spreading in the market, depends on the acceptance of the few influential agents. When participants are only connected to a few influential agents, the spread of change in the network depends solely on the speed at which a new product reaches the influential participants. In an environment where agents are all interconnected, the influence of a few influential agents is counteracted by the interactions with other, less influential agents, ultimately decreasing the power of influential agents to spread the new product as effectively. From this it can be assumed that in centralized organizations, if the agents are willing to explore new possibilities, the change is going to penetrate the organization more easily than in case of decentralized organizations. If all other agents are connected only to participants that are very prone to accepting change, they will be influenced only by this behaviour. On the other hand, if participants are prone to other’s opinions and are connected to both the explorative and conservative agents, then the effects of the connected agents are offset by one another.

The organizational structures applied in the course of this thesis are inspired by the study of the “Oprah Effect” (Peck, 2002) as well as by the general structural model of dividing organizational members into smaller teams. The study of the “Oprah Effect” was an observation of the campaign aimed at promoting reading in the US by promoting it in the Oprah Winfrey show. The ‘hub’ were her guests and her audience that initiated the acceptance of the books she recommended and further spread them down their own personal networks. Ultimately thirty-eight books which were consecutively promoted in the show became bestsellers. This effect is often seen in VIP marketing, where famous people become brand ambassadors which embody the ideas and visions of the brand in question. Because of this, the

models adopted in this study are created around groups of likeminded agents forming a few hubs that interact with some agents from other hubs.

Rather than creating strict hierarchical structures, inspired by the work of Helgesen (1995), the study utilizes centralized (circular) vs. decentralized networks. Helgesen has found that women preferred putting themselves in the centre of organizations, rather than in top positions. This approach emphasized and promoted accessibility, equality and inclusion of members in their decision-making. Through this, they nurtured good relationships as well as diffuse communication over rigid hierarchical structures (Helgesen, 1995). To mimic organizational structures, the above-mentioned hubs are either fully interconnected, or agents are connected to the central body, or central hub, of managers and decision-makers.

In terms of cooperative vs. competitive environment, the assumption underlying this thesis is that the members involved are situated in a cooperative setting, given that they are all members of the same organization. This assumption suggests that the individuals should collectively strive towards common objectives. The reason why this assumption is necessary is due to the differences in evaluation of emotions based on the setting the individuals find themselves in. As was already mentioned, the same emotions may have a completely different implied meaning, depending on the social context. Compared to competitive settings, which are prone to selfish motivations and strategic behaviour, cooperative settings are characterized by high levels of trust and a greater motivation to work together (De Dreu, Beersma, Steinel, & Van Kleef, 2007)

10. Research Design – Agent Based Model

To address the research question, the thesis applies agent-based modelling. More precisely, it makes use of the existing **Change Diffusion Model** by altering the code and implementing new variables to simulate the impact of emotions on overall acceptance of change in organizations. For the purpose of this experimental research, simulations for the two chosen network structures have been treated with different combinations of emotions, as well as with settings where emotions played no role in outcomes. Twenty participants were divided into 5 groups and were connected to mimic centralized or decentralized organizations. Four different emotional states were introduced and designated manually

by deliberately choosing which agent in the network feels which emotion. To measure the results most objectively, each group of agents was given the same set of emotions. This enabled a comparison not only between the different emotions, yet also between structures.

For a better understanding of the procedure, an outline of the model and its function is given in the next chapter. Further, the choice of emotions and organizational structures is outlined, enabling a framework to form the hypotheses. The simulations were run using the change diffusion model, tailored to accommodate emotional impacts. The results of the simulations have been documented in a tabular form and further analysed using simple mathematical procedures.

10.1. Change Diffusion Model

The change diffusion model is often used as an agent-based model and it simulates the adoption and diffusion of changes, innovations or ideas through a network of agents over time. The individual agents can be representations of individuals, organizations or any other entity that interacts with one another. The change diffusion model can be used in various fields, such as sociology, economics, epidemiology, and marketing, to study the dynamics of adoption and diffusion processes. Researchers can experiment with different scenarios and conditions, allowing them to explore the effects of various factors on the spread of innovations and make predictions about future diffusion patterns (Rogers, 1995; Bass, 1969).

At the centre of the model are the **agents** which are connected with one another, forming a **network structure**. These agents are affected by both **individual and shared characteristics**. More precisely, all agents are affected by agent universal parameters - determinism of choices (model exploration), learning rate, weight on payoffs from conformity (vs. environment). On the other hand, each agent also carries individual characteristics – interactions with other agents in the network, susceptibility to actions of agents they interact with, and their own initial beliefs. These parameters are inputs used in the two model functions, the **softmax function** that determines the choices of agents and the **environment function**, which updates the state that was chosen by each agent separately. Further, there is two task environment parameters, **states** and the **payoff from status quo**. Namely, the basic model defines two states, one being change acceptance and the other being the status quo. The payoff from the status quo further plays a role in agents' choice of action. Each simulation period has a number of sampling

histories which. Each sample represent one agent decision. In an organization, the period would be for instance one year, and samples will represent the number of decisions that are made during that year.

Understanding the variables is essential to understanding how the model works and which factors of decision making it encompasses.

Determinism of choices (τ) is a measure of how likely the agents are to choose the options purely objectively, i.e. based on how attractive the options are and not based on how determined they are to stay with their initial choice. The lower the determinism of choices, the more sensitive the agents to changes in attractiveness of states, so the more affected they are by the values of other parameters in the model. A low determinism of choices makes agents most likely to choose states with the highest attraction, while high determinism of choices makes the probabilities of the two states more similar to one another, thus less affected by attraction values. Higher determinism fosters conservative behaviour, leading agents to stick with their current state or preferences more often, while a lower τ enhances their willingness to change status quo.

Furthermore, another parameter that is set universally for all agents in the model is the weight agents put on **payoffs from conformity** (w), i.e. staying in the status quo, rather than risking to obtain the payoff from choosing the new option. If the weight agents put on conformity is high, they will be more likely to choose to remain in the state they are already at.

All agents learn from their choices, how well they learn is determined by the **learning rate** (ϕ). If agents learn quickly, i.e. the learning rate is high, that means they incorporate new information in their decision-making rather quickly. The learning rate thus reflects how agents balance between exploring new strategies or staying by the strategies they already know will bring them benefits. In the model, a high learning rate would mean that agents quickly adopt the behavior if they perceive positive outcomes or witness other agents in the network adopting it. It is a Bush-Mosteller value in that the probabilities of states to occur gets updated by the experience the agent had in the previous round.

Each agent also has individual characteristics, which is filled out based on what the simulation aims to explore and is imported into the code. For one, agents in the model **interact** with one another, so each of them has connections to other/others in the network. An agent can either be fully disconnected, in

which case he will base his opinions only given his own evaluations, or he can be connected to all participants in the network, making him (more or less) susceptible to decisions of all other agents. The connections of each agent create a network through which the change diffuses in the model.

Furthermore, each agent can be given his own **susceptibility** score which determines how prone he is to be influenced by evaluations of other participants. A high susceptibility implies that an agent bases his judgment mostly based on choices of others. Lastly, all agents carry their initial beliefs, in the model, the initial belief is the state, or the option that the agent is currently in. It gets updated after every decision (sample) and the agent learns from the outcomes of each of his/her choice.

Overall, the social influence factor depends on two variables (a) the number of connections and (b) the susceptibility (theta) value. This means that agents with low susceptibility scores can still be more prone to social pressures due to the number of agents they interact with in the network. Conversely, the choices of a highly susceptible agent may be relatively uninfluenced by others if they interact with only a few agents.

The **softmax function** incorporates these parameters and determines the choices for each agent. Namely, agents use the softmax function to probabilistically select one of the available states (0 or 1). The softmax function considers the "attraction" of each state, which is influenced by an agent's beliefs, the payoffs associated with the states, and the 'tau' parameter that controls the level of exploration. In essence, the softmax function computes the probabilities for each state based on the objective and subjective parameters.

