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IT IS TIME TO CHANGE THE WAY WE CHANGE

by

THANE KELLER
B.A. Virginia Military Institute, 2007
M.A. Liberty University, 2016

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Science
in the School of Modeling, Simulation, and Training
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ABSTRACT

Seventy percent of organizational change initiatives fail. Among organizations where change and adaptation are necessary for survival, the U.S. military stands at the top. The disparity between desired health and fitness behaviors and actual behaviors is a glaring reminder that change is difficult to implement and that current change systems struggle. Merit-based systems offer a solution by rewarding and reinforcing good behavior to generate lasting change. This paper evaluates Kotter's Change Model and Nudge Theory and found them insufficient because they do not sufficiently address reinforcement learning or the temporal tie between behaviors and rewards for reinforcement. This paper then examines behavior modification through a theoretical framework called Active Inference. Active Inference suggests agents or organisms will engage in behavioral tradeoffs based on their prior knowledge, present sensing, and future beliefs. This paper suggests that the modeling of behaviors using active inference allows supervisors to predict and target behaviors that will need to be reinforced by a merit-based system to produce long-term change. Finally, this paper examines and recommends the adoption of blockchain play-to-earn models to standardize and automate rewards to produce lasting habits that result in long-term change.

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CHAPTER ONE: INTRODUCTION

The U.S. Military has a health and fitness problem that directly impacts readiness (Clark, 2020; Steinhauer, 2021; Tilghman, 2016). The U.S. Military's singular mission is to deter and defeat enemies of the United States to ensure U.S. security (U.S. Department of Defense, 2022). Critical to deterrence and defense is the strength, fitness, training, and wellbeing of each individual soldier, airman, sailor, and marine, the U.S. Militaries most valuable asset (Cronk, 2022; Saunders, 2022; Thorton, 2018). Over 15% of active duty service members are now considered obese and only 33% of service members are classified as having a normal weight (Clerc et al., 2022).

Despite many change efforts to address health and physical fitness, numbers continue to trend in the wrong direction (Clerc et al., 2022; Steinhauer, 2021). It is time for the U.S. Military to evaluate how they change individual attitudes and behaviors to regain a fit and effective force. These individual behaviors and attitudes create a disparity between desired behaviors and actual behaviors, often which result in long term harm to both the organization and the individual.

The Department of Defense, an arguable leader in encouraging healthy soldier habits through enculturation processes such as basic training and unit mentorship, spends "about $1.5 billion a year in obesity-related health care costs for current and former service members and their families…" and "lost work days due to overweight and obesity averages 658,000 days per year and costs the DOD $103 million a year" (CDC, 2022a, 2022b). More broadly, the cost of preventable diseases in the U.S. alone has been estimated at a shocking $730.4 billion (Galea & Maani, 2020). Civilian organizations across the U.S. estimate that 20% of their employees arrive

late resulting in a "productivity loss of $500-$600 per employee each year" (Keri Systems, 2021). In New York alone, it is estimated that late arriving employees cost their state more than $700 million per year (Kline, 2018).

Individually, the cost is much higher. Research overwhelmingly shows that high fat, processed foods, and refined sugar, are major contributors to heart disease, obesity, high blood pressure, diabetes, low energy, and even depression (Farquhar et al., 2015; N. Fox, 2019; Poti et al., 2017). In an article published by the Fast Company titled "Change or Die" (2005), Dr. Edward Miller presented a staggering fact about lifestyle change and heart disease: Ninety percent of patients confronted with lifestyle change over multiple painful bypass surgeries and ultimately death do not change their lifestyle (Deutschman, 2005).

While the U.S. Army and other military staff colleges teach organizational change models, those change models do not sufficiently address individual behaviors to encourage both small and broad-based change. The vast majority of popular change models today are top down approaches that spend a lot of time developing change visions and change desires, developing a structure that enforces those desires, and then celebrating short term and long term organizational wins (Expert Program Management, 2022; Hicks, 2020; Kotter, 2022; McKinsey & Company, 2022). While each framework should be lauded for their work in the organizational change sphere, numerous studies show that fewer than 30% of change initiatives succeed and only 18% of employees call themselves "change agile" (Rock, 2019; Wentworth et al., 2020).

This leaves the Department of Defense in a precarious position and is the broader problem this paper addresses: if most change initiatives fail and if most people are not change agile, then how does the U.S. Military encourage health and fitness change to enable leaders to

maximize the potential of warfighting organizations and the human capital that exists inside of them? To answer this question, this paper examines change through the lens of reinforcement learning (which in this paper is defined as a psychological construct where the subject is not explicitly told what actions to take but rather discovers them through exploration and exploitation and the gaining rewards or punishers (Sutton & Barto, 2018)), individual habit management (the act of making positive choices that lead to habits), and automation (to save leader time and gain efficiencies). It examines two predominant change management frameworks (Kotter's Change Model and Nudge Theory) and suggests a new framework for evaluating decision making as a change management approach called Active Inference (Smith et al., 2021). Finally, this paper provides a model for a blockchain based change initiative (which is the application of an automated, secure, and transparent ledger system that stores actions and transactions in a single chain of subsequent blocks (Zheng et al., 2018)) that can be adopted to the Department of Defense and other hierarchical organizations more broadly.

CHAPTER TWO: LITERATURE REVIEW

Current Models for Organizational Change

Kotter's Change Model

There is no shortage of models describing ways to encourage organizational change. Kotter's Change Model is an extremely popular change model among organizations, including the U.S. Army, where it is taught in the Army's Command and General Staff College at Fort Leavenworth, KS. Kotter's change model has been celebrated as an effective way to implement and manage organizational change (Kotter, 2022). Applying Kotter's change model has also been associated with a greater chance of achieving change success and has been adopted by many organizations because of its practicality and simplicity (Appelbaum et al., 2012).

Figure 1: Kotter's Change Model. Kotter's Change Model consists of eight steps for creating change.

Source: Kotter Inc. (Approved for use by Kotter, inc.)
https://www.kotterinc.com/methodology/8-steps/

Kotter's model begins by encouraging leaders to create a sense of urgency in their subordinates – by inspiring people "to act with passion and purpose." Step two is building a guiding coalition. This consists of a group of volunteers who are committed to guiding change. Step three in Kotter's model is forming a strategic vision, which should clarify how the vision for the organization is different from the past. Step four requires the enlistment of a volunteer army, suggesting that large scale change "can only occur when massive numbers of people rally around a common opportunity." Step five is focused on removing barriers to change so that there are no roadblocks that would slow down progress. Step six recognizes that momentum can be

built by the collection of small, short-term wins that can be seized and capitalized on. Step seven is focused on leaders sustaining the acceleration of change. And finally, Step eight encourages the formal institution of the change behavior the organization was seeking. (Kotter, 2022).

Research on Kotter's change model is generally positive, although it should be noted that there have not been very few, if any, comprehensive studies that examine all eight steps of the model (Appelbaum et al., 2012; Wentworth et al., 2020). However, there are several studies that do show the successful implementation of Kotter's change model. A study conducted at a tertiary academic hospital showed that the implementation of Kotter's eight step model led to a cost savings of nearly $40,000 per year and a time savings of over 1300 hours per year (Toor et al., 2022). Other corporations such as Ericsson, Honeywell, and PepsiCo also used and applied some or all of Kotter's change model with success (Paper et al., 2001; Wentworth et al., 2020). Finally, an assessment of Kotter's Change Model in the non-profit setting found that following Kotter's eight step process successfully achieved the desired organizational change (Richesin, 2011).

Nonetheless, there are some issues with Kotter's model. For example, a review of Kotter's model reveals that resistance to change results in the marginalization of resistant employees while only the change-willing employees are engaged in the change initiative (Alfaro Solano & Preuß, 2019). This dangerous precedent not only risks sidelining a significant percentage of the workforce (given only 18% of employees rate themselves as change agile (Rock, 2019)), but also could result in longer term headaches such as workers that quit or retire and the loss of that expertise. Companies who lose employees must not only begin the rehiring process, but also must find trained workers or pay for training and certifications that an inexperienced worker will need.

Kotter's change model also requires substantial leader involvement but doesn't completely describe those characteristics and skills required for a leader to execute a change initiative (Alfaro Solano & Preuß, 2019). While Kotter's descriptions only scratch the surface of the types of leaders that can lead organizations through change, it is also unlikely that leaders in existing organizations will be able to sufficiently be trained and adapt their management style to such an endeavor.

Lastly, Kotter's model encourages an orderly stepwise approach to implementing change. For example, leaders should not move to step six until they have completed steps one through five. But the risk is that this adds precious time between inspiring employees with a vision for change and generating the first short term win at the organizational level. In an environment where time is a critical factor for producing behavioral changes and given the statistics that fewer than 30% of change initiatives succeed (Rock, 2019), Kotter's model runs the risk of become more like a New Year's Resolution that a template for meaningful lasting change.

Nudge Theory

Whereas Kotter's Change Model is primarily focused on leadership encouraging broad change, Nudge Theory is another popular theory that highlights the role of the individual. Specifically, the premise is that people can be "nudged" to make the right decisions (Expert Program Management, 2022). The nudge theory process consists of seven steps leaders should take when attempting to nudge an employee to exhibit the right behaviors (Caredda, 2020; Mulholland, 2019). Step one encourages leaders to define what they want changed and to find small goals that build up to the overarching outcome. Step two encourages leaders to think

through the employee's perspective and the benefits to them to participate in change. In Step 3 a leader develops courses of action that shows the best possible choice. This evidence is then used in step four to let people choose the nudge over alternatives. It is possible in this step that there is only one true choice or that there is the illusion of choice. Properly done, this step provides evidence to an employee why the choice they make should be the choice you want them to make. Step five is evaluating whether the nudges are working, often through metrics or feedback. Step six is determining what obstacles or negative reinforcement exists between your team and the desired change. And finally, step seven consists of a review of success and an adaptation if challenges were discovered. (Caredda, 2020; Expert Program Management, 2022; Mulholland, 2019).

