

Encounter with March's Organizational Learning Model

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ABSTRACT

Extensive studies in the literature of the importance of knowledge and learning within an organization indicate that there exists a trade-off between the exploration of new possibilities and exploitation of old certainties in a certain time and space to achieve competitive advantage. This paper reflects on March's model which is highly cited in management and business administration literature, approximately 10,000 times, as evidenced through publish and perish software. Whilst studying March's model, paper explores how organizational learning affects the adaptation of innovations within an organization, where the creation of knowledge helps to achieve competitive advantage. The paper is classified in various sections where March's organizational learning model is critically evaluated and the theories, on which this model was based, along with some originating from the model, are explored.

Keywords: Learning, Innovation, exploration and exploitation of resources, March's organizational learning model

1. INTRODUCTION

Using exploration and exploitation of new possibilities and old certainties, March (March 1991) developed a simulation model of organizational learning that focussed on the survival and prosperity of organizations. This simulation model reflected the complementary nature of learning within organizations: organizations learn from individuals and vice versa. He also examined how competitive advantage is affected by the accumulation of organizational knowledge or learning. This review aims to identify applications of organizational learning theory (March 1991), and how these applications are expanding due to factors influencing learning such as collaboration, joint ventures, innovation, technology adoption, and market orientation (Crossan 2008; Kane 2007).

While March's model is widely cited, there appears to be little critical evaluation of it in the literature. By evaluating this model, its extensions, and critical response an understanding of the relationship between individual beliefs, or individual knowledge, and organizational code for the purposes of organizational learning is presented. The paper will start with an evaluation of March (1991). It summarises his model along with its assumptions and findings, examines the theories used by him, including the impact of cognitive theory on his model, and extensions of his approach, and offers criticisms of his model. It considers the impacts of the model and assesses the model's applicability to knowledge within an organization.

2. MARCH'S ORGANIZATIONAL LEARNING MODEL

March (1991) considers that there is a trade-off process between the exploration (of new possibilities) and exploitation (of old certainties) that helps in the organizational learning process. Exploration means developing new routines by using scarce resources, and this is a risky or experimental process which can reduce the speed of current processes and increase the skills (Crossan 2008; March 1991). Exploitation, on the other hand, means learning from the existing routines by using scarce resources, and this process focuses on improving productivity or efficiency, and is less riskier and less costly than exploration (Crossan 2008; March 1991). March's model defines '*organizational code*' as a set of 'procedures, norms, rules, and forms', which are aggregated together in a form of knowledge. Members of the organization, who have certain beliefs and customs that may support mutual learning at both individual and organizational levels, interact with these organizational codes, while following certain assumptions embedded in the members' beliefs and customs. The word *learning* is used in this paper as a method of retaining and improving productivity, innovation and competitive advantage (Dodgson 1993) in an uncertain environment influenced by external and internal (partnership or acquisition) dynamics of an organisation. External dynamics means that an organization is influenced by external factors such as market conditions, competition (Aghion, Harris, Howitt and Vickers 2001; Cantner 2009; Klaus 2010), and any structural changes (Lindmark and VikstrÖM 2002; Memedovic and lapadre 2010; Schumpeter 1942; Silva and Teixeira 2008). March suggests a mutual learning model for the development and diffusion of organizational knowledge that was based on certain assumptions, as explained below.

2.1 Assumptions of March's Model

March's (1991) organizational learning model is based on four key features:

- a) The organizational environment (*external reality*) is independent of the beliefs of the members of the related organization. In his model, March identifies the environment as consisting of m -dimensions with equal probability of occurrence, where reality is denoted by a probability value of 1.
- b) The beliefs of ' n ' individuals adhere to the external reality and may change over time. At each of the m dimensions of reality, beliefs are represented with the codified values 0, 1, and -1; which have a one-third probability of its occurrence in an organization. Here '0' represents no belief, while '1' and '-1' represent commitment and anti-commitment to a particular belief respectively.
- c) The process of learning from an organizational code is visible where individual beliefs (n -dimension) change or adapt to new beliefs. At '0' code within a categorized dimension, individual beliefs are not affected. The individual belief adapts to the organizational code with a probability ' p_1 '. This probability (process) of learning from organizational change, or code, is identified as the process of 'socialization'.
- d) The organizational code adjusts over time, as it adapts to the beliefs of those individuals that correspond with external reality on more dimensions than the code itself. The individual dimensions of people are classified in the '*superior group*' when these individuals have beliefs of either 1 or -1, and the probability of occurrence of superior group is defined as ' p_2 '. The number of individual members with superior performance, holding the majority view minus the number of individuals with superior performance holding the minority view, is defined as ' k '. The probability that the organizational code remains unchanged is

$(1-p_2)^k$.