The payoffs from the status quo and from transitioning to state one are predetermined. State one always has a payoff of one, while the payoff from the status-quo is given by the mentioned parameter d. Once the agent has made a decision, the payoff from the choice is included in his learning process and further probability calculation for future choices.

The model then yields the **final period adoption**, the **standard deviation** of the runs and the **graphical representation** of the acceptance curve. The final period adoption is the measure of the percentage of agents that chose the new state (state one) rather than opting for the status quo. The standard deviation on the other hand is a measure for how much each run varies from the all other runs, i.e. it is a measure

for the variability or dispersion of acceptance across different simulation runs. A higher standard deviation value indicates greater unpredictability in the behaviour of the model agents across simulations. Furthermore, the model yields a graphical representation of the change adoption over simulation runs, with simulation runs on the x-axis and the percentage of agents that adopted the change on the y-axis.

Furthermore, the model yields an image of the social network and the way in which the agents are connected to one another.

10.2. Implementing Emotions

There is supporting evidence that emotions may be grouped in families based on their interpersonal effects, and that emotions from the same family produce comparable interpersonal effects. More specifically, van Kleef et al. (2010) has distinguished between aggressive emotions (e.g. anger and irritation), affiliative emotions (e.g. happiness and contentment), supplication emotions (e.g. disappointment and sadness) and appraisal emotions (e.g. guilt and interpersonal regret). For instance, their research found that, across all studies, the effects of happiness and anger are clearly distinguishable from one another. Also, happiness and enthusiasm produced very similar results on acceptance by others that participants felt (Heerdink, van Kleef, Homan, & Fischer, 2013).

Based on this and using the two-dimensional circumplex model of affect, four emotions have been chosen for the purposes of this research.

The emotion as social information theory suggests that emotional expressions provide valuable information about the expresser's evaluation of the situation. On the other hand, the theory posits that the interpersonal effects of this emotional expression depend highly on the observer's motivation and ability to process information conveyed by these expressions. Building on this idea, the implementation of emotions in the change diffusion model takes into account the variability of emotional effects across agents. In other words, in the alteration of the model, the emotions felt by the agents also alters their susceptibility to opinions and evaluations of other members of their personal network.

The emotions chosen for this research are **joy**, **contentment**, **anger** and **sadness**. They differ in their intensity and their valence. Naturally, the intensity and valence also influence the appraisal tendencies.

The valence and intensity of the four chosen emotions is depicted in the graph below. These characteristics have been assigned based on the findings for each of the emotions that were already outlined in the previous chapters of this thesis (Posner, Russell, & Peterson, 2005; Russell, 1980).

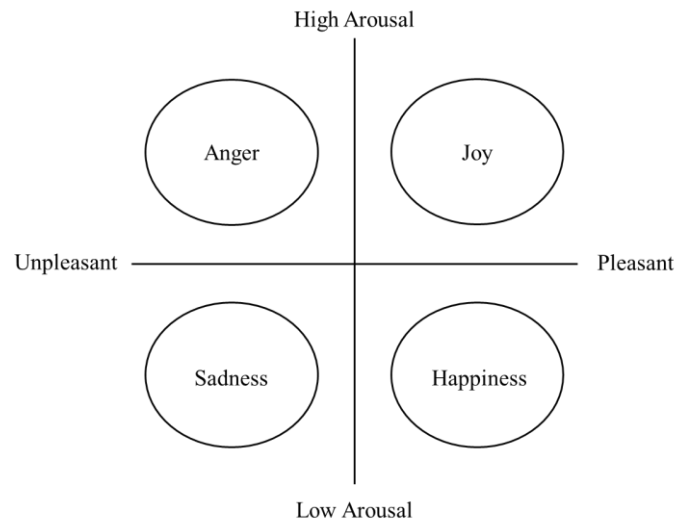


Figure 9: Implemented Emotions on a Valence-Arousal Graph

Emotional Influence on Susceptibility Values

The relative impact of the specific emotions on susceptibility to others' opinions has been determined based on consistent findings from prior research on emotional effects on judgment and decision-making. More precisely, two dimensions of social influence were used to determine effects of emotional states on its value. These dimensions are feeling in-control over the situation, as well as degree of cooperative vs. individualistic behavioural tendencies. The directions of impact were chosen based on the found appraisal tendencies. The intensity of the effect was defined based on the arousal evoked by the emotion. Happiness, a positive emotion of high intensity, gives an individual a feeling of control over the situation and enhances cooperative behaviour. Sadness, on the other hand, tends to maintain cooperative tendencies but makes individuals feel they lack control over the circumstances. Anger promotes individualistic behaviour, imposing blame on others for the undesirable circumstances, while giving the individual experiencing anger a perception of control over their choices. Contentment, like joy, increases cooperativeness and makes a person feel in control. However, because the intensity of contentment is not as high as joy, its effects are somewhat less pronounced.

Emotions influencing creativity/conservation:

It was widely found that positive emotions promote creative ways of thinking and acceptance of novel solutions. Therefore, the influence of positive emotions on the determinism of choices is in the opposite direction – positive emotions decrease the determinism of choices. Happiness increases creativity and the willingness to explore more than the contentment, as it is of higher arousal. Anger, although a negative valence emotion, also increases the willingness of the individual to change the current circumstances, if the other options seem more appealing. It is also connected to a strong desire to change the current status quo, thus decreasing the determinism of choices. Sadness, on the other hand, promotes conservative approaches and relies more on overly analytical cognitive tendencies, with little willingness to explore possibly risky opportunities.

There is also consistency in findings regarding two dimensions that impact the degree of social influence on individual choices. Namely, the perception of being in control and the cooperativeness in a group setting. When people perceive being in control over the situation, they tend to rely less on choices of others around them. On the other hand, some emotions enhance the cooperative behaviour, while others promote individual actions. For instance, anger induces a feeling of control over the situation and promotes overly individualistic behaviour, while at the same time blaming others for current unsatisfactory circumstances. Therefore, anger reduces the susceptibility, i.e. the degree of agreeableness and influence of others' choices on our own behaviours (Lerner, & Keltener, 2000).

For a better overview, the exact impact of emotions on dimension of social influence and determinism of choices is outlined in the table on the following page.

Table 1: Emotional Influence on Model Parameters

			(tau- determinism of choices)	(theta – social influence)	(theta – social influence)
Emotion	Valence	Arousal	Creative/ Conservative	Feeling in-control/ out-of-control	Cooperation/ Individualism
Joy	Positive	High	Creative	In-control	Cooperative
Contentment	Positive	Low	Creative	In-control	Cooperative
Anger	Negative	High	Creative	In-control	Individualistic
Sadness	Negative	Low	Conservative	Lack of control	Cooperative

As can be seen from the table above, the emotions are built into the model to modify two of the existing model parameters (a) tau – the determinism of choices and (b) theta – social influence (susceptibility). So, to sum up, joy, anger and contentment decrease determinism of choices, i.e. the value of parameter tau, while sadness increases its value. Further, Joy, contentment and sadness increase social influence and value of theta, due to their tendency towards cooperative behaviours, while anger decreases the value of theta by promoting individualistic behaviours. Lastly, joy, contentment and anger all increase the value of theta, or susceptibility to others' opinions, while sadness decreases it by causing a perceived lack of control over the situation and circumstances at hand.

The precise integration into the model and the alteration of the parameters will be further introduces in the chapter 10.5. where the thesis will focus on the technical aspects of the thesis and programming.

10.3. Organizational Structures

Most research on organizational structures concentrates on teams made up of five people (Urwick, 1956; Delre et al., 2010). The teams used in the course of this research is have the size of four participants each, divided into five teams, making up a total of twenty agents in the model. The reason why the number of participants was one below is that the emotions are designated per team. In centralized structures, the team whose participants are connected to all other agents in the network can be interpreted as managers. For an organization of only twenty participants, it seemed more reasonable to create a team of four members and teams of homogenous agents, rather than the other way around.