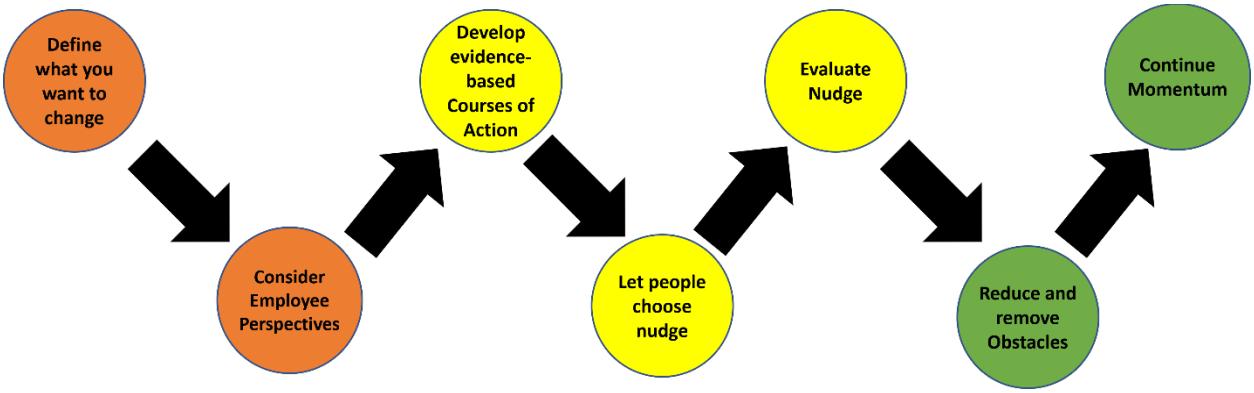

Figure 2: Nudge Theory. Nudge Theory describes ways to "nudge" employees into the right behaviors.

Source: Adapted from process.st
https://www.process.st/nudge-theory/

Nudge theory has recently gained substantial visibility in both the U.S. and the U.K. Cass Sunstein, co-author of *Nudge: Improving Decisions about Health, Wealth, and Happiness* (2008) had the ability to implement his nudge theory into government during his time in the Obama Administration (Kosters & Van der Heijden, 2015). In the U.K. nudge theory was implemented

in the government through Behavioral Insight Teams to implement these theories into governance (Kosters & Van der Heijden, 2015).

Despite its popularity, nudge theory is not without criticism. Kosters & Van der Heijden (2015) provide several criticisms of nudge theory. Nudge theory is accused of restricting freedom of thought and behavior by presenting "subjectively good" nudges while employees are often restricted in their choices for alternatives (Kosters & Van der Heijden, 2015). Examples of nudge theory are also primarily about leaders altering the environment rather than a preference for internal behavioral change. One example given is that if a leader wanted employees to meet members of the company outside of their immediate team, then the leader might consider creating "a single cafeteria for the entire organization…" (Expert Program Management, 2022). This example highlights that if habits are changed, they are changed because of a forcing function, rather than the result of decision making on behalf of the individual. Given the methods of nudges, one must also evaluate whether this method is truly transparent rather than simply manipulative. For example, if behavior is influenced subconsciously (not enough time to eat elsewhere) or coerced (removing alternate seating options) then nudging is likely neither transparent to nor welcomed by the employee (Kosters & Van der Heijden, 2015).

Within a military context nudge theory closely resembles coercion based on rank, culture, belonging, or status. The nudge that soldiers receive to conform to certain standards is often presented without alternative options. For example, a team leader that expects his or her soldiers to sit as a team in the dining facility may simply ostracize a non-conforming member as an example to the others. Commanders who are unhappy with performance inspections will simply close off morale rooms until soldier discipline improves. As above, it should be noted that these

nudges do not inherently change behavior, they simply change the opportunities that certain behaviors have to exhibit themselves. Once a morale room re-opens, it should be expected that performance will once again slide until corrective action is again taken. Furthermore, because military units experience high personnel turn-over and soldiers frequently join and leave teams because of promotion, schools, injuries, leave, or the military move cycle, nudge theory proponents will find it challenging for nudges to remain effective unless that nudge reflects a permanent change to the environment. But permanently removing morale and recreation facilities, dining tables to encourage cohesion, or continually finding the next soldier to make an example of is hardly a positive way to impact behavioral change.

Organizational Culture

Much of the discussion on organizational change above overlaps with concepts of organizational culture and the types of cultural changes necessary to alter the behavior and habits of an organization so that it can successfully change. Culture can be defined as "beliefs, values, attitudes, behaviors, and practices that are characteristic of a group of people" (Warrick, 2017). Culture varies significantly from organization to organization (Warrick, 2017) and the units across the U.S. Army have vastly different cultures based on their missions, job titles, and unit history. Interestingly, recent research indicates that many change initiatives don't fail because of large overarching strategies but because of those very behaviors, attitudes, habits, or beliefs that make up a culture (Cinite & Duxbury, 2018; Rock, 2019; Warrick, 2017).

Rock (2019) summarizes the change challenge this way: "You might assume the biggest factors were some combination of poor strategy or lack of investment. Not so. By far, the biggest

factor in why organizational change fails, involves a failure to change human habits. In case after case, everything was right – the strategy, the plans, the budget – but the *people* were not changing." Ultimately, an organization's culture is made up of people who exert their behaviors, attitudes, habits, and beliefs on an organization and therefore must be the primary focus of any organizational change initiative. Whereas Kotter's Change Model and Nudge Theory are largely top-down leader driven events, given the discussion on organizational culture it is important to look at merit-based approaches as they seek to reward the behaviors of the individual.

Merit Based Approaches

There are relatively few comprehensive studies (Cameron & Pierce, 1994; Pham et al., 2020) on merit-based approaches and even fewer studies that account for more than just financial rewards. Still, a critique is warranted as this paper seeks to implement a merit-based approach to organizational change. The literature on merit-based approaches is split, with some finding approaches to be effective and others finding no effect. In a review of financial compensation for managers based on their organization's performance, researchers found that there was no indication that a merit pay program effected organizational performance at all (Pearce et al., 1985) while a more recent evaluation found that merit-based incentive payment systems in the health industry suffered from weak incentives and invalid reward criteria and data (Rathi & McWilliams, 2019). Additionally, in an empirical test of the relationship between sustainable behavioral changes and rewards, there was found to be no correlation (Pellegrini et al., 2018). Instead, researchers discovered that when organizational leaders and first line supervisors promote and value change behavior, employees are more likely to internalize the change

(Pellegrini et al., 2018). Finally, in a study evaluating the psychological well-being of employees in merit-based pay organizations, researchers found that employees were less satisfied with their organizations when compared to counterparts who do not have such a system (Choi & Whitford, 2017).

Other studies, however, have highlighted the importance of both monetary and non-monetary reward systems. In a study among Malaysian Subject Matter Expert employees, there was a significant and positive relationship between both intrinsic and extrinsic rewards and that employee's organizational commitment (Chung & Al-Khaled, 2022). Extrinsic rewards include things like "salary, fringe benefits, promotions, and social environments" while intrinsic rewards include "sense of achievement, challenges, responsibility, personal growth, professional growth, social status, acknowledgment…self-worth, and personal satisfaction" (Chung & Al-Khaled, 2022). This research also aligns with Herzberg's Motivation Theory (1959) which suggest that rewards such as compensation, recognition, and benefits should be combined with an employee's intrinsic desires (Chung & Al-Khaled, 2022; Nickerson, 2021).

Other research echoes these claims. In a study on internal stakeholders in France and organizational change, the internal employee stakeholder role in successful change was essential. On rewards, employees recognized that "If we all have a good year, well we'll all have the same thing at the end, whatever the position, from the salesman to the operator, the innovator. Everyone receives the same reward at the end. Front line personnel such as sales people don't have more opportunities for rewards than support personnel…we all get the same incentives" (Chebbi et al., 2020). These findings highlight two incredibly important aspects of merit-based approaches. They must be fair and transparent. Finally, research in general has found that both

monetary and non-monetary rewards encourages participants to "be proactive and innovative while focusing on customers, service quality and service mindedness" (Chebbi et al., 2020).

This is generally an area where the U.S. Military excels. While there aren't financial incentives such as bonuses or pay raises based on performance, the Army does provide opportunities for service members to earn rewards such as achievement awards to be worn on their dress uniform, certificates that can count towards promotion points to the next rank for junior soldiers, public recognition by peers, or even time off. Soldiers who are high performers are also recognized by being selected to attend coveted training certifications and schools such as airborne school, air assault school, ranger school, and officer candidate school. Finally, a very small percentage of officers who excel well beyond their peers may be selected for early promotion to the next rank.

Research Summary

In a meta-analysis on organizational change models, Hamlin et al., (2019) identified the top factors mentioned for organizational change failure. In the top three reasons were a "lack of communication, ineffective leadership, and employee resistance" (Hamlin et al., 2019). Change resistant employees and a lack of employee involvement were substantive change-failure comments within those top three categories (Hamlin et al., 2019). Among other factors were the loss of skilled staff and the pace of change (Hamlin et al., 2019). While not explicitly described in their research, the loss of skilled staff is likely a further indicator of the impact change has on an organization and especially on change resistant employees. They simply leave.

Among merit-based approaches, there is little discussion about using merits to generate change. Merits as a reward system are well documented and appear to be effective, but not necessarily pertaining to organizational change itself. Kotter's change model is a model that most closely addresses merit-based approaches through its leveraging of short term wins to gain and maintain momentum (Kotter, 2022), however these short-term wins do tend to rely on employee altruism rather than tangible pleasure (such as bonuses or time off).