The above assumptions help to understand that mutual learning between the individuals and an organization plays an important role in the development of knowledge within different environmental settings. March stated that the beliefs of an individual do not directly affect the beliefs of other individuals in an organization. The effect of individual (superior) beliefs (including false beliefs) passes to the organizational environment (reality) known as 'organizational code'. The code adapts to superior beliefs and other individuals in the organization adapt to the newly created beliefs (including false beliefs). The simulation model of mutual learning was iterated many times under closed¹ and open system² conditions, while adapting to the social environment. These iterations were carried out '*subject to stochastic variability...using the same initial conditions and parameters...to estimate the distribution of outcomes*' (March 1991: 75) about knowledge and knowledge exchange under competitive dynamism (ecology).

2.2 Findings of March's (1991) Model

The findings of March's model are derived from a set of 30 'm-dimensions' of reality with a set of 50 'n-dimensions' of individuals. A total number of 80 simulation iterations were thus used to complete this model. March explains that adaptive organizations learn to allocate resources between exploitation and exploration, as a result, of consequences and experiences that occur across time and space.

2.2.1 Social context of adaptation in organizations

Within a social context, learning between an individual and an organization occurs due to process of assimilation, where the introduction of change helps to understand new ways of dealing with the problem of the relationship between individual or group actions and organizational level actions (Scarborough 2008) and to reflect on the effectiveness of changes. The goals of learning therefore, are to achieve adaptation to an environment or changing external conditions for the improvement in efficiency in times of change (Dodgson 1993). This demonstrates that the adaptation to the social context of organizations explains how the inter-relation of individual beliefs and organizational codes grows over time. March (1991) explains adaptation to change under two systems: closed and open. He found that both m and n dimensions had an overall impact on quantitative distribution of outcomes rather than qualitative distribution of outcomes. March (1991) suggested that the organizational code gains from individual beliefs that deviate from the actual learning and is influenced by the superior performance individuals.

¹ Closed System is a system where the organization is not affected by external environment and therefore individuals working in an organization and reality are both stable (March 1991).

² Open system is a system where organisational membership and reality (organisational environment) changes. Here the role of turnover and reality is considered as an important dimension (March 1991).

In an open system, March (1991) amplified his model and tested it under two alternative conditions: organizational turnover and environmental turbulence. Organisational turnover is defined as any movement (entry or exit) which happens across organisational boundaries. These turnover movements can be voluntary, involuntary, functional or dysfunctional, intent to leave and so on (Lucas, Whitestone, Segal, Segal, White and Mottern 2010). Environmental turbulence is a result of unsettling forces generated from the internal and external dynamics of the organisation, such as uncertain technological shifts, uncertain financial crisis, uncertain shifts in occupational requirements by professional bodies and uncertain competition (Otote 2009).

March stated that a moderate level of turnover in an organization, and the replacement of members (new recruits) increases exploration, and thereby knowledge, through the diversity of the new recruits. The effect of environmental dynamism or turbulence can also have moderate effects on exploration and exploitation but adaptation to environmental changes takes time. The non-existence of environmental turbulences can benefit organizations by encouraging adaptive learning (Cohen, March and Olsen 1972; Cyert and March 1963). The importance of environment, therefore, is undeniable in organizational learning (Agarwal and Selen 2009, 2011), as competition within a market can enforce threats for sustenance of a particular organization (Aghion, Harris, Howitt and Vickers 2001; Cantner 2009; Klaus 2010), which further help an organization to access knowledge through collaboration or joint ventures with other organizations. The importance of external environmental factors, such as competition and external networks is important for understanding innovative practices adopted for a unified creation of knowledge and learning in an organization.