Including one more member in the teams would not bring very large differences in interpretation of the model, as the emotional effect would simply be enhanced by one more agent.

Inspired by the Helgesen's (1995) founding about the circular organizations in which female managers tend to put themselves in the middle of the organization, rather than on top of others. Therefore, the centralized structure in this model was created in a similar manner. In the centralized structure outlined in this thesis, the management team is connected with one another, and each manager is connected to everyone else in the network. The reason why this type of centralized structure is chosen is twofold. First of all, in reality, managers communicate and consult each other. This does not necessarily imply that all decisions are brought together, but that there exists a potential and possibility for managers to share opinions and be emotionally contingent on emotions of other managers. The expectation of converging opinions of managers, regardless of whether they are represented as one interconnected circle or as one executive director and second-layer managers, is based on the assumptions of groupthink and leadership influence (Janis, 1982; Ruben, De Lisi, & Gigliotti, 2016). In the decentralized, or dispersed, network, all subjects are interconnected with one another.

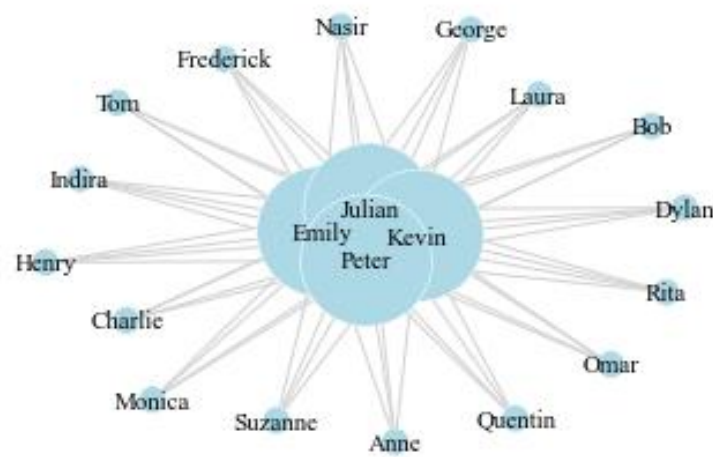


Figure 10: Centralized Organizational Structure

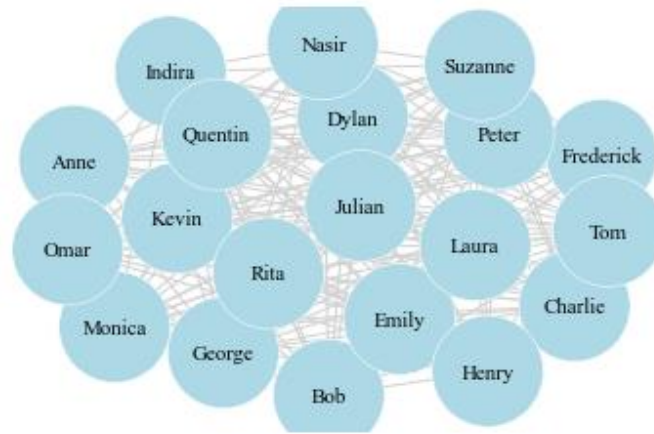


Figure 11: Decentralized Organizational Structure

Furthermore, apart from being backed by the real-world settings and literature, these two structures were chosen as such for practical reasons as well. To compare the structures and the effects of emotion at the same time, it is necessary to use the same distributions of emotions in both structure cases. The four participants that are designated the intense emotions of anger and joy in a centralized structure, forming a ‘management team’, are the same four agents in a decentralized structure. Through this, the effects of these emotions and their relation to the number of connections can be measured directly and objectively.

10.4. Hypotheses and Exploration Themes

This thesis employs a hybrid approach in terms of addressing hypothesis and exploring the research questions and assumptions outlined in chapter 9. The hypothesis will be included to test the efficiency of the organizational structures, as well as to compare the effect of strong emotions in both structures. Namely, since in decentralized structures agents hold a higher number of connections, it is expected that the change diffuses through the network more easily and more promptly, therefore the following hypothesis has been set:

H1: Decentralized structures spread change faster than centralized organizations.

Furthermore, based on the conclusions that were found in the research so far, the assumption is that centralized structures will be more effective in dispersing the effects of these strong emotions, thus yield higher last period change adoption rates. Strong emotions such as joy and anger, which enhance exploratory behaviour are more likely to diffuse through a centralized network, in which most of the

agents carry just a few connections. This reasoning is in line with the assumption outlined in the chapter 9.2. positing that when few influential agents accept the change, they will spread it throughout the network more successfully. This is more effective than when all agents are interconnected without any particular influence authority. Thereby, the following hypotheses are tested:

H2a: Joy as a strong emotion prompts higher last period change adoption in centralized organizations more than in decentralized organizations.

H2b: Anger as a strong emotion prompts higher last period change adoption in centralized organizations than in decentralized organizations.

The conducted simulations provide valuable insights into how different emotional states interact with organizational structures to influence the rate and extent of change adoption. To understand these dynamics further, an exploratory approach will be adopted. Rather than testing specific hypotheses, the analysis will focus on revealing how different emotional states interact with organizational structures to influence the rate of change adoption. The impact of strong emotions like anger and joy, experienced by managers, on change acceptance will be examined in both centralized and decentralized settings. Additionally, the effect of mild emotions like contentment and sadness, felt by employees, on their willingness to accept change will be explored.

Apart from the impact of structure, special attention will be given to the interconnectedness and susceptibility of agents within the organization. Further, short-term and long-term changes will be observed and compared, which has important implications for the field of organizational science. Some changes need to be introduced quickly, while others need a steady and high long-term adoption.

The analysis will aim to identify the trends and consistencies underlying the mechanisms which drive change acceptance. This exploratory analysis aims to reveal the interplay between emotional states and organizational structures and the ways in which they jointly shape the process of change adoption, providing valuable insights that can guide decision-makers.

In summary, the research will not be confined to testing predefined hypotheses but will instead explore the model results to understand the complex interactions between emotions, organizational structures, and susceptibility in both the short and long run. This approach will help identify which changes can be

expected and how quickly they might occur, offering a nuanced perspective on the dynamics of change acceptance.

10.5. Model Alteration and Technical Implementation

To introduce the effects of emotions in the model, a new variable for an individual characteristic has been introduced, namely – the four chosen emotions. These emotions are not shared among all the participants yet are deliberately assigned to chosen participants. The possible emotions are, as mentioned, joy, anger, contentment, sadness, and a neutral state. The data for the emotions of each participant was stored and loaded into the code the same way as other individual characteristics - susceptibility scores, interactions and initial beliefs. They were stored on an external excel data sheet and loaded into the model through code. The parameter values for emotions are stored as text and are imported and used as string variables in the python code.

The data from this new set of characteristics are used to modify the variables:

- Tau, measuring the determinism of choices or in other words, softmax action selection parameter, and
- the parameter theta, which measures the susceptibility scores of agents.

For the modification of the variable tau, the new variable tau_modified is introduced. Depending on the emotion the agent is assigned, the parameter tau either increases or decreases the previously set value. If the person is neutral, tau_modified holds the same value as tau itself. For other four emotions, the tau increases or decreases by a percentage, depending on the found effects that the emotion exhibits on willingness to explore new options.

- Joy increases exploration and is an emotion of high arousal. If an agent was assigned to feel joy, their tau modified will be just 50% of the original value of tau.
- Anger also increases exploration and is of high arousal, which is why tau_modified is set to the same value as for joy, making up 50% of the original tau value.
- Contentment increases creativeness and thus willingness to accepting change. However, it also shows tendency to preserve current circumstances and since it is of lower intensity than joy or

anger, it decreases the value of tau by 25%. So tau_modified for the agent experiencing contentment is 75% of the original tau value.