Research Gap

A review of the literature exposes a gap between change model theory and the military's health and fitness problem. While leaders are armed with current change theories for driving top down, broad change (U.S. Army, 2015), fitness and obesity trends move in the wrong direction (Clerc et al., 2022; Steinhauer, 2021). Furthermore, the research above describes two additional glaring facts that are important to the U.S. Military's change problem. First, most individuals resist change, often irrationally (Berridge, 2003; Kennett et al., 2013) when considering the potential short and long-term effects of not changing; and second, most leaders neither have the time, nor the skill set to lead organizations through broad change. Much research has been done into the factors influencing change failure, but solutions are not presented, specifically for performance based, hierarchical organizations like the U.S. Military. Within the meta-analysis on change failure (Hamlin et al., 2019), a suggestion is made that a "flexible organizational change approach is needed" because one-size-fits-all models do not appear to be sufficient. This is a haunting finding for a military that eagerly seeks to direct health and fitness changes with top-down programs and resources. This paper seeks to fill this gap by providing an organizational

change approach that specifically addresses the behaviors of individuals and includes a flexible change approach that Hamlin, et al., (2019) suggests. This approach is rooted in a theory called active inference (Smith et al., 2021), a framework for understanding decision-making and behavioral trade-offs. Because Active Inference has not been applied to organizational change before, there are three research questions this paper seeks to address.

Research Question 1: Can active inference describe why organizational change fails? This research question will be addressed by conducting a qualitative analysis of active inference theory research. If active inference theory does describe why organizational change fails, then it may be a viable alternative to current change theories and can be examined for applicability to the U.S. Military.

Research Question 2: Can active inference provide a framework for implementation of organizational change in the U.S. Military? This research question will be addressed by applying the active inference model to the specific health and fitness change problem in the U.S. Military. If a model can be created, it can enable future human research on active inference and change in the U.S. Military. The answer to this question will enable military practitioners in the field to begin immediately applying active inference theory to their organizations.

Research Question 3: What emerging research and technologies can assist with organizational change management under a new approach? This research question is important because the literature review suggested that leaders struggle to implement change because of time and skill set. To address this question, a qualitative analysis of blockchain technologies is performed to determine if a blockchain-based approach can provide leaders with the automation, transparency, individualization, and standardization that is traditionally missing in broad-based

and merit-based change initiatives. If blockchain based technologies are found to be helpful for implementing a change-based program, this will enable researchers to specifically tailor research towards a blockchain based approach.

CHAPTER THREE: METHODOLOGY

The purpose of this study is to develop a novel approach to organizational change for the U.S. Military to specifically address the military's growing health and fitness problem. To develop this novel approach, a qualitative analysis of relevant research on organizational change, reinforcement learning, and active inference was conducted which led to the production of a theoretical model. A qualitative approach was selected because the breadth of the research question covered multiple intersecting disciplines: organizational change, organizational culture, reinforcement learning, pleasure hormones, active inference, and blockchain. Themes and trends within the research were examined to develop a novel model addressing the change problem.

To address the first and second research questions ("Can active inference describe why organizational change fails?" and "Can active inference provide a framework for implementation of organizational change in the U.S. Military?"), this study first reviews Maslow's Hierarchy of Needs. When contrasted with the literature review on organizational change and individual decision making, it becomes apparent that there is an irrational interplay between actual needs and desires. To address this apparent disconnect this paper then conducts a qualitative analysis of related reinforcement learning research. To examine this seemingly irrational activity within individual decision-making, this paper conducts a qualitative analysis of related reinforcement learning research to identify additional factors that may be contributing to poor decision-making towards food and physical activity. Specifically, research relating to pleasure and gratification is examined to determine an interplay between pleasure, gratification, and decision-making. The

result of this research leads to one final examination of the hormones associated with pleasure and rewards, namely dopamine and norepinephrine.

The qualitative analysis of reinforcement learning and the interplay between pleasure, gratification, and decision-making provides justification to develop a theoretical framework where active inference is applied to organizational change. Active Inference is suitable as a way to model decision-making because it focuses on the individual as they relate to their environment (Sajid et al., 2021; Smith et al., 2021). Active Inference relies on three primary categories to describe future behavior: Past beliefs or experiences, present observations or sensing, and preferences, trade-offs, and beliefs. Each of these are described in depth as a new framework for organizational change is created with active inference at its core.

Using the active inference framework, a theoretical model is produced of a scenario where a soldier makes decisions about food choices. After describing potential prior learning and beliefs, present observations about oneself and one's environment, and individualized preferences, a stepwise model is developed to track possible decisions made over time. Following the development of the model, the model is tested using PYMDP, an Active Inference package in python with a pre-developed grid world scenario for agents to navigate (Heins, 2021).

There are two experiments performed in the simulation. First, a clue is removed from the pre-packaged code which gives the agent information about the location of the reward. The agent navigates the world and observations are made about the behavior of the agent. Second, the default settings are restored which allow the agent to navigate to the first clue which gives information about the reward. Observations are again made about the behavior of the agent and

its success. This experiment demonstrates the claim that adding new information to an agent results in different behaviors.

The third research question specifically targets the practical implementation of that change within an organization. It asks "What emerging research and technologies can assist with organizational change management under a new approach? This research question is addressed next. This research question is important because human decision making is complex and occurs nearly continually throughout the day. Therefore, leaders who intend to use this framework to impact change must have technological assistance to implement such a system.

The literature review on merit-based systems indicated that transparent, fair, and individualized merit-based systems were more beneficial than those that either rewarded only certain employees or offered rewards that employees didn't care for (Chebbi et al., 2020; Chung & Al-Khaled, 2022; Nickerson, 2021). Further, because of the overwhelming number of tasks military leaders must accomplish, rewards for individual behaviors on a daily and sometimes hourly basis can be taxing and unrealistic. For this reason this paper examines recent advances in online gaming – specifically play to earn games (which can be defined as a game or environment where players earn currency when they achieve objectives or hold valuable assets within a game (Udonis, 2022; Vidal-Tomás, 2022)). These play to earn games are paired with new technology called blockchain, which is defined as the application of an automated, secure, and transparent ledger system that stores actions and transactions in a single chain of subsequent blocks (Zheng et al., 2018). A qualitative analysis of play to earn games and blockchain is conducted and several already existing use cases of the technology are investigated and discussed.

CHAPTER FOUR: ANALYSIS

In this chapter, I will briefly discuss Maslow's Hierarchy of Needs to establish a foundation between needs and desires. From there, I will introduce reinforcement learning and operant conditioning to make sense of irrational decision making that exists outside of the Hierarchy of Needs and is instead characterized by pleasure and desire. Finally, I will introduce Active Inference to evaluate decision-making and behavioral trade-offs.

Maslow's Hierarchy of Needs

Maslow's Hierarchy of Needs can be grouped into two categories. First, there are needs where deficiencies may exist, things like food, safety, intimacy, and self-esteem needs (Mcleod, 2018). Second, there are needs within the hierarchy are viewed as growth needs and stem from a desire to be better or achieve more (Mcleod, 2018). In the reinforcement learning discussion above, it was shown that actions are taken as a result of desire, pleasure seeking, and perceived reward. Some of those desires reflect real needs, such as the physiological needs described by Maslow including food, water, warmth and rest (Mcleod, 2018). Others, however, are the product of powerful hormones and addictions that culminate in pleasure-seeking behaviors and actions. In the case of the latter, the research above has shown that many behaviors exist outside of the Hierarchy of Needs, where an individual neither needs food for growth nor for sustenance, but rather because of a dynamic between preferences (which are assigned certain values by the individual) and pleasure (Kennett et al., 2013).

The goal of any organizational change model is to somehow influence habits that have formed based on perceived needs or desires to produce an organization's preferred effect. But

within the literature review, it was shown that the link between change models and habits are not clear and often non-existent. In the military, the preferred effect is most often related to performance, productivity, and team effectiveness, which all translate to mission accomplishment and lives saved. Interestingly, individuals don't choose the behaviors that help them realize their career defined growth needs, their health needs, their performance needs, or their safety needs (because of operating in dangerous environments), or even their most basic physiological needs, but instead often choose the behaviors that are actually a detriment, both to their careers and to their health. This challenge must be overcome if organizational change models are to be successful and solutions begin to present themselves as concepts from reinforcement learning and operant conditioning are examined.

Reinforcement Learning

The concept of reinforcement and behavioral conditioning to alter behavior is not new. Operant conditioning, researched by BF Skinner, observed that when a behavior is reinforced (rewarded), it is more likely to be repeated while behaviors that are not reinforced will likely die out (McLeod, 2007). In his book About Behaviorism (1976), Skinner suggests that operant conditioning is relevant when seeking to cause a behavior to occur given certain circumstances or occasions. Because of this, operant conditioning is immediately relevant to the U.S. Military problem because the military is seeking to encourage health and fitness behaviors in their personnel. BF Skinner identified three types of environmental conditions that can follow an action in the environment. Neutral operants are responses from the environment that neither increase nor decrease the probability of a behavior being repeated. Reinforcers are those

responses from the environment that encourage the repeat of a behavior while negative reinforcers or punishers are those responses that reduce the likelihood of a behavior (McLeod, 2007; Skinner, 1976).

Closely tied to rewards are the emotional factors connected to that reward, namely, desire and pleasure. Pleasure is described as the way that desire is felt by the body (Malins, 2017). In the case of operant conditioning, pleasure can be delivered in the form of a reward, while desire is the drive that causes an organism to seek out that reward. Once a reward is delivered, pleasure is the foremost emotion, but pleasure is temporary and is soon replaced by desire – a desire to gain more reward (Schultz, 2015). Examples of this include eating, relaxation, making money, and even drug highs. The problem, however, is that pleasure and desire do not necessarily lead to appropriate trade-offs. In fact, those trade-offs between short- and long-term pleasure are often poorly and even irrationally evaluated (Berridge, 2003; Kennett et al., 2013). Figure 1: Desire/Pleasure Dynamic illustrates this concept. Each time pleasure is low, a person acts in accordance with their desire to increase their pleasure.