2.2.2 Knowledge and ecologies of competition

Organizations, individuals, and their environments are inter-dependent due to the influence of technological, sociological and environmental phenomena, and on the actions taken by decision makers (Lewin, Long and Carroll 1999). Due to scarce tangible and intangible resources in a competitive environment, managers try to use their resources efficiently and organizations (managers) adapt new techniques similar to those used by other organizations to deal with the same issue (problem). Under social context of organizational learning, competitive ecology as defined by March (1991) is a competitive environment, where one organization learns from others experiences and beliefs. A competitive advantage of an organization is therefore a result of overall learning, performance, and ecologies of competition.

March further claims that an increase in learning does not ensure the reliability of organizational performance; Huber (1991) also makes this point. The uncertainty of the environment cannot be predicted and this uncertainty can affect the competitive positioning of the organization. March suggests that loose coupling of systems and effective techniques of coordination and communication are more likely to be reliable in increasing the performance mean of an organization. The trade-off of exploration and exploitation is made by understanding the distributed costs and benefits of ecological interaction with the resources of an organization. These findings by March (1991) influenced many theories of organizational learning, including cognitive and managerial-based theories.

2.3 Theories used by March (1991)

Organizational theories from Schumpeter (1934, 1942), Cyert and March (1963), Winter (1971), Cohen (1972) and Argyris and Schön (1978) influenced March's organizational model of learning (knowledge). It should be noted that the development of knowledge production and associated learning has emerged from the field of the 'economics of innovation' (Krafft and Quatraro 2011). Knowledge originates from the branch of philosophy, known as epistemology. Swan defines knowledge as an 'intrinsically ambiguous and equivocal concept' (Swan 2008: 750) which can be classified under two different views of knowledge; '*epistemology of possession*' (knowledge is something which people possess) and '*epistemology of practice*' (knowledge is something which people do). March (1991) followed the views of Schumpeter in organization studies and determined that the processes of allocation of resources between the poles of a 'one-dimensional' continuum are oscillating between *exploration* and *exploitation*. Schumpeter (1934, 1942) proposed that innovation was an outcome of the 'recombination process', that is, new or untried ways are combined with newly acquired resources such as of an organization to help generate incremental innovation. On the other hand, the combination of existing resources or products in new ways is known as radical innovation.

Argyris and Schön (1978) produced a seminal work known as *single-loop*, *double loop* and *deutero learning* that focused on organizational learning. These terms are similar to March's use of exploration and exploitation. *Single-loop learning* followed radical change (exploitation) and the identification of paradigms for further detection and correction of errors in the process of learning. *Double-loop learning* is affiliated with transformational change (exploration) that questions the actual paradigm or goal of an organization, thereby, developing new routines of creating knowledge and learning. *Deutero learning* necessitated reflection on the learning process and goals, called 'exploration' by March. March's study adapted its concept of exploration and exploitation from Argyris and Schön's model. Even though March does not specifically refer to the applicability of single-loop learning and double-loop learning to his model, he cites Argyris and Schön's (1978).

Cyert and March's (1963) managerial theory of the firm, including the concept of a knowledge-based view of the firm, also influenced March's learning model. In managerial theory, power is delegated to the managers who are not accountable for liabilities, resulting in a proliferation of bureaucracy in managing the resources of an organization (Todeva 2008). Their theory was based on the assumption that managers aim to maximise both personal and organizational outcomes. March argued that a trade-off between exploration and exploitation was influenced by the individual goals and aspirations of the members including managers themselves within an organization. Pfeffer (1982; Pfeffer and Salanchik 1978) agrees that individuals develop their own goals while working in an organization, so that they can meet the 'bigger goals' of their organization. This trade-off between exploration or exploitation of resources is a strategic choice often made by managers (on behalf of organizations) based on the goal adaptation and decision making process (Todeva 2008).

2.4 Impact of Cognitive Theory on Organizational Learning Model

Organizational learning theory is influenced by both cognitive and behavioural research in psychology (Crossan 2008). Cognitive research seeks to understand the relationship of how resources are acquired by 'knowledge-based systems' while interacting with the external environment (Garcia-Marques 2008). This approach dominates different dimensions of cognitive psychology, as any external reality that can be delineated, as a *knowledge-based system* is attainable for cognition. The main dimensions of cognitive psychology are classified as '*perception, representation, memory, and language*' (Hayes 2006). Perception means how people in an organization interpret the information, while representation refers to how the process of perception occurs. Memory is the manner in which the information is stored for future retrieval, where language embodies the sophistication of interpreting the ideas and concepts (Hayes 2006). Garcia-Marques (2008) associates the cognitive approach with mental models. The human mind is defined as a knowledge-based system that '*acquires, transforms, and uses information by a variety of basic (cognitive) processes, such as attention, perception, memory, language and reasoning*' (Garcia-Marques 2008: 183). The human mind is, however, also assumed to be able to familiarise itself with different situations and to react accordingly and learn flexibly (Aronson 1995).