- Sadness promotes conservative and analytical approaches to problems and is of low arousal. Therefore, it increases the value of tau by 25%, so tau_modified equals 125% of the initial tau value.

```
tau_modified = {"neutral": tau,
               "joy": tau*(1 - 0.5),
               "contentment": tau*(1 - 0.25),
               "sadness": tau*(1 + 0.25),
               "anger": tau*(1 - 0.5)}
```

Figure 12: Code modification of the parameter tau

As mentioned, the second variable that is modified by the effects of emotions is theta, the susceptibility parameter. This parameter is influenced in two dimensions (a) the cooperativeness and (b) the feeling in control. In chapter 10.2. the influence of each of the emotions on these two attributes of susceptibility have been outlined. Feeling in control decreases theta, while cooperativeness increases it. Depending on the intensity of the emotion, these increases/decreases amount for 10% or 30%, as outlined in the Figure 13. For example, anger is of high arousal, and it promotes individualistic behaviour, decreasing theta by 30%, but it also gives individual a feeling of control over the situation, decreasing the value of theta by additional 30%. So, the susceptibility score of an angry agent amounts to 49% of the original theta value.

```
theta = np.zeros(N) #(0,1)agent mutual influence parameter; one for each agent
for i in range(N):
    theta[i]=susceptibility[i]
    if agent_emotions[i] == "neutral":
        theta[i] = theta[i]
    elif agent_emotions[i] == "joy":
        theta[i] = theta[i]*(1 - 0.3)*(1 + 0.3)
    elif agent_emotions[i] == "sadness":
        theta[i] = theta[i]*(1 + 0.1)*(1 + 0.1)
    elif agent_emotions[i] == "anger":
        theta[i] = theta[i]*(1 - 0.3)*(1 - 0.3)
    elif agent_emotions[i] == "contentment":
        theta[i] = theta[i]*(1 - 0.1)*(1 + 0.1)
```

Figure 13: Modification of the parameter theta

Since theta is bound to each individual, consisting of their individual susceptibility scores, and tau is an environment parameter set constant for all agents, their implementations in the code differ.

The degree of change for the parameters was set according to the intensity of emotion because there are no studies that measure the intensity of the behavioural and cognitive effects of separate emotions. There are no present studies that predict or show the extent of the increased creativity and impulsiveness that is connected to both joy and anger respectably (Harmon-Jones, 2003; Clore, Schwarz & Conway 1994; Fiedler 1988), nor the increased agreeableness induced by sadness or contentment. Because of this, it is assumed that the change induced by emotions of similar intensity will be comparable and was therefore set to these two uniform values in the model.

Tau is called in the softmax function, which was modified to include the agent_emotions variable and iterates through each agent. The variable tau was replaced by tau_modified, and since the function iterates through agent emotions and retrieves data for each of the agent, it automatically uses the value of tau_modified that is defined through the emotion assigned to the agent in the network. Theta on the other hand influences the attraction values of the states. It also iterates through a loop for each agent, enabling each agent a unique evaluation of the attraction value of their possible choices.

11. Model and Parameter Treatments

Important to note is that strong emotions, both joy and anger, enhance the participant's willingness to explore new options, i.e. diverse from status quo. Since in a less connected and more centralized network the participants are influenced largely by managers, rather than other network agents, it is expected that these structures will yield results indicating the highest acceptance of change. Important to consider is, however, whether the change is indeed beneficial to the organization. Not all change is good, and some changes may also be damaging for organizational performance. The benefits also depend highly on the key performance indicators one uses to measure the success of innovation and change. This topic, however, is out of scope of this Master Thesis.

As was already mentioned, simulations were run on two types of structures, a circular centralized structure, and a fully decentralized structure in which all participants interact with each other. This means that all parameter settings, in particular for emotional distributions and susceptibility scores were done twice, once for each of the chosen structures. The choice for these two "extreme" cases of

structures is that they depict most vividly the difference between the two. All further structures would yield results in between these two “extreme” organizational structures.

To avoid full linearity of results, the centralized structure is created to mimic a managerial team where all managers are connected to each other, but also where every manager is connected to all other agents in the network. This way, managers have 19 connections out of 20 participants, whereas all subordinates have 4 connections, all being managers of the organization. If there were only one manager who is connected to the subordinates, the effects of emotions would not be profound and would yield a rather negligible difference to other settings on overall change acceptance. Further, in this case, the distribution of emotions between the structures would have to be different and the results would not be directly comparable to one another. Dividing emotions and agents into teams, and adjusting how one team interacts with the other, enables the effects of emotions to come through more effectively and helps observe the results more clearly.

All agents' initial beliefs have been set to 0, meaning that they all find themselves in the state 0 in the first sampling history and first sampling period. By doing this, an objective comparison of the change acceptance among agents is ensured, since all agents are in the same state and their further choices depend strictly on their subjective evaluation of other states' attractiveness.

The learning rate, payoff from status quo and weights on payoff from conformity are all set to 0,5. This means that the agents learn from their actions with a 50% probability, that the payoff of the state 0 is 0,5 as compared to 1 in case of state 1 and that the weight they put on sticking to the same option as opposed to introducing change is set to 50%. They were all set at 50% to ensure a certain neutrality in their influence, so that one state is not inherently preferred more than the other. When it comes to the exploration parameter tau, it has been set to 0,2 so it provides a chance for emotions to play a differentiated and different role in determining its ultimate value. Stronger emotions, anger and joy, decrease its value by 50%, while the other two emotions impact it by 25% each. Simulations with higher tau values, implying more conservative thinking and a biased approach to choices have not provided results where differences were significant and the effects were easily observable. This can be interpreted that only in cases where people show openness towards different alternatives and views is that emotions

can have a significant impact in their decisions. For now, however, this allows an examination of the direction of this impact.

The combinations of emotions that were chosen were the following:

- Management team feeling **joy**, other agents feeling (a) neutral, (b) sad, (c) content.
- Management team feeling **anger**, other agents feeling (a) neutral, (b) sad, (c) content.

This makes up a total of six emotional combinations. For two structures, it amounts to twelve combinations in total. The reason for these choices is that some studies showed that subjects expressing intense emotions, such as happiness and anger were perceived as high in dominance. On the other hand, it was found that targets with sad or fearful expressions, as well as subtle positive emotions, were perceived as low in dominance (Knutson, 1996). Furthermore, if ‘managers’ are the decision makers, they have the most influence over other people in the organization. The impact of their strong emotions is of importance for the field of organizational sciences, in that it tends to be more severe and more noticed in a social setting. Other people in the network can also feel strong emotions, and employees with strong emotions can significantly affect organizational outcomes. However, this research has focused on the top-down approach, respecting the two-way communication in the model, and understanding that the network depicts the interactions among agents.

Further, the susceptibility of participants plays a vital role, which is why the cases are divided into three further groups. One in which all participants carry a same, neutral susceptibility of 0,5. This means that they are 50% likely to be influenced by opinions of agents they interact with, other than their own evaluation of the two possible states. Further combinations in which either the management or the subordinate groups show high levels of susceptible behaviour. In these cases, the highly susceptible groups carry a susceptibility score of 0,85, while the low susceptibility groups were assigned a value of 0,15.

Also, for all combinations of structures and parameters results when all participants are neutral was collected, allowing for an objective comparison between neutral states and all other emotional combinations.

In total, forty-two combinations were run through the model for which the data was collected and used for further analysis and interpretation of results.

These combinations were conducted first for a smaller number of periods (fifty) and histories (five hundred). For all combinations that haven't reached stagnation, yet showed continued growth within the fifty periods, a simulation with a hundred and fifty periods and five hundred histories each was conducted. For simplicity and flow of the text, the first shorter cases are referred to as *short-term* cases, while the longer simulations are referred to as *long-term* in this thesis.