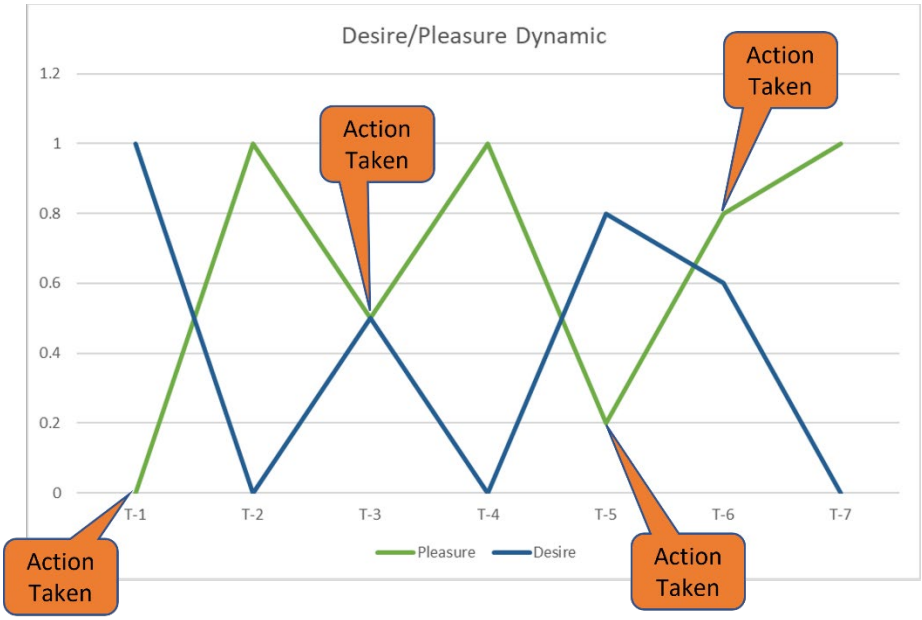

Figure 3: Desire/Pleasure Dynamic. This conceptual chart describes the dynamic between desire and pleasure. As pleasure decreases, desire increases and action is taken to satisfy that desire.

Using the example of employee timeliness, employees may simply be executing a trade-off between extra sleep or a leisurely breakfast as opposed to arriving to work on time. In the case of the U.S. Army, a soldier may have executed their trade-off the night prior by staying up late or staying out longer with friends. While being tardy once is often overlooked, a consistent display of tardiness will result in disciplinary action involving reduced pay, extra duty, confinement to one's quarters, or even separation from the service. One would expect this to be a sufficient punisher to reduce the tardiness behavior, however statistics above demonstration that one fifth of people across the U.S. are tardy (Keri Systems, 2021) and commanders . This indicates a disconnect between the value of rewards and the punisher of tardiness. Put another way, there is a trade-off occurring between the immediate gratification of a choice and the potential punisher or long-term reward later.

In the example of healthy eating, part of the Army's performance triad (U.S. Army, 2022), trade-offs clearly occur between the immediate gratification of a high sugar or high fat meal rather than the delayed punishment of poor performance or physical or mental health issues. This temporal component to reinforcement or behavioral conditioning is extremely important and the associated effectiveness between the timeliness of reward has been well documented (Clark & Thompson, 2009; Molet & Miller, 2015; Schultz, 2015). For example, studies on childhood obesity found that a major contributor was the inability to defer gratification (Caleza et al., 2016) while studies with adults found that few people actually act on long term intentions (Arbuthnott, 2010). Many adults simply choose immediate gratification over longer waits with larger rewards (Arbuthnott, 2010). While some studies suggest that the gravity of the reward is an indicator to whether reward delay is still a motivator toward behavior, generally the positive relationship between human decision making and future rewards decrease as time increases. Organizations that expect to have or implement a system that is effective at reinforcing positive employee behaviors must take this temporal component into account.

Furthermore, the discussion, let alone implementation of many organizational change models today, often fails to account for the temporal component sufficiently. Leveraging research from Arbuthnott (2010), Molet and Miller (2015), and Bermudez and Schultz (2015), one can describe the relationship between time and reward in the Chart below. Figure 2: Value and Time of Reinforcer shows that when time to receiving reinforcement increases, the subsequent value of that reinforcer decreases. This helps to highlight just how important timeliness is when rewarding or reinforcing good behavior.

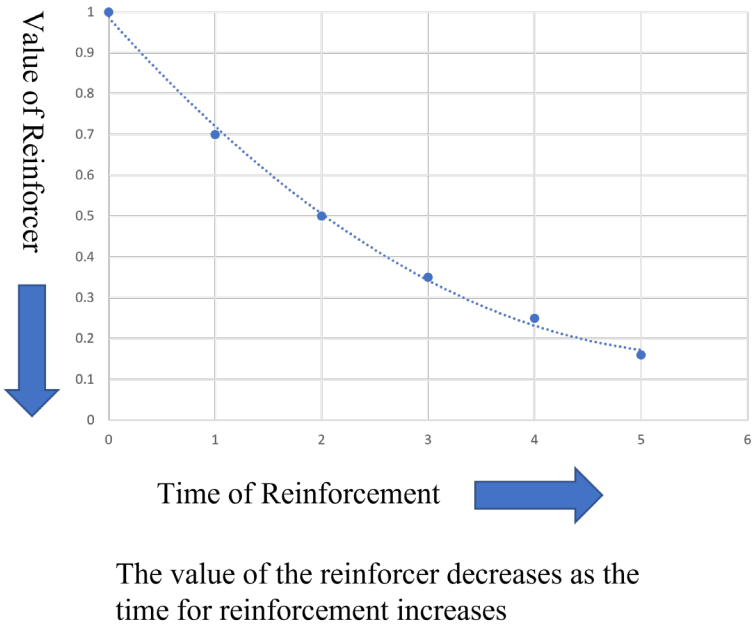

Figure 4: Value and Time of Reinforcer. This conceptual figure shows that the value of the reinforcer decreases the longer it takes to receive the reinforcer. This helps to explain why people choose immediate gratification over long-term rewards.

Finally, within the discussion of reward, pleasure, and decision-making exist critical hormones and neurobiological systems. Dopamine, for example, is heavily implicated in decision making and dopamine releasing neurons increase their firing when positive outcomes are better than expected (Egelman et al., 1998; Groman, 2020). In reinforcement learning, the hormone norepinephrine has been associated with balancing exploitation and exploration (Aston-Jones & Cohen, 2005). Additionally, norepinephrine has been associated with the ability to learn tasks and new states and studies have found that norepinephrine neurons "adjust their firing rates when reward contingencies are changed, a point when behavior should switch from exploiting the current option to exploring other potentially more valued options" (Groman, 2020). In fact, in certain impulsive behaviors such as overeating, ADHD, and substance abuse have been improved by NET inhibitors that prevent the uptake of norepinephrine (Groman, 2020).

Active Inference & Behavioral Tradeoffs

One possible way to evaluate behavioral trade-offs and healthy habit making within organizational change is by using a theory called Active Inference. Active Inference is a theoretical framework that offers a way to model decision making and is related to Bayesian principles by examining the probability of an outcome given observations (Smith et al., 2021). Specifically, agents or organisms within an active inference model will engage in behavioral tradeoffs based on their prior knowledge, present sensing (including sensing about themselves – i.e. hunger), and future beliefs (Constant et al., 2022; Fountas et al., 2020; Sajid et al., 2021; Smith et al., 2021). Active inference is active because agents are engaging with their environment as they seek to explore it to gain information or exploit it by taking an action (Smith et al., 2021). Inference refers to an agent using Bayesian inference to update its beliefs about possible actions given the data it has based on present observations, prior learning, and the likelihood that a belief is true based on its model of the world (Smith et al., 2021). Active inference theory has been suggested as a viable model for startup companies because it offers a way to model desired states from real states (S. Fox, 2021b) organizational quality management programs because of its predictive nature reduces energy expenditure by reducing prediction errors (S. Fox, 2021a), and as a general means to reduce uncertainty in an organization (S. Fox, 2021c). For these reasons it appears logical to apply active inference to organizational change, specifically when the desired change is managed at the individual behavioral level such as eating and physical fitness.

To address **RQ1(Can active inference describe why organizational change fails in performance-based organizations like the U.S. Army?),** active inference is used to evaluate

how present sensing (observations about oneself and environment) assists in decision-making. As noted above, people may experience a variety of stimuli that cause them to seek immediate gratification. For example, new parents experience a lack of sleep, new employees experience the excitement of a new job, soldiers must deal with a rapid operational tempo that limits downtime, and all these groups are confronted with a slew of choices that might not maximize their actual needs but will achieve satisfaction and produce pleasure. People also sense their own hunger, fatigue, boredom, laziness, apathy, excitement, and many other feelings and stimuli that contribute to their decision making.

Figure 5: Factors for Decision-Making describes the above factors graphically. It combines observations about oneself and one's environment with prior beliefs and experiences. It also adds individual preferences, which are often unknown by leaders or supervisors and are sometimes at odds with each other, creating conflicting beliefs about which action to take. The goal of merit-based systems is to impact individual preferences and tradeoffs from a baseline level to something above baseline in accordance with an organization's goals. To highlight this, individual preference is depicted by a dotted line, demonstrating its permeability from merit-based systems.

Figure 5: Factors for Decision-Making demonstrates how observations about oneself one's environment is added to prior experiences and individual preferences to create an action.