An organization can be viewed from a cognitive approach when individuals (such as managers, employees) work towards achieving their organization's goals. The goals are the policy commitments of organizations helping the organization compete in its respective markets (Greve 2003). Greve (2003, 2008) further argues that organizational goals can constrain activities. Sutton and Hargadon (1996) state that while prior knowledge of a particular task contributes towards an individual's ability to construct novel ideas, it is the achievement of goals that individuals are working for in an organization. Ford (1996) argues that creative productivity stimulates the cognitive, motivation and knowledge abilities of an individual in an organization. This knowledge attained can have an effect on the decision-making process, which may involve a trade-off between exploration and exploitation so that the goals of an organization are achieved.

Decisions are a '*cognitive framework*' which simplifies processes where the sense-making of complex situations and dynamic environments are supposed to occur (Miller 2008). An individual's learning however, can be constrained by their capabilities to interpret complex situations (reality); a concept known as bounded rationality (Simon 1957). Cyert and March (1963) suggested that it is not necessary for all decisions that are made needs to be rational, as most of the decisions of the managers are a mix of cognitive and rationality, while subordinates who are authorised to undertake actions on these decisions made may influence these decisions through their behaviour. March followed Cohen's (1986; Cohen, March and Olsen 1972) view on the advantage diversity of individuals gives an organization in an unstable environment where a rational decision needs to be made. The choice of the decision outcome is a sensitive issue and one chosen from the problem and solutions mix, known as a '*garbage can model*' (Cohen, March and Olsen 1972). Cohen further depicts the '*garbage can*' as a design principle in an organization that is flexible, and can be modified repeatedly according to desired capabilities and routines, in order to deal with new tasks. The decision making discourse, therefore, can help an organization explore the relationships of the individuals and organization, the effects of decision strategies on the members of the organization.

Decision makers often tend to be overconfident about the efficacy of practices (routines) and therefore are not able to search for and identify new problems and creative solutions (Ford and Porter 2008). The challenges an organization faces due to overconfidence of decision makers are a) a lack of motivation in the organization to promote creativity, and b) a reduction in the salience and attractiveness of organizational routines (Ford and Kuenzi 2008). Overcoming these challenges, and allowing the members to choose creative processes, can help make an organization's competitive position stronger. Thus, creativity is 'context-specific' and a subjective judgement of individuals on the novelty and usefulness of a particular solution (value) (Ford and Porter 2008). On the other hand, there is evidence that creativity can be a source of inherent conflict (Campbell 1960; Weick, Sutcliffe and Obstfeld 2005; Weick 1969). The challenges of decision-making can be addressed with a trade-off between exploration and exploitation of knowledge, provided creative thinking is encouraged in the organizations.

2.5 Extensions of March's Model

There are many ways to acquire knowledge in an organization. Consultancy, expert knowledge, exploring, and exploiting resources in the same organization, collaborating with other institutions (public or private) are a few examples (Agarwal and Selen 2009, 2011; Schulze 2008). Knowledge is created through the process of conversion of tacit knowledge (personal and context-specific) to explicit knowledge (knowledge which can be expressed and codified) (Nonaka 1994). This assumption is based on four different modes of conversion of knowledge – '*socialization*' (tacit to tacit), '*externalization*' (tacit to explicit), '*combination*' (explicit to explicit), and '*internalization*' (explicit to tacit).