12. Results and Interpretation of Findings

Before diving into the results and analysis of their implications, it should be briefly noted that the group of agents which were assigned strong emotions of joy and anger are called *manager team* or *managers*, regardless of whether the structure in the specific modification run was centralized or decentralized. In the same way *subordinates* or *employees* depict the participants who were assigned the emotions of low arousal, sadness and contentment, or were treated in a neutral affect state. Whether the interpreted results apply to a centralized or decentralized structure is always mentioned in the analysis, allowing the reader to follow through the results.

A descriptive analysis was conducted on the collected results, focusing on identifying patterns and consistencies in the used sample. The comparisons were simple and based on the value differences between treatments as well as the speed of change acceptance. The data was further analysed from a perspective of structural influence as well as the influence of emotions. Special respect was paid to the role of susceptibility in these effects.

Regarding the three different structures for susceptibility scores, the study identified that the most significant adoption of change occurs when managers exhibit high susceptibility while employees have very low susceptibility. This scenario indicates that only four out of twenty agents in the model base their decisions more on the opinions of others rather than their own parameters. Specifically, the managers, already experiencing intense emotions that enhance their willingness to explore, are further influenced by other managers in the network, thereby increasing the likelihood of change. Managers are likely to accept change and spread it to other agents as they are willing to explore new options but

are also susceptible to judgments of other agents. This starts prompt change adoption of the managers. Other agents in the network mostly depend on their own evaluation of the state attractiveness over the choices of other agents. However, despite their low susceptibility, employees still factor in the behaviour of other agents in their decision-making process.

This phenomenon is particularly evident in centralized structures, where employees interact solely with managers who are highly likely to accept change. Since managers are both dependent on choices of other managers, but are also not deterministic in their choices, they will most most likely accept the change and spread it further down the network. In such centralized structures, there is no counter-effect from "conservative" participants, leading to a notably high acceptance of change.

12.1. Effects of Structure

The analysis revealed that, in terms of speed of acceptance, in all emotional and susceptibility configurations, decentralized structures diffuse change more promptly than centralized structures. When all agents are interconnected, the agents that first accept change influence every other agent in the network simultaneously. In centralized organizations, however, where each subordinate only interacts with the management, the management must first accept the changes to be able to have additional influence on the subordinates. Important to have in mind is that agents, regardless of the number of connections, also choose based on their own preferences, which means that the change is accepted to a certain extent regardless of the structure and number of connections. However, being connected to agents that accept state 1 (change) over state 0 (status quo), depending on the susceptibility scores, has effects on other agents to choose the same state.

Overall, in the long run, i.e. runs with many (hundred and fifty) simulation periods, centralized structures were shown to be more effective in diffusing change in the organization. The reason is that subordinate agents are only connected to managers, thus making them dependent only on their evaluations and emotions. Since both anger and joy prompt exploration, agents connected only to others that feel these emotions, will also be influenced only by these exploration enhancing effects.

Each conducted simulation showed a faster change adoption in decentralized over centralized organizational structures. This brings to the conclusion that the simulations support the hypothesis 2. Namely that decentralized structures spread change faster than centralized organizations.

Since the change adoption occurs faster in decentralized organizations, there were a few instances in which, in the short run (fifty periods), decentralized structures introduced changed at a higher scale than centralized organisations. Specifically, this is the case in the following situations:

- All participants are equally susceptible and base their opinions on their personal choice as much as they do on the choices of agents they are connected to in the network (susceptibility 0,5). In terms of emotions distribution, this occurs when the central group is **angry and happy**, while other agents in the network are **content**.
- Managers (central group) is less likely to base their opinion on influences of one another (low susceptibility – 0,15), while subordinates in the network have a high susceptibility (0,85). The distribution of emotions is the same as in the case above, i.e. management either **happy** or **angry** and other participants are **content**.
- To a much lesser extent, of a few percent, decentralized structures spread change more effectively when the susceptibility scores for the central group are low, central members are **angry**, while others remain **neutral** to their emotional expressions.

The reason is that contentment increases cooperation (social influence) as well as creativeness (exploration). Therefore, decentralized structures very promptly diffuse the change, as compared to a centralized structure, making the effects of these emotional combinations on change diffusion higher in the short run.

Contentment increases exploration, or better said, the probability that the agent will choose solely based on the state payoffs. In other words, the security and knowledge which the status quo gives is not as appealing as when an agent feels neutrally, yet the contentment motivates the agent to try something new. It also increases the agent's susceptibility, making them more prone to adhering to others' decisions. When all agents are interconnected, especially when most of them are highly susceptible and a few of them experience emotions that increase the possibility to accept the change, this change starts

to diffuse in the organization more promptly. The runs were designed so that agents are designated the same emotional experiences in both types of structures. The chosen emotional combinations for participants were conducted respectfully on both centralized and decentralized structures, allowing an objective comparison between structure performances. Therefore, the agents that accept change, which was introduced or at least enhanced by managers, further contribute to diffusion of the change within the network. So, decentralized structures diffuse change more efficiently than in cases when all subordinates are connected only to managers and nobody else in the organization. In the long run, however, marginal growth of change acceptance starts to diminish only to reach its peak in somewhere between periods 100 and 120, depending on the emotional combination. This is when centralized structures outperform decentralized, proving more effective in the ultimate change adoption rate. This occurs mainly because the employees are only susceptible to managers, which experience strong emotions and are prone to accepting the state with the highest payoff. In the long run, the differences between the impact of structures for the emotional distributions in which central teams feel angry or joyful, while the rest is content, were the strongest when the management team was highly susceptible. In this case, centralized structures accepted change by 9,42% (centre is joyful) and 9,19% (centre is angry) more than decentralized structures. In the case with high susceptibility among subordinate agents, the differences between structures were the smallest, amounting to around 2,4% for both types of emotional distributions (one when management is angry, and one when it's joyful.)

The same arguments hold when agents other than the central group express and feel neutrally towards the situation. Although in the short run, the adoption quotient is almost the same, differing in only close to three percent, the speed at which this change is accepted is different for the structures. Namely, as argued earlier, centralized structures show much slower diffusion of change than do decentralized forms.

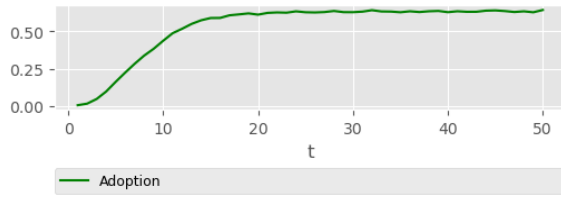


Figure 14: Short-run adoption for a decentralized structure

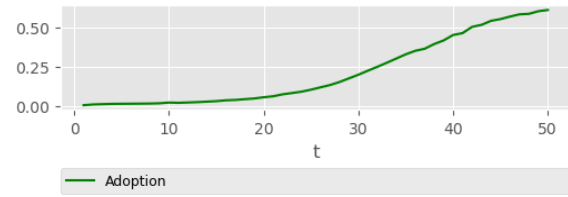


Figure 15: Short-run adoption for a centralized structure¹

Furthermore, each emotional distribution was compared to the neutral emotional setting for both of the structures. So, for the same susceptibilities, the outcomes with neutral emotions were compared to values of chosen emotional distributions. The impact of emotions for both structures was similar, apart from the short run differences that were outlined previously.

In general, the difference in performance between decentralized and centralized structures is the highest when the management team is highly susceptible, while the others remain low in susceptibility. This is also the only susceptibility combination where, in the short run, all emotional combinations in centralized structures outperform decentralized structures. The precise differences are depicted in the table below.