Within the active inference framework, time is evaluated in a stepwise manner. This means with each time stamp, the subject's actual state and inferred state is evaluated. Once an action is taken, the subject enters a new state and makes an inference about their new current state. This is similar to taking a step in the forest and making an inference about where you are. The person may not know perfectly where they are but will likely have a good idea. The more steps you take, the greater your inference is and the greater the gap is between truth and belief. For this reason, this framework must also include actions and alternatives. Actions are important because they are the result of coming to a decision and alternatives are important because they are weighed as a result of not perfectly knowing your true state.

To illustrate this, assume a soldier is hungry and chooses high fat food to satiate his hunger. The action of eating high fat foods may have short or long term consequences but it primarily addresses the need identified: it will result in a lower hunger. Logically, this choice appears as **Hunger → Eating High Fat Foods → Immediate Satisfaction.** Satisfaction is the new state; however, this new state was imperfectly achieved because it leads to other negative observations that can be made and others that may not be able to be made or understood (upset stomach, high blood pressure, heart attack, depression, etc.). Under active inference, this new state is the true state a person is now seeking to understand and is a state that is unknown to the person but must be inferred through observations. Without the proper observations, a person may continually make false inferences based on incomplete observations. For example, when the person does eat, they enter a new state and now must re-evaluate their current state to determine if that action met their objectives. This new state of being full must be inferred through additional observations and will be achieved as the result of invoking the preferences of the

person described in Figure 5: Factors for Decision-Making above, namely their values, tradeoffs, and risk tolerance.

Continuing the example of healthy food choices, consider the following scenario. A soldier has just completed physical training and now must transition to get ready to go to the rifle range. Because his unit is the first unit to shoot, he has limited time. His experience tells him that the on-base dining facility, which offers the widest selection of healthy food choices and has coded their food options with red, amber, green performance stickers will also take the longest. He still must shower, change, gather his gear, and make it to formation to draw his rifle from the company arms room. He is also feeling tired from physical fitness training and his body is craving calories. The choice the soldier makes is predictable. The soldier chooses the gas station over the dining facility, purchases a greasy sausage patty sandwich and an energy drink (both of which provide the fat, protein, sugars, and caffeine the soldier's body is craving), and continues his day. This was a trade-off in values and preferences. The soldier determined that long term health and performance were less important than time savings and tasty food.

Figure 6: Active Inference Modeling depicts the framework for evaluating the preferences and observations described above. In this framework, a soldier makes observations about himself based on what he can sense or observe. Based on those observations the soldier makes inferences that drive actions. Time is indicated using T:0, T +1, and T+2, to show subsequent time frames of observations, inferences, and actions, leading to a changed real state and additional observations being made. Using this framework, one can see how present observations added to prior knowledge will impact an individual soldier's action.

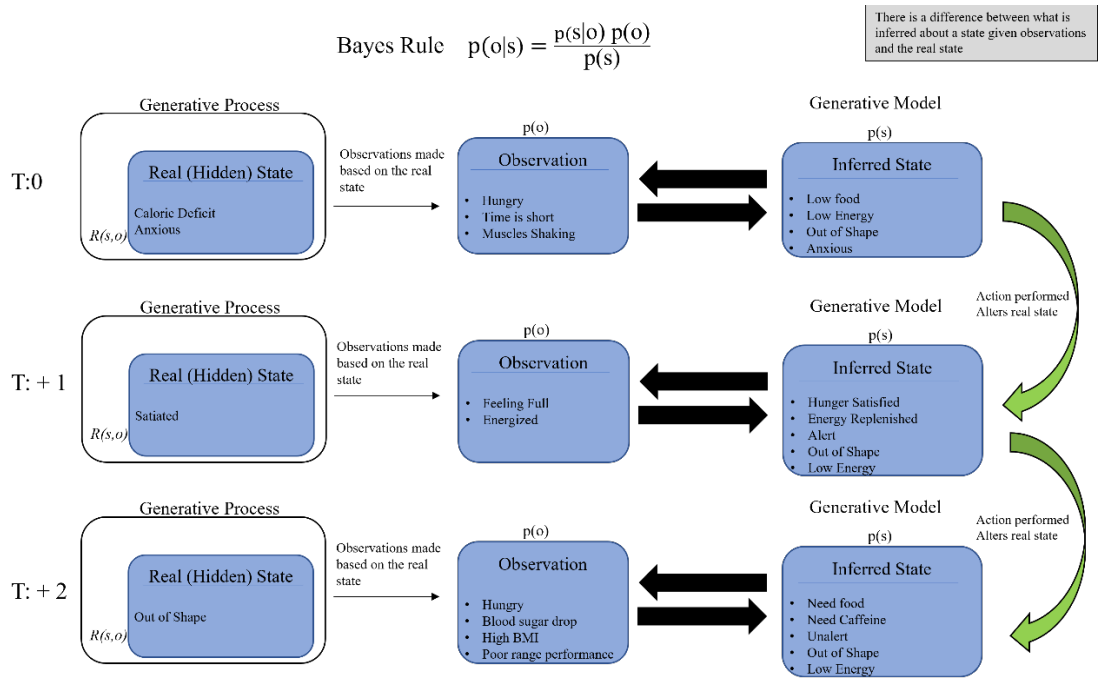

Figure 6: Active Inference Modeling. Adapted and expanded from the generative model and process (Smith et al., 2021; Solopchuk, 2019).

The example depicts a soldier who is confronted by hunger and anxiety at T:0 following unit exercise and prior to a deployment to the training area. The soldier infers that he needs food and needs to get it fast so that he will not be late. It is assumed that the soldier makes an unhealthy choice between T:0 and T: +1. At T: +1, the soldier is feeling satiated and was able to make it to the range in time. The real states and inferred states are updated based on this new observation of feeling full and energized. Furthermore, the soldier is not disciplined for being late and experiences additional pleasure rewards. At T: +2, the soldier makes another round of observations about himself. This time, he observes he is hungry, tired, and suffers from poor performance at the range. The soldier struggles primarily in the standing position where he must keep the heavy rifle steady to execute his shots. The real state is that poor food choices has left the soldier out of shape, but the soldier may not make that inference. Instead, the soldier may

infer he simply needs caffeine or additional calories to get him through the day. He infers that the hard work has left his body fatigued rather than his choices causing him to be out of shape. This process of creating inferences based on observations about a true and hidden state to make decisions is the core of active inference modeling.

The scenario above should be familiar to any reader because everyone has been in a situation where they make tradeoffs between immediate gratification and their values, preferences, and risk tolerance. One could easily replace the scenario above with fast food choices during a road trip, sleeping in rather than exercising, acting on cravings such as dessert or soda, or a variety of other scenarios. Given the ease of making poor choices for immediate gratification, performance-based organizations like the U.S. Army must develop a viable model for impacting daily behaviors to save time, money, resources, and the health and welfare of their employees.

CHAPTER FIVE: IMPLEMENTATION

Active inference describes why change is hard, but because the process and model are visible and explainable, active inference also allows for a potential solution and helps to address **RQ2 (Can Active Inference provide a framework for implementation of organizational change in the U.S. Army?).** As already shown, decision making under active inference is based on observations about oneself and the environment (observations), prior beliefs and experiences (reward values), and individual preferences (tradeoffs, risk tolerance, and values). By adding new information to the environment, you can alter the outcome of the model and provide the individual with a viable tradeoff.

This can be done by adding new information; typically about a reward or in the form of a reward – a reward that still meets the criteria of pleasure and timeliness and is individualized to a person's values and tradeoffs. Figure 7: Active Inference reward modeling shows how adding new information about a new reward can alter both the observations and the generative model. Specifically, the individual now has a viable trade-off to poor eating shown between Time +2 and Time + 3.