The '*Socialization*' mode follows an intense interaction between the individuals, where the mental models³ of different individuals in an organization help to create tacit knowledge. '*Externalization*' affirms the transformation of tacit to explicit knowledge, thereby generating descriptions, hypothesis, and concepts. '*Combination*' follows three steps: a) acquiring or collecting knowledge from internal, as well as external, resources of an organization b) synthesising the collected knowledge, and c) disseminating the results amongst the members of the organization. '*Internalization*' is the process where the knowledge is applied, absorbed, and embodied. Knowledge generation can be done through real world experiences or via simulation or experimentation (Schulze 2008). Nonaka (1994) argues that knowledge can be created through a continual cycle. March however, attributed the organizational learning literature partly to the individual's cognitive capacity and motivation. Tacit knowledge cannot be communicated or passed to others as, it is inherently gained through experience (Nonaka 1994), thus the diversity of individuals (different perspectives and backgrounds) helps in knowledge creation in an organization. Teamwork is one way to use this tacit knowledge and gain from individual experience.

³ Mental models are defined as the knowledge structures and abilities of individuals in a group or a team which enhances a process or a specific task (Schulze 2008).

Individual interpersonal networks are however, ignored by March in his organizational learning model. March assumes mutual learning occurs only between the individuals and organizational code. The importance of learning through interpersonal communication amongst peers, on the other hand, has been widely recognised by various researchers (Allen 1977; Erickson 1988; Miller, Meng and Calantone 2006).

Axelrod (1997) extended March's model through a simulation that included the spatial aspect of the learning process. In a square grid, a sample of 100 individuals was plotted, arrayed on a ten by ten grid, where each individual's interactions had four different neighbours (north, east, south, and west) except for the individuals along the edges and corner who had three and two neighbours respectively. The conclusions of this simulation of individuals' interactions showed that learning occurred quickly through nearby individuals, while the learning from distant individuals was slow. Provided that they interacted directly or indirectly, one individual can learn from a distant individual and where they interact with the third individual, they can share overall knowledge. March's (1991) model ignored the location of individuals which may affect the external dynamics and the knowledge created through it. While comparing learning by organizational code in the March model and the Axelrod model, it is clear that the organizational wide knowledge exploitation process becomes slower due to spatial interaction or the distance between individuals. One may argue that this bias occurs because individuals are likely to prefer to interact with their immediate neighbours rather than with distant neighbours. Cyert and March (1963) state that innovations usually begin locally and once a failure occurs while in-searching in an organization itself, innovators look for ideas outside the organization. Carr (1996) in his study of Dutch companies also agrees with Cyert and March's view in concluding that most innovations are failures, and organizations learn from their failures, making the previously failed innovation a success in future.

Miller et al.'s study (2006) used March's model to create two new dimensions of interpersonal learning and location. Miller et al. designed the edges of the grid in such a way that the neighbours of each individual were equivocal. The organizational code in the Miller et al.'s study was *primary* 'organizational intervention'. This study concluded that there was a) a dismissal of central tension (trade-off) between the exploration and exploitation, and that the increase in complexity of the model decreases the level of knowledge obtained in an organization. The latter conclusion of Miller did not take into account the fact that complexity increased competitive advantage in an organization, already explained by March (1991).

A study conducted by Kane and Alavi (2007) showed the distinct effects of information external dynamics, such as technology, on exploration and exploitation in organizational learning by creating knowledge. This effect was dependent on organizational and environmental conditions, and interactions among individuals were allowed, which was not the case in March's model. The observation that knowledge heterogeneity maintains exploration and exploitation dynamics is consistent with March. Information technology enabled learning mechanisms (such as emails, knowledge repositories, and groupware) meant a higher learning rate that either increased, or had no effect on, the overall knowledge level of the organization; however, this was different from March. March suggested that an increase in the learning rate might decrease the overall knowledge level of an organization (p. 76).

2.6 Criticism of March's Model

March ignores peer or interactive learning amongst group members or teams, which has become essential these days so that failure can be avoided. According to 'social learning theory' an individual's knowledge is dependent on the interaction with, and observation of, other people in a social context (Schwandt 2008). Bandura (1977), in his book *Social Learning Theory*, argues that organizational members are not affected by inner forces (organizational code) or environmental factors, rather they are affected by psychological factors as they continuously interact with environmental factors. Concepts such as '*sense making*' are also driven by seemingly plausible actions (Weick 2010; Weick, Sutcliffe and Obstfeld 2005; Weick 1976). Weick (1969) lays the groundwork for the development of the theory of sensemaking where people communicate with an effort to reduce the number of possible interpretations, and in doing so they will make coordinated action possible. This suggests that actions can change due to distorted reflections of multiple experiences in the past. These, in turn, force changes to frame the knowledge of an individual. One may argue that if individuals in an organization are affected by each other's thoughts and actions, then March's (1991) simulation model assumption of no interaction amongst peers needs to be revised to make the model work in a realistic world.