Table 2: Short-Run Comparison between Structures when Managers are Highly Susceptible

Management Emotion	Employee Emotion	Structure Difference (Central - Decentral)
Neutral	Neutral	6,30%
Anger	Sadness	8,06%
	Contentment	13,64%
	Neutral	7,94%
Joy	Sadness	6,50%
	Contentment	15,78%
	Neutral	8,32%

In this case, the difference in last period adoption for the emotional combinations between contentment and any other high-arousal emotion were the highest. In other two susceptibility combinations, i.e. management is low in susceptibility and all agents are equally susceptible (0,5), for these same emotional combinations (contentment plus a strong emotion), decentralized structures yielded higher change adoption in the short run. The reason why different structures were shown to be more effective

¹ Figures 12 and 13 depict manager structure low in susceptibility, with management team being angry while other participants remain neutral.

given different susceptibility combinations is in the speed at which the management team adopts change and the extent to which the employees follow. When managers are highly susceptible and they adopt the change, they will spread it more quickly through the system than is the case in decentralized organizations. In centralized structures, even when employees are highly susceptible, they carry only four connections each, while managers, although low in susceptibility, carry nineteen connections in the network. Because of this, in such a configuration in a centralized structure, their social influence remains stronger than that of other agents in the network, allowing them to pursue others. This, however, is not the case in decentralized organizations, where employees carry higher social influence than managers. Therefore, in these two susceptibility combinations, decentralized structures spread change faster. In simple terms, social influence of managers matters more in centralized structures, increasing their ability to introduce change acceptance in an organization to a significantly higher extent than in decentralized structures. In decentralized structures, the change comes more rapidly, possibly also due to help, opinions, and knowledge transfer of colleagues, making the change process faster, however the overall adoption in the long run remains lower than in centralized organizations.

These findings allow us to address the hypotheses 2a and 2b which relate to the effectiveness of the emotional influence in an organizational structure. In the short run, these hypotheses can only be supported in cases where the managers are highly susceptible. Here, as long as managers feel a strong emotion, regardless of what other employees feel, the last period change adoption will be higher in a centralized over the decentralized structure. For the other two susceptibility variants, in the short run, these two hypotheses cannot be confirmed. On the long run, however, in case of all emotional combinations, centralized structures outperform decentralized structures, confirming the hypotheses 2a and 2b.

Overall, it can be concluded that centralized structures, regardless of the emotional combination, are better for introducing steady change that should be welcomed by most agents in the network. On the other hand, decentralized structures show to be effective in the short run, when prompt reactions to address market changes are necessary.

12.2. Effects of Emotions

In general, in the long run, the effects of emotion did not have a particularly high effect on change acceptance when compared to the results of the neutral treatments. However, some tendencies and conclusions about their effect on decision making and change acceptance can be drawn.

General Comparison

Comparing all simulations that were conducted for their performance showed consistencies in effective parameter and structure combinations. Simulations which reached their maximum acceptance, i.e. measured in the 'long-run' (hundred simulation periods), the following were the top five best and worst performing combinations:

Table 3: Highest and Lowest Five Change Adoption Combinations

Susceptibility	Structure	Emotion of Managers	Emotion of Agents	Final Period Adoption	Standard Deviation
'Managers' high susceptibility scores	centralized	Joy	Contentment	76,15%	0,0953
'Managers' high susceptibility scores	centralized	Anger	Contentment	75,70%	0,0973
'Managers' high susceptibility scores	centralized	Anger	Neutral	72,26%	0,0919
'Managers' high susceptibility scores	centralized	Joy	Neutral	71,94%	0,0974
Susceptibility 0,5	centralized	Joy	Contentment	69,66%	0,1094
Managers low in Susceptibility	decentralized	Joy	Sadness	61,05%	0,1024
Managers high in Susceptibility	decentralized	Anger	Sadness	60,89%	0,1091
Susceptibility 0,5	decentralized	Joy	Sadness	60,80%	0,1067
Susceptibility 0,5	decentralized	Anger	Sadness	60,14%	0,1041
Susceptibility 0,5	decentralized	Neutral	Neutral	59,99%	0,1117

As can be noticed from the table above, centralized structures significantly outperform decentralized ones in terms of change diffusion in an organization. The scale of this effect was particularly high when managers were highly dependent on opinions of others while the rest based their opinions largely on

their own evaluations. The reason is that all of the emotions promote innovative behaviour and readiness to accept change. When managers are more prone to listen to one another, the effects of the strong emotions, i.e. the readiness to try new options, other managers will more likely be persuaded, as they are prone to similar behaviours as well. Managers are also agreeable with other subordinates, who when feeling content, tend to promote creative thinking. Sadness, compared to contentment, decreases explorative tendencies, while both increase cooperativeness (agreeableness) to the same extent, as programmed in the model. Therefore, the teams which accept most change share the characteristics in that (a) they are centralized in structure, (b) managers are cooperative with one another and with their subordinates as well, (c) subordinates feel either neutral or content.

The worst performing combinations were those where the majority of participants in a decentralized organization felt sad, which is in line with prior research, suggesting that sadness induced agreeableness, analytical thinking and conservative choices (Pekrun, & Frese, 1992). The only combination which performed worse in the decentralized organization is when all agents are neutral, as this combination is entirely independent on the exploration enhancing effects of joyful and angry affective states. Since in a decentralized structure, all agents interact with each other, the influence of sadness present in most agents (sixteen out of twenty) is promoted throughout the network the most strongly. Sadness leads to disengaging behaviour (Pekrun, & Frese, 1992), and could also be interpreted as dissatisfaction and a lack of motivation on the job. Therefore, the prevailing presence of this emotion can have detrimental effects on accepting and implementing change in the organisations.

Emotions in Decentralised Structures

For decentralized structures, in the short run, the emotional effects on change adoption are rather constant across emotional distributions and susceptibility variants. The largest effects are for both strong emotions in managers and a neutral affective state for other agents, in which cases the change diffusion is increased by around 4%. This means that the highest two achieved changes in organizations were constant across all susceptibility variations which were used. When all agents are interconnected, the susceptibility scores play a smaller role on change acceptance than in centralized organizations. Comparing the results to neutral runs, first when all agents feel neutral and second when the managers

keep the high arousal affective state (joy or anger) yielded a conclusion that strong emotions indeed prompt a larger last period change adoption. Mild emotions felt by employees, like sadness and contentment failed to significantly enhance or diminish the effects of these strong emotions.

In the long run, in decentralized structures, the most efficient change acceptance occurs in combination of the four agents with strong emotions and the rest of agents being content. However, the influence, also in the cases with the most effective emotional distribution, is rather small, amounting for no more than 4%. This influence is, naturally, the highest in cases where managers are highly influential, i.e. when their susceptibility scores are high. When the management team experiences intense emotions and is highly influential, due to their number of connections and high susceptibility scores, they can prompt change adoption effectively. Their influence will significantly persuade others to follow management commands and accept innovation.

Adoption speed in decentralized organizations is the fastest, when most agents are high in susceptibility scores, i.e. employees are highly susceptible. The slowest acceptance happens when only the four managers highly rely on choices of others. In this case, agents are less likely to explore new options, since their emotional treatments do not enhance this as much as managers' strong emotions, joy and anger. Also, they are less influenced by others in the network, as their susceptibility scores are low. As all agents are interconnected, but less susceptible and less likely to promptly adopt change, this combination yields the slowest acceptance. To put it more clearly, if in a group of 20 individuals, everyone interacts with each other but is not particularly prone to listen to others or accept innovation, the change will spread more slowly. This is in contrast to when these individuals are prone to listen to even just a few agents who have already adopted the change.

Emotions in Centralized Structures

For centralized structures, however, these scores show larger disparities among emotional combinations. Also, the effects of emotions are larger, making up for up to almost 7% compared to neutral settings. In some instances, the emotional combinations have shown poorer results in change acceptance as compared to a neutral setting, however, these differences are negligible, as they amount for less than 1%.