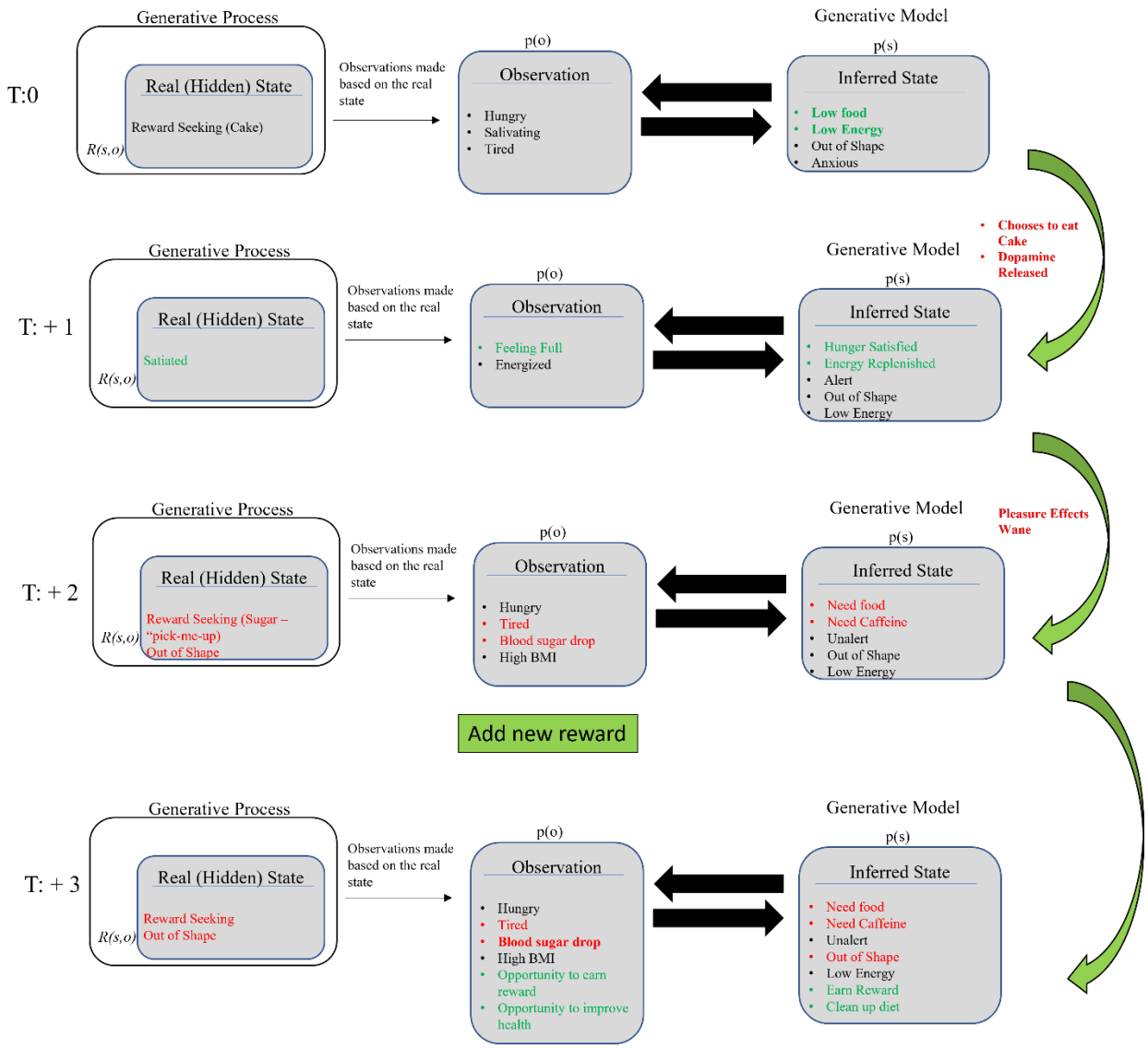

Figure 7: Active Inference Reward Modeling. The active inference model is adjusted between times 2 and 3 by adding new information. This new information allows the agent to make different observations and choose different outcomes.

In addition to producing a viable trade-off in the form of a reward, the tradeoff is also provided within the same timestamp as an alternative option. It is critical that organizational change practitioners acknowledge the timeliness of reward seeking behavior and how it can alter

decision-making. The conclusion of T+3 in Figure 7 shows that there are new actions that can be taken based on updated observations and inferences.

Using the Active Inference package called PYMDP in Python (Heins, 2021; Heins et al., 2022), the introduction of new information can be demonstrated by simulating an agent using active inference to navigate a grid square. The agent's objective is to find the reward which is placed in a random location on the map. As the agent explores its grid world, it receives clues about the next step it should take to minimize it's chances of receiving a reward. In figure's eight and nine, the reward is depicted by a green box while a punishment is depicted by a red box. The grey box represents the first clue and tells the agent where the second clue is located, which is in one of the four light blue boxes, labeled "L1, L2, L3, and L4). Once the agent arrives at the correct light blue box, it is given the location of the reward box versus the punishment box.

Figure 8: Active Inference Grid without Cue 1 shows how the agent performs when it is missing information about the next clue. The agent has ten moves to find the reward in the green box. In Figure 8, Clue one is located in grid square (4, 6), which is the farthest point from the agent's starting point. Instead, the agent chooses to exploit each of the possible boxes that contain the final clue for the reward. The clue for the reward is located in the bottom-most light blue box (4, 2). By the time the agent discovers the location of the reward, it is out of moves.

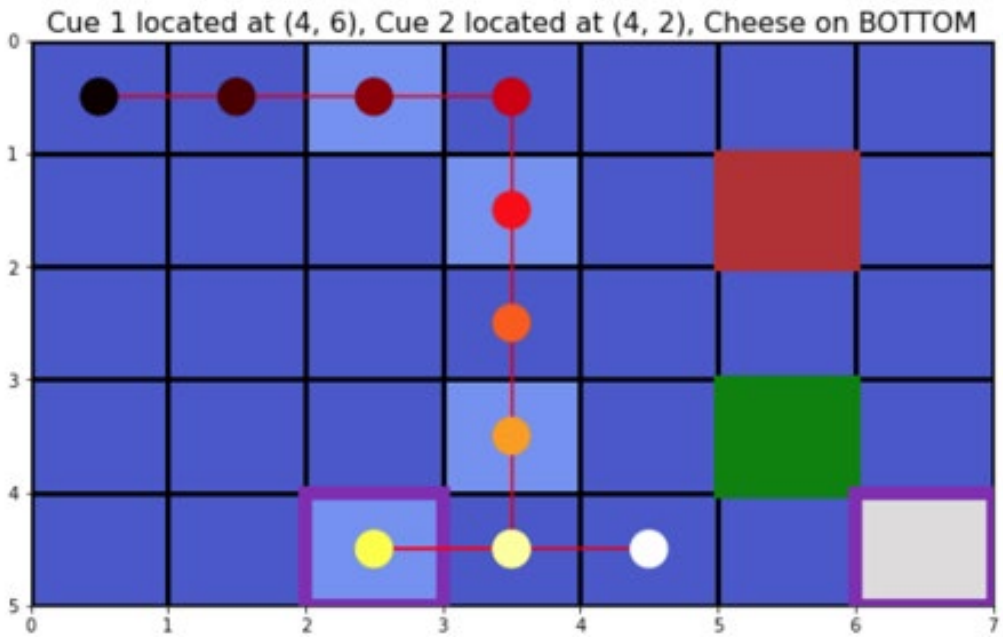

Figure 8: Active Inference Grid without Cue 1. The agent navigates the grid world, but Cue 1, which contains information about where Cue 2 is located, is determined to be too far away. Instead, the agent searches each grid square with a possible cue 2 clue in it as it hunts for the reward. The agent does not get the reward in the number of moves allotted.

Figure 9: Active Inference Grid with Cue 1 takes the approach of adding new information within reasonable reach of the agent. The agent in figure 9 has a choice to make. It can either seek to exploit the four possible cue 2 locations as it did the first time, or it can take an equal number of steps to the now easily accessible Cue 1, located at (2, 0). The agent still only has 10 steps to solve the grid world and gain the reward. Using Active Inference, the agent chooses to step down, receives the location of the second clue and moves directly there. Under this framework, it can be clearly seen that the agent not only took advantage of the new information to receive the reward, but it did so because it determined that choice to be the most probable way to achieve its goals.

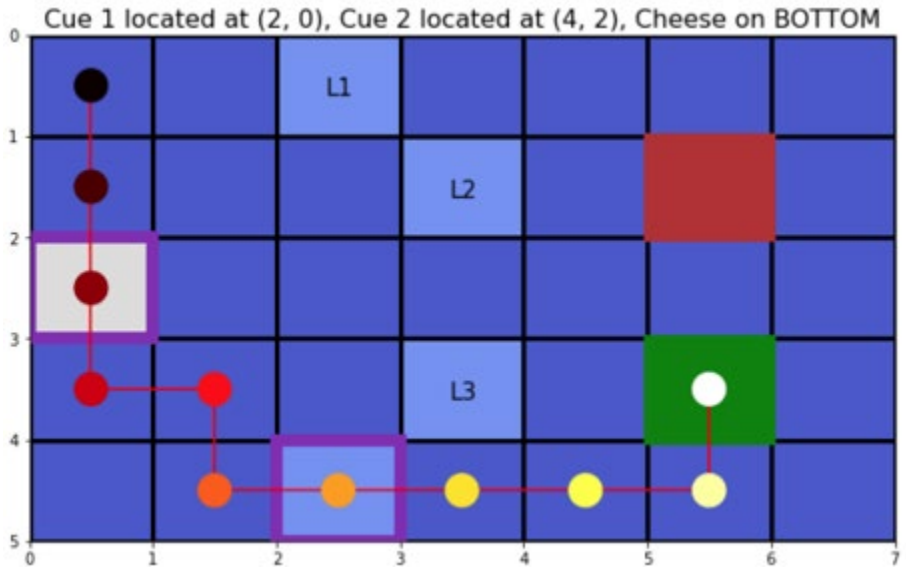

Figure 9: Active Inference Grid with Cue 1. The agent chooses to go to Cue 1, receives the location of the next clue and earns a reward.

This simulation demonstrates the discussion about active inference above. Active inference, as a theory of decision making, allows agents or people to change their decisions based on the information or reward available to them. By adding information, it is possible to alter behavior. By reinforcing that behavior with rewards, it is possible to establish new habits.

Emerging Technology for the Implementation of Change

RQ3 asks: **What emerging research and technologies can assist with organizational change management under a new approach?** In a recent shift, the U.S. Army began implementing merit-based promotion systems to enable a transition between promoting based on seniority towards work performance. This strategy utilizes data from soldier evaluations and the new Integrated Personnel and Pay System which is meant to track soldier training and performance records throughout their careers (Maucione, 2019). A new policy also exists to

promote officers based on merit and is touted as a system that will "recognize the skills and abilities of officers beyond what has been traditionally included in their official records" (AUSA, 2019).

General McConville, the Chief of Staff of the Army, has also embraced merit-based promotion system saying that "[soldiers] don't see themselves as interchangeable parts in an industrial-age system. Part of what we are trying to do now is implement a 21st century talent management system that recognizes every person in the Army for their unique talents" (Maucione, 2019). Army Sgt. Maj. Clark, with the Military Personnel Management Directorate, provided a similar sentiment by saying "A merit-based promotion system allows for the most talented to rise to the top… The better they do, the more they will be recognized versus having to wait their time for those who are more senior than them" (Maucione, 2019).

While these strides demonstrate an attempt to reinforce behavior, the research above suggests that merit without near-term temporal considerations is insufficient for altering behavior. It could be argued that these systems do not actually change behavior but do reward those for already exhibiting the right behaviors. Furthermore, applying merit-based systems requires substantial leader involvement to ensure constant, consistent, and continuous implementation of the reward system. Frankly, this is extremely challenging for leaders to do given the plethora of tasks that fiercely compete for a leader's time and attention. However, because of the already stated temporal component to altering behavior, timely reward is essential to building and reinforcing positive habits.