The problem faced by organizational learning is 'unlearning', or not remembering past unsuccessful innovations, and/or the behaviour of individuals. Hedberg (1981) argues that knowledge expands and inculcates the effects of change in reality. The changes in reality over time can make this knowledge obsolete; therefore, learning involves understanding new knowledge mechanisms and discarding old or obsolete knowledge. Learning from past failures is indeed important (Carr 1996; Clark, Hayes and Lorenz 1987) and was also addressed in Hedberg's (1981) analysis. The 'unlearning of knowledge is a crucial weakness of many organizations' (Hedberg 1981: 3) and was also ignored by March in his organizational learning study.

The excessive employment of exploitation and exploration in organizations can lead to self-destruction and self-created learning traps. March (1995) identified two traps; 'failure trap' and success trap'. *Failure trap* is a trap where organizations fail repeatedly due to bad ideas that lead to new courses of action, as well as an excess of exploration. *Success trap* however, is a trap when an organization appears to use the actions that succeeded before, irrespective of any change in the environment, which can lead to later failure. Ahuja and Lampert (2001) classified learning traps as: a) the *familiarity trap* – the tendency of an organization to adopt to known solutions, b) the *maturity trap* – the tendency of an organization to adopt proven or deployed solutions, c) *propinquity traps* – the tendency to adopt solutions which are close to known solutions. There is evidence that innovation in older companies has less impact than innovation in younger companies (Sorensen and Stuart 2000). Researchers have further suggested ways to mitigate these traps by experiencing novel and pioneering new or improved technologies (Ahuja and Lampert 2001; Crossan 2008), or by balancing internal or external learning processes (Bierly and Chakrabarti 1996).

March (1991) in his model proposed the forced replacement of individuals in his '*turnover model*' for better exploration of ideas. The job replacement of individuals, however, may cause job insecurity and may not be an appropriate solution to replace individuals in a simulation analysis and in an organization, demonstrating that replacing individual knowledge is more important in this context than the individuals themselves. It is important to protect

knowledge, rather than only protecting the superiority of knowledge from the organizational code, as suggested by March (1991). Interpersonal learning can generate new ideas, as is evident from the process of working in teams to help generate critical thinking and better ideas (Gersick 1988, 1991). This process helps to improve job satisfaction.

March used a simulation model to develop organizational learning. Simulation research is, however, problematic, as the results cannot be used to confirm or extend a theory. There is no periodic element, as in the natural sciences, that can be designed to deal with human social interactions (Washington 2008). A longitudinal study could be designed to validate March's theory, as the data used in the March's model was restricted to 80 iterations where there is the possibility that theory derived from simulation model under controlled variables can be falsified. This would increase the level of maturity of the simulation method within organizational studies.

3. CONCLUSION

This paper explores the simulation-based model of March and its applicability to organizational studies. A range of theories including cognitive theory, decision-making, 'garbage-can' theory, and bounded rationality influenced March in developing his theory. March also noted the importance of individual variations while simulating. Characteristics such as individual's personality traits, cognitive ability, energy, curiosity, and intellect are associated with creative productivity. Simulation verified these characteristics by identifying patterns of organizational learning using the interactions in March's model. This paper also identified March's contribution to organizational studies literature, and discussed how March's work was adapted and extended by other authors. March's model is widely cited in literature, approximately 10,000 times. The immense contribution of March's work is noteworthy, though certain points could productively be readdressed, such as interpersonal learning and empirical evaluation, by conducting a longitudinal study.

In sum, I suggest that organizational learning research has advanced considerable work of March in 1991. In his seminal article, March identified the continuum where resources in an organization are placed in such a manner that they can be either exploited or explored. Subsequently, the literature on learning is a piece of research that points towards disparate directions. More of empirical literature is required to test March's model, such that the proliferation of concepts and relationships that emerge from this literature, such as decision-making and cognition, can be further analysed without any dispute. Now is the right time to move towards empirically driven constructs rather than theoretical stages, which consolidates the main constructs and a capitalization of previous research in a more structured manner. The aim of this review is to contribute towards this transition.

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