In the short run, combinations which performed the best in centralized structures varied depending on the susceptibility scores. However, these increases in change adoption that were prompted by introducing emotions were rather small between 1% and 2%, with an exception in cases where managers exhibit high social influence, are joyful while the rest of the participants remains content (increase of 4,35% compared to neutral treatment). Second most effective increase is also in the case of highly influential managers, however when they are angry, and the rest remains neutral. In this case, the increase in change adoption compared to neutral treatment is 2,79%.

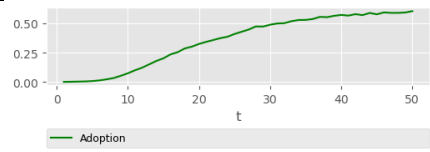
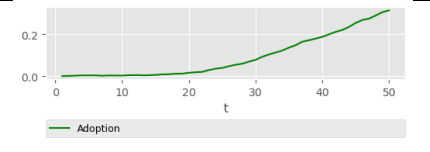
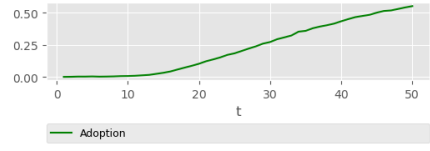
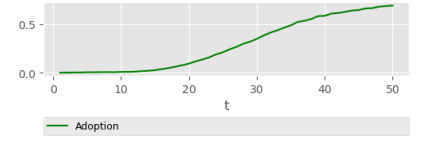
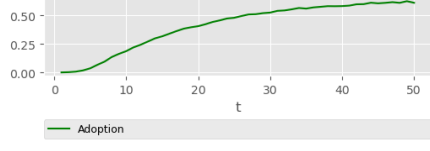
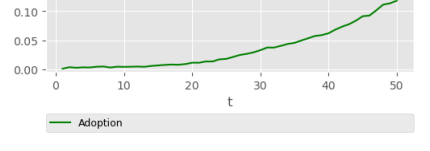
Table 4: Best Performing Combinations for Centralized Structures

			Last period adoption	Standard Deviation
Susceptibility 0,5	I	Neutral treatment of all agents	63,58%	0,1053
		Center Joyful, Rest Neutral	65,98%	0,1081
	II	Center Angry, Rest Neutral	65,58%	0,1106
'Managers' high susceptibility scores	I	Neutral treatment of all agents	69,47%	0,1059
		Center Angry, Rest Neutral	72,26%	0,0919
	II	Center Joyful, Rest Content	73,82%	0,1418
'Managers' low susceptibility scores	I	Neutral treatment of all agents	62,12%	0,1077
		Center Angry, Rest Sad	63,11%	0,1105
	II	Center Joyful, Rest Neutral	62,90%	0,1361

The change adoption is higher in the case where other agents are highly susceptible and carry sadness, while managers are angry, than when other agents (apart from managers) remain neutral. The reason is that sadness significantly increases susceptibility and agreeableness, which is why the overall change adoption is increased with a combination of angry managers and sad employees in a centralized structure, as compared to a decentralized structure, where agents are also influenced by other sad agents, diminishing their willingness for exploration even further.

In the long-run, emotional combinations that showed most effective in terms of change acceptance in line with results from the centralized organizations, strong emotions felt by managers and contentment of the rest of the agents. Here, the treatments were between 5,05% to 6,68% more likely to accept change than during neutral treatments. Interestingly, these were the combinations which performed the worst in the short run, as the change acceptance in these combinations was very gradual and showing mostly linear and steady growth at the end of conducted simulation periods.

Table 5: Short-Term Change Acceptance in Anger/Contentment Combination

	Anger & Contentment in Decentralized Structures	Anger & Contentment in Centralized Structures
Susceptibility 0,5		
Managers high in susceptibility		
Managers low in susceptibility		

From the above graphs it can be drawn that, compared to centralized structures, decentralized achieved higher growths in shorter period for the given emotion combination. However, after conducting long-term simulations for these emotions, centralized structures once again proved to be more effective in diffusing change in organizations, achieving significantly higher results than in the decentralized case. This is particularly the case with highly susceptible managers, where the centralized structures outperform decentralized structures by almost 10% in the last period adoption. This difference is the least noticeable in the case where most other participants are highly dependent on evaluations of others. In centralized structures, this means that subordinates, which interact only with each of the four managers, base their opinions largely on managers' choices, rather than their own evaluation of state pay-offs. Because of this, instead of choosing the option they desire, which could increase the chance of accepting new states, they are most likely to align their choices with those of the managers. The

similar process occurs in decentralized organizations as well, so, although each agent interacts with more agents, they are still most likely to base their choices on actions of others. Because of this, the extent to which each agent decides for himself is limited and the difference between structures in this case is comparable. The same argument, yet in the other direction, explains why the change acceptance is so significantly higher in centralized organizations when managers are highly susceptible. Not only are the chances that they accept change higher, but ‘subordinates’ do not only feel emotions which enhance the probability to invite innovation, yet they also interact solely with agents that this change. On the other hand, in decentralized organizations, these ‘subordinate’ agents are not only influenced by agents experiencing strong emotions, but also those that experience contentment, thus decreasing the overall impact of strong emotions in the network.

The most peculiar dynamic revealed by the model is that a combination between contentment and strong emotions, such as joy or anger. This combination yields a most gradual change acceptance, particularly in centralized network structures. The overall change acceptance process is especially slow when the subordinates are highly susceptible, but only connected to the management team. High susceptibility means agents are highly influenced by their connections. However, when the few agents they interact with possess low susceptibility, the influence they can exert on the rest of the network is significantly weakened. The few highly connected, low susceptibility agents, i.e. management, serves as a bottleneck. If they accept the change late in the process, since they are connected to many other agents, their reluctance to adopt new states slows down the overall diffusion process. Further while contentment generally fosters creativity and cooperation, it also encourages maintaining the status quo. Agents that are satisfied with their current state are less likely to initiate or adopt change as quickly as those that feel angry or joyful. In a structure where most of the participants are content and less likely to blindly base their evaluations on choices of others, this process becomes very gradual. In decentralized structures, while the effect is still present, the impact is weaker, as there is no single point of resistance and change can move along the network freely through all interconnected agents.

13. Conclusion and Suggestions for further Research

To delve into conclusions on the conducted analysis, it should be noted that the model only measures the degree to which change, and innovation get accepted and diffused within a network. In no way does the model address the potential benefits nor the success of this introduced change. This is also supported by a study (Lindebaum, & Jordan, 2012) positing that positive-valence emotions can have negative impacts, while negative can yield positive results. The study gives an example of an angry leader being perceived as authentic, and by potentially introducing mild levels of fear within employees, can serve as a source of self-motivation to perform better and be accepted (Heerdink et al., 2013).

The results of the study highlight several key findings. First, decentralized structures generally diffuse change more promptly than centralized structures, particularly in the short run. This is because decentralized networks allow agents who accept change to influence every other agent simultaneously. However, in the long run, centralized structures prove to be more efficient in diffusing change, especially when managers exhibit high susceptibility. This is due to subordinate agents depending solely on the evaluations and emotions of the managers, who are more likely to adopt change when experiencing strong emotions such as anger and joy.

Another significant finding is the role of susceptibility in change adoption. In a centralized organization, when managers have high susceptibility ($\theta = 0.85$), they are highly influenced by the evaluations and actions of other managers. Since managers are also connected to all employees, any change adopted by the managers quickly diffuses down through the organization. Employees, having low susceptibility, are influenced solely by the choices of their superiors, their managers. This hierarchical influence means that once the highly susceptible managers adopt the change, the employees will follow due to the strong top-down influence. On the other hand, in decentralized networks where all agents are equally connected, the influence is more evenly distributed. While this allows for quicker initial diffusion of change, it lacks the strong hierarchical diffusion observed in centralized structures.