Recent advances in digital technology are offering a potential way to influence decision making using blockchain based play-to-earn games. In fitness, play-to-earn applications

encourage an active lifestyle in exchange for crypto-currency tokens that have real world value. The application STEPN, which tracks users runs and rewards them in currency for miles, has attracted over two million users since December 2021 with weekly users surpassing 1.1 million (Sarah, 2022). The attraction is obvious, in April 2022 the value of a token was $8.51; meaning that at the most basic level, users could earn around $40 for each walk or run they performed. Another such application, called dotmoovs, allows users to compete against each other through athletic performance. As of May, 2022, dotmoovs had a market cap of $24.1 million and has over 57,000 social media followers (CoinGecko, 2022; Sarah, 2022).

Several other companies are also examining merit-based approaches using blockchain. PayPal recently implemented blockchain style incentives for its employees. Weighing innovation as a critical component that they want to reward employees for, PayPal offers the opportunity to earn tokens by participating in innovation related programs. While the tokens hold no financial value, PayPal has offered over 100 different experiences including "poker tournaments with a couple of their vice presidents, a trail run and coffee with CFO John Rainey, and morning martial arts with CEO Dan Schulman" (Elaine, 2019). These rewards are redeemable by the employee, effectively allowing the employee to make their own tradeoffs between behavior and reward interval. The Spanish bank BBVA has also implemented tokens that can be redeemed for training credit and prevents the employee from having to attend mandatory training so long as token earning conditions are met (Berman, 2018; Elaine, 2019). In each of these examples, the companies are using blockchain based play-to-earn platforms to incentivize users by influencing an employee's preference structure by adding a value for tokens and allowing the individual to make trade-offs.

Blockchain itself has its own benefits. First, blockchain allows a secure and tamper resistant ledger that logs transactions (Yaga et al., 2018). In this case, those transactions are behaviors being reinforced, rewards being given, and redeemable transactions between reward tokens and reward perks. Smart contracts, which sit on top of blockchain applications, enable automated delivery of reward tokens once conditions have been met (Yaga et al., 2018). This automation saves time and allows leaders to remain focused on operations, sales, planning, and logistics, while subordinates can still engage in behavior-rewarding activities. For casual observers of decentralized finance and blockchain, these play-to-earn games may not seem like much, but behind play-to-earn games are powerful habit-forming incentives that must be examined. These are incentives that provide leaders a way to impact behaviors by providing a 'clue' as to which choice or alternative might yield the best outcome and thus be preferred by the soldier.

First, play-to-earn games provide financial incentives to users who complete challenges or gain accomplishments. Financial incentives are extremely powerful when properly employed and have been seen as "effective, improve performance quantity…quality…and enhance intrinsic motivation" (Shaw & Gupta, 2015). Research also shows that when financial incentives are "fairly distributed… employees feel more competent and autonomous… which… fosters greater motivation and better work performance" (Thibault Landry et al., 2017). Play-to-earn games offer a fair and consistent framework for financial incentives because the rules and rewards are clear, and everyone has an equal opportunity to participate.

Second, play-to-earn is interactive, providing game-like features to activities that would not necessarily be enjoyable by themselves (Sarah, 2022). This interactivity can extend beyond

the physical world, enabling users to integrate virtual and augmented reality and social media. Finally, games are addictive and impact the brain in the same way that addictive drugs do – they cause the brain to release dopamine which is a chemical that "plays a role in pleasure motivation, and learning" (Addiction Center, 2019; Cristol, 2021).

The final factor that makes play-to-earn appealing is that play-to-earn offers users to the ability achieve things, which boosts motivation and encourages further achievement (Sarah, 2022). The Achievement Motivation Theory, suggests that people are moved to action by a desire to be successful and a desire to avoid failure (Boggiano et al., 1992) and play-to-earn apps offer a framework where people can achieve success and are motivated to continue through financial gain, competition, and social reward. The achievement motivation theory also provides room for people who make immediate trade-offs such as arriving to work on time, with longer-term tradeoffs such as ensuring you get eight hours of sleep. Under play-to-earn models, both behaviors can be rewarded immediately.

Unlike current crypto-currency play-to-earn models, incentives and rewards can go beyond financial. Points earned for good behavior could translate to discounts or gift cards for shopping and dining, days off work, points towards promotions for junior members, access and discounts at recreational facilities, or even additional contributions to 401K and retirement systems. Whatever reward is chosen, what is critical is that the reward is standardized, transparent, meets individual employee preferences, and is given in a timely as it relates to alternative selections.

The Template for A Play to Earn Model

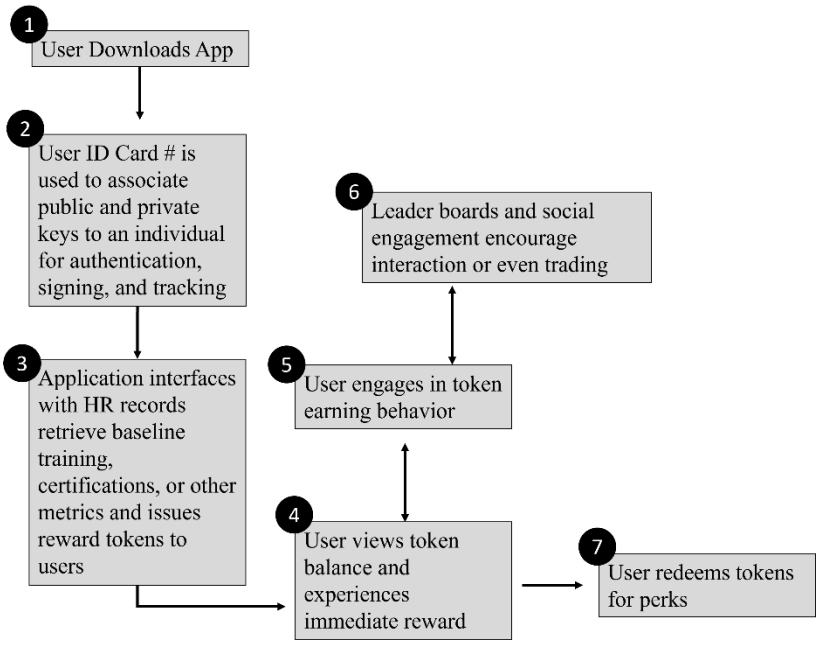

Figure 10: The implementation of a Play to Earn Model in the U.S. Military

Figure 5 offers a framework for the implementation of a tokenized reward system using the U.S. Military issued Common Access Card (which is provided to each service member upon entry and contains digital information and access to computer systems and on-installation facilities). In box one, the user downloads an application onto their phone or can access the application on a browser depending on the desired application. For example, if the reward schedule was related to fitness tracking, a phone may be preferrable to a web browser. Box two shows how leveraging existing cyber-security systems allows users to access the application and the public ledger. This access enables users to share accomplishments, engage in transactions with each other, and automate the reward process. The inherent nature of blockchain, which permits unique and signed transactions ensures validity and prevents fraud or tampering.

Once a user authenticates themselves in the application, the application uses the employee's identifier to access their HR records. This can include certifications such as project management, engineering, safety and emergency management, technical certifications, or other specialized certifications a company must maintain for their employees. In a military context, it can also access physical fitness data, time in service, and performance evaluations, all of which are stored digitally today.

Box three describes how the application adjudicates training and certification and issues tokens based on past training. This serves to give the user an immediate reward for their prior activities but also encourages engagement in the application. Upon authentication, the user can immediately access rewards, use rewards, or engage in the digital-social component of the application.

Finally, boxes five, six, and seven describe actions that users may take with their play-to-earn system. They can either engage in behaviors that earn them more tokens such as exercise, certifications, self-learning, training, or a demonstration of technical or tactical skills or they can redeem their points for rewards, such as discounts, promotion points, a rise in their order of merit list for coveted schools, or even time off or financial gain.

CHAPTER SIX: DISCUSSION

Research Question 1 asked whether active inference could describe why organizational change fails? The above qualitative analysis shows that active inference does provide a framework for why organizational change fails. Active inference demonstrates how individual behavior is driven by present learning and past experiences, including the release of, and expected release of hormones. It describes how those experiences and hormones cause individuals to seek out pleasure producing behaviors and how those past experiences alter the preferences and trade-offs when executing actions based on current observations. When individual observations and experience don't align with an organizational change initiative, there is a greater risk of failing. Given that 18% of employees considered themselves change agile (Rock, 2019), active inference helps describe why that is: behaviors produce internal and external rewards that employees have become accustomed to receiving. When change occurs and those rewards are no longer certain, people resist change in favor of the reward producing habits of their past.

Research Question 2 asked whether Active Inference could provide a framework for implementation of organizational change in the U.S. Army? It was determined that active inference can provide a framework for merit-based organizational change approaches in the U.S. Army so long as those approaches considered the timeliness of the reward. By adding an individualized reward, active inference allows organizations to alter long-established habits. This was demonstrated by an experiment using the python package PYMDP. Within a performance-based organization like the U.S. Army, providing timely and rewarding alternative to long

established detrimental behaviors can alter habits and increase the performance of the individual and the team over time.

Research Question 3 asked what emerging research and technologies could assist with organizational change management under a new approach? In this section individualization and timeliness were major drivers of the discussion. Individualization is the concept that people are most informed about what rewards they prefer, not organizations supervisors, or leaders. It further reinforces the recommendation from Hamlin et al., (2019) that one size fits all change models are not sufficient to effectively produce change. Timeliness referred to the timeliness of the reward and acknowledged that leaders often do not have the time to manually manage every individual soldier's behavior. The result is that poor habits often occur frequently below the threshold of leadership visibility until something bigger causes them to examine the organization more deeply. Currently, the approach is to cast a wide net of education through classes and with mandatory activities such as physical fitness, physical fitness tests, and training. But as indicated previously, this has not been enough to prevent large performance and health gaps from forming within U.S. Army Formations.

Blockchain technology was submitted as a solution to this research question because of its flexible applications, automation, timeliness, and ability to be individualized to unique preferences. Current blockchain play-to-earn models also demonstrated significant value because they provide a social construct for interaction, give members the ability to achieve success, and motivate participation in the system. Finally, the automated and individualized nature free up leaders to focus on operations and planning while reward systems operate in the background to ensure a healthy and capable force.

While this paper is not one that develops an entirely new organizational change theory, it is important to compare and critique a proposed active inference inspired play-to-earn model with popular change models.

Critique 1: Kotter's Change Model encourages change agents to follow his steps in order, but maintaining this order has yet to be fully evaluated through research (Appelbaum et al., 2012). This orderly approach to change management is also associated with a longer timeframe for the reward for implementing change. For example, it is suggested that short term wins will only occur after the first five steps have been implemented. This implementation necessarily requires convincing employees that change is truly urgent, something that even heart doctors were unable to do when confronting patients with heart disease (Deutschman, 2005). The play to earn model does not force a pre-supposition of urgency upon employees. It merely rewards employees with incentives for making the right trade-offs.

Critique 2: Neither Kotter's Change Model nor the Nudge model inherently explores behavior reinforcement to implement change. While it can be argued that short term wins are the result of and an encouragement towards positive behavior, there is no real reinforcement mechanism. Ignoring reward and reinforcement also ignores the trade-offs that people make in response to desire and pleasure. It ignores powerful hormones such as dopamine which should be leveraged to encourage positive change. A play to earn model considers reinforcement through financial or other important incentives. It also allows employees to choose which reward they want, rather than requiring leader brainstorming for their diverse population.

Critique 3: Popular change theories ignore the temporal component to reinforcement. While leaders may receive rewards as they observe change, it's possible that short term wins or

successful nudges take many months to achieve. Because behavior is associated with the timing of reward or punishment, play to earn models offer a far more rapid way to encourage positive behavior.

Critique 4: Popular Change Models are time and leader intensive. They also require substantial oversight to ensure the proper wins are being made in accordance with their vision. A play to earn model relies on technology to automate standards for success and automatically reward those behaviors that meet the standard. Because the process is digital, a digital and transferrable record can be kept, which further allows for the automation of many human resource functions. This allows leaders to spend more time on operations, planning, and logistics and less time reinforcing behaviors and reiterating their change vision.

Critique 5: It's possible that readers of a play to earn implementation in professional organizations believe that organizations consist of professionals in their field who should be intrinsically motivated. A suggestion using this approach is not inappropriate, but it heavily relies on the individual altruism of the employee and ignores challenges that companies currently faces with detrimental behaviors such as preventable health care costs, timeliness, maintaining certifications, and encouraging innovation.

Critique 6: Implementing a blockchain based play-to-earn platform could be costly. While not cheap, this paper has shown that over a trillion dollars is wasted annually from preventable causes. The case must be made that a play-to-earn model is a cost savings measure that will save organizations in both near-term and long-term expenses and may even allow them to gain a substantial advantage over their competitors based on the behaviors they seek to reward. Performing an analysis to determine if spending a relatively minor amount in tokenized

reinforcement could subtract from the major costs of annual healthcare and certifications both appropriate and wise.

Critique 7: Rewarding behavior leads to decreased performance. As described in the literature review, research is divided whether reward systems lead to decreased performance with the majority of research support certain types of rewards for behavior reinforcement (Chung & Al-Khaled, 2022; Pearce et al., 1985; Pellegrini et al., 2018). This concern, however, echoes several other cultural concerns listed above, namely that an employee is being paid to work and to work well and should be intrinsically motivated to succeed in their place of work. While no merit-based system is a replacement for leadership, merit-based systems can and should augment leadership to reinforce behaviors that match an organization's climate, culture, and goals. Creativity should be implemented when determining a reward schedule, criteria for rewards, and impact of the rewards on the desire behavior. Leaders should still expect to do after action reviews of their reward implementation and whether merit-based systems are enabling their organizational change philosophy. Finally, it is important to realize that behavior is being rewarded, whether an organization implements a reward scheme or not through reinforcers such as dopamine, pay, time off, reduced workload, and many other rewards. Instead of resisting a reward structure, organizations should evaluate how their reward structure fits into their organization's goals.

CHAPTER SEVEN: LIMITATIONS AND FUTURE DIECTIONS

Limitations

This paper presents a novel method to approaching organizational change in the U.S. Military and suggests a way to supplement current organizational change models to address employee behavior in an effort to reduce the number of failed organizational change efforts. It also presents a simulation that demonstrates how adding new information alters decision making. Finally, this paper theorizes that a blockchain implementation would be a favorable approach for such a model.

There were, however, limitations in existing research. First, there is limited research on merit-based approaches as applied to organizational change. In addition to being limited, the research was contradictory, with some studies suggesting merit-based approaches do not work, while others suggest they do (Pellegrini et al., 2018; Chebbi et al., 2020; Chung & Al-Khaled, 2022; Choi & Whitford, 2017; Nickerson, 2021). Current research on change models also does not sufficiently clarify how much impact the model had on the change effort as opposed to other methods and styles being adopted. It was often not clear whether a change model alone was used to implement change or if several methods were employed at once. What was clear from that research, however, was that most organizational change efforts do in fact fail.

Finally, play to earn games and blockchain approaches being used in companies like PayPal or the BBVA have not been sufficiently researched. There is no research indicating that this method has been successful, primarily due to the newness of this approach and there has been no reports indicating whether the program will continue. This paper then, while establishing

a framework for the implementation of a new model, does not answer the question as to whether such a model will work any better than existing models.

Future Work

Because of the limitations above and because this is the first model that leverages active inference to describe organizational change, future research should take this framework and implement an organizational change experiment using a merit-based approach within the U.S. Army focused first on encouraging greater soldier physical fitness. This experiment should address a research question such as: Do U.S. Army squads execute more consistent physical fitness during off duty hours when under a merit-based system?

The results of this study will be indicative of whether merit-based systems can influence change better than traditional models or the status quo. But the results of this study would also have implications beyond physical fitness. If successfully applied, the U.S. Military could pilot a food-based program that is linked to the soldiers Common Access Cards (CAC) used to access dining facilities, gyms, computers, and networks, a cyber-security program, or even an innovation program that encourages and rewards soldiers for innovations on the battlefield and in training. Collaboration with the U.S. Army Training and Doctrine Command and the U.S. Army Public Health Center is encouraged as each organization seeks to tackle the health and fitness trend from their unique positions.

Additionally, this framework sets the conditions for a digital twin. The ability to record, track, and reward soldier behavior lends itself towards using that data in training and in combat. Blockchain with smart contracts provides a structure for digital twin data to be used securely

while tracking soldier activities both in training and during daily events. Because Soldiers use their common access cards for dining facilities, post exchanges, fitness centers, and training events, tying rewards to activities and behaviors as tracked by the common access card would be a natural next step. Further, enabling the digital twin to retain training data and certifications provides for certificate management, the maintenance of a skilled workforce, and through rewards, can serve as an encouragement to soldiers who maintain their professional profile properly. As the Army seeks to use digital twins in training through their modernization priorities, behavior, decision-making, and reinforcement should all be considered.

This future research also has implications beyond the U.S. Military. Organizations that are hierarchical but struggle with changing employee habits or behaviors would also benefit from the outcome of this research. Expansion into manufacturing safety, logistics efficiency, and retail operations could all conceivably benefit from a refined approach to organizational change that specifically targets an organizations vision and bottom line, while individualizes reward structures for employees.

CHAPTER EIGHT: CONCLUSION

The U.S. Military must embrace a better organizational change model so it can continue to deter and defeat the nation's enemies. Current popular change models are time and leader intensive and do not sufficiently alter soldier and employee behavior to successfully achieve a change initiative. Further, they fail to address operant conditioning, reinforcement learning, and timeliness factors that all play a role in daily decision-making and long-term behaviors.

This study examined three research questions. First, can active inference describe why organizational change fails? It discovered that active inference was a suitable framework for organizational change because it successfully describes individual decision-making when considering a list of alternative options. Second, this paper asked whether Active Inference could provide a framework for implementation of organizational change in the U.S. Army? It was determined that an active inference framework could be used in the U.S. Army to address soldier habits that led to unit effectiveness. Finally, this paper asked what emerging research and technologies can assist with organizational change management under a new approach? It was determined that automation was a critical enabler to organizational change because it enabled timeliness of rewards, individualization of rewards, and a social component to awards. Further, blockchain was suggested as an automation solution because it inherently enables automated, transparent, standardized, and the timely delivery of rewards.

In addition to answering the above research questions, this paper offers five broader takeaways for any hierarchical organization seeking to enact change. First, relying on employee altruism is not a sufficient vehicle for causing the totality of an organization to adopt a change

vision. It should not be assumed that a new company vision aligns with the goals and objectives of employees. Second, the status quo costs billions of dollars annually in preventable diseases, late and missed workdays, and efficiency of operations. Third, ignoring reinforcement as a change mechanism ignores the simple fact that every behavior an employee makes is being rewarded or punished; choosing inaction simply endorses the current system of rewards. Fourth, examining behavior based on past experiences, present observations, and values and tradeoffs offers an alternative way to approach change. Finally, automating change through blockchain-based systems can free up leaders, motivate employees, and ensure reward delivery is as timely as the default behavior.

APPENDIX: COPYRIGHT PERMISSION LETTER

Gmail

Thane Keller <thane.keller@gmail.com>

Kotter Citation Request

Jennette Seward <jennette.seward@kotterinc.com> Tue, Aug 23, 2022 at 7:26 PM
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Hi, Thane

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JENNETTE SEWARD
Director, Marketing
M: 206.931.3441
1000 Second Ave, Suite 3300, Seattle, WA 98104
www.kotterinc.com
Boston | Seattle

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