The study also reveals that contentment significantly impacts change adoption by promoting cooperation and creativity. In decentralized structures, contentment increases the probability that agents will choose based on state payoffs, i.e. objectively perceive the attractiveness of state 1 (change), but it

also makes them more susceptible to others' decisions. This dynamic facilitates prompt diffusion of change. Because of this speed of change diffusion, in the short run, in combinations with content agents, decentralized structures achieve higher last period adoptions than centralized. However, in the long run, centralized structures outperform decentralized ones, particularly when managers are highly susceptible and exhibit strong emotions.

Apart from emotions, organizational structures, and social influences, what significantly impacts our responses to a task is its complexity. For instance, how much we enjoy a task or how boring we perceive it can directly be linked to the relative complexity of the task at hand. The relative complexity of the task is the alignment between the simulation provided by the task and the level of simulation which is optimal for the individual at a given point in time (Pekrun, & Frese, 1992). Thereby, assuming that effects of emotion are equal for every decision that should be made is an oversimplification of a much more sophisticated issue. It would be beneficial to explore the simulations with different levels of relative complexity and the direct impact of affective states on individual responses.

Furthermore, although some general conclusions on the activation tendencies of different emotions can be made, humans have individual approaches and mechanisms to dealing with emotions. While fear can be paralyzing for some, for others it can be a driver of performance (Lindebaum & Jordan, 2012). However, these mechanisms can also be grouped into more homogenous characteristics and responses. Therefore, another suggestion for a possible direction for research on emotional and interpersonal effects in organizational decision making, would be to further divide the emotional reactions and the agents into different categories. Psychology offers a variety of models which can be incorporated to enable the model to come closer to describing the real-world settings. These might include the five-factor model, which outlines the five broad dimensions of personality which influence our emotional reactions (a) openness to experience, (b) conscientiousness, (c) extraversion, (d) agreeableness, (e) neuroticism. For instance, high neuroticism is associated with more intense emotional reactions and a difficulty in emotional regulation (McCrae, & Costa, 1987). Further, Cloninger, Svrakic and Przybeck (1993) developed a model with seven dimensions, four temperaments (novelty seeking, harm avoidance, reward dependence, persistence) and characters (self-directedness, cooperativeness, self-

transcendence). What would have to precede such a modular approach to decision making are experiments which combine these research fields to understand the effects of emotions on these chosen models of personality.

Hand in hand with individual mechanisms to deal with emotion is also the individual manifestation of emotions. Depending on how vivid the physical expression of emotions are, as well as how strong the emotional reactivity of the individual processing this emotional expression, the effects of the emotional influence on others varies significantly (Lindebaum, & Jordan, 2019). This emotional expression, and its interpretation, also depends on the dynamics of the group, how competitive or cooperative are the settings or how excluded or accepted an individual feels. As Van Kleef, de Dreu and Manstead (2010) show, emotions can have different effects depending on the social context they are expressed in. For instance, Heerdink et al. (2013) found that the feeling of rejection when an individual disagrees with the majority is stronger when the majority expresses anger, than when the majority expresses happiness. The same study also suggests that not all negative emotional reactions lead to feelings of rejection. For instance, the feeling of rejection in case of deviance from majority's opinion was the same in a neutral setting as when the majority expressed disappointment, however it was significantly increased when the group expressed anger. As emotions also influence our behaviour in social interactions, serving as a form of communication, (Ekman, 1993; Frijda, 1986; Knutson, 1996), it would be interesting to further deepen the current research fields in areas of network dynamics. In an organization, not all people we interact with are perceived equally, nor would we react to emotions of everyone else in the same way. For instance, a dear colleague could openly express anger towards another person in an organization, leading to our sympathies for the situation. On the other hand, expressions of anger by someone from our team, who we do not particularly like, may further strengthen our disliking and negative evaluation. Therefore, an understanding of emotions in social decision making requires additional focus on interpersonal effects of emotions (van Kleef, De Dreu & Manstead, 2010).

In summary, the findings of this study highlight the complex interplay between emotions, organizational structures, and susceptibility in the process of change adoption. While decentralized structures facilitate quicker diffusion of change in the short term, centralized structures are more effective in the long term,

particularly when managers are highly susceptible and exhibit strong emotions. These insights underscore the importance of considering emotional dynamics and organizational structure when designing strategies for change management.

Further research could build on these findings by exploring the effects of different levels of task complexity and individual differences in emotional regulation. Incorporating psychological models such as the five-factor model and Cloninger's seven-dimension model could provide a more nuanced understanding of how emotions influence decision making in organizational settings. Additionally, investigating the interpersonal effects of emotions and their expression within group dynamics could offer valuable insights into the social aspects of change adoption.

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Appendix

Table 6: Short Run Simulation Results

Susceptibility Variants	Management Emotions	Employee Emotions	Organizational Structures			
			centralized		fully decentralized	
Susceptibility 0,5	Neutral	Neutral	63,58%	0,11	59,99%	0,11
	Anger	Sadness	63,09%	0,11	60,14%	0,10
		Contentment	31,57%	0,33	60,41%	0,19
		Neutral	65,58%	0,11	62,13%	0,10
	Joy	Sadness	63,19%	0,11	60,80%	0,11
		Contentment	51,46%	0,30	58,78%	0,19
		Neutral	65,98%	0,11	61,45%	0,11
'Managers' high susceptibility scores	Neutral	Neutral	69,47%	0,11	63,17%	0,11
	Anger	Sadness	68,95%	0,10	60,89%	0,11
		Contentment	68,85%	0,23	55,21%	0,26
		Neutral	72,26%	0,09	64,32%	0,10
	Joy	Sadness	68,60%	0,10	62,10%	0,11
		Contentment	73,82%	0,14	58,04%	0,23
		Neutral	71,94%	0,10	63,62%	0,10
'Managers' low susceptibility scores	Neutral	Neutral	62,12%	0,11	61,31%	0,11
	Anger	Sadness	63,11%	0,11	61,33%	0,11
		Contentment	11,80%	0,24	61,07%	0,18
		Neutral	61,10%	0,18	64,18%	0,10
	Joy	Sadness	62,28%	0,10	61,05%	0,10
		Contentment	15,87%	0,27	60,72%	0,18
		Neutral	62,90%	0,14	61,96%	0,11

Table 7: Long Run Simulation Results

Susceptibility Variants	Management Emotions	Employee Emotions	Organizational Structures			
			centralized		fully decentralized	
Susceptibility 0,5	Neutral	Neutral	63,58%	0,11	59,99%	0,11
	Anger	Sadness	63,09%	0,11	60,14%	0,10
		Contentment	69,66%	0,11	63,45%	0,11
		Neutral	65,58%	0,11	62,13%	0,10
	Joy	Sadness	63,19%	0,11	60,80%	0,11
		Contentment	68,73%	0,10	64,32%	0,11
		Neutral	65,98%	0,11	61,45%	0,11
'Managers' high susceptibility scores	Neutral	Neutral	69,47%	0,11	63,17%	0,11
	Anger	Sadness	68,95%	0,10	60,89%	0,11
		Contentment	75,70%	0,10	66,51%	0,12
		Neutral	72,26%	0,09	64,32%	0,10
	Joy	Sadness	68,60%	0,10	62,10%	0,11
		Contentment	76,15%	0,10	66,73%	0,11
		Neutral	71,94%	0,10	63,62%	0,10
'Managers' low susceptibility scores	Neutral	Neutral	62,12%	0,11	61,31%	0,11
	Anger	Sadness	63,11%	0,11	61,33%	0,11
		Contentment	68,01%	0,12	65,60%	0,10
		Neutral	66,28%	0,10	63,14%	0,10
	Joy	Sadness	62,28%	0,10	61,05%	0,10
		Contentment	67,17%	0,12	64,73%	0,11
		Neutral	62,90%	0,14	61,96%	0,11