# Artificial Intelligence and Machine Learning as Catalysts for Dynamic Capabilities: A Framework for Organizational Innovation and Competitive Advantage

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**Abstract**: Information Technology firms are operating in competitive and volatile market conditions and are using Artificial Intelligence (AI) and Machine Learning (ML) technologies to augment dynamic capabilities and transform their organizational strategies to achieve market success. This study attempts to explore the effect of AI/ML capabilities on dynamic capabilities, organiza-tional innovation, and competitive advantage within IT firms in Chennai. The research examines how AI/ML aids organizations to sense, seize, and trans-form opportunities to foster innovation and improve market positioning by leveraging the dynamic capabilities framework. The sample data collected from 415 IT professionals were analyzed using IBM SPSS and Jamovi. The study findings show a moderate level of AI/ML adoption, with significant variability in its effects on organizational innovation and competitive ad-vantage. The results confirm that AI/ML capabilities mediate the relationship between dynamic capabilities and organizational innovation, while organiza-tional innovation further drives competitive advantage. The study indicates AI/ML capabilities enhance organizational agility, sustained competitiveness and promote innovation. The study aids to the research literature represent-ing the strategic importance of AI/ML in driving dynamic and innovative outcomes. The study findings offer insights for practitioners and emphasize the need for future research to explore broader applications of AI/ML across industries and regions..

**Keywords:** Artificial Intelligence, Machine Learning, Dynamic Capabilities..

## Introduction

In the dynamic world of contemporary business, companies are always look-ing for methods to improve their competitiveness and flexibility. One approach that has garnered considerable attention is the development of dynamic capabili-ties concept. It is defined as "a firm's ability to renew,

reconfigure, and transform both internal and external competences in response to environmental changes" (Teece, Pisano, & Shuen, 1997). These capabilities consist of three core func-tions: sensing market opportunities, seizing them, and transforming organiza-tional resources and structures to remain agile (Teece, 2007). Organizational amalgamation of artificial intelligence (AI) and machine learning (ML) capabili-ties have developed as a vital strategy for augmenting these dynamic capabili-ties, as these technologies offer advanced data processing, predictive analytics, and automation that enable quicker, more informed decision-making (Brynjolfs-son & McAfee, 2017).

The integration of AI/ML enhances a firm's ability to sense opportunities by enabling sophisticated data analysis, which helps identify emerging trends, changes in consumer preferences, and market fluctuations more efficiently than traditional approaches (Davenport & Ronanki, 2018). AI algorithms are able to predict customer behavior and forecast market conditions, empowering firms to capitalize on new opportunities in dynamic and uncertain environments. This ability to process large-scale data in real-time is critical, especially for industries characterized by rapid technological shifts and high competition (Rai, 2020).

Further, AI/ML is instrumental in helping organizations seize opportunities by optimizing decision-making processes and operational efficiencies. By leveraging AI, companies can analyze market conditions faster, facilitating quicker responses to new opportunities. AI tools also improve resource allocation by automation of predictable tasks, which grants organizations to focus on strategic endeavors (Kietzmann et al., 2018). This optimization is crucial in environments where time-to-market is a key determinant of success, providing firms with a competitive advantage by allowing them to act faster than their competitors (Wamba et al., 2017).

The transform function relates to an organization's ability to evolve continuously through reconfiguration of organisational resources and structures. AI/ML technologies support this transformation by enabling organizations to automate mundane processes and make human resources available for more innovative and strategic tasks (Davenport et al., 2020). Companies across industries such as healthcare, finance, and manufacturing are adopting AI to drive innovations in product development, process optimization, and service delivery (Sharma et al., 2020). These innovations are critical for maintaining long-term competitiveness and fostering organizational resilience in a changing business landscape.

Given the potential of AI/ML to strengthen dynamic capabilities, this research attempts to explore the influence of AI/ML technologies on the enhancement of these capabilities and their effect on organizational innovation and competitive advantage. Specifically, the study will examine how adoption of AI/ML improves a company's capacity to detect, respond to the changes in the environment, and these improved capabilities support long-term innovation and commercial success. By studying the intersection of dynamic capabilities and AI/ML technologies, this research aims to provide valuable insights into how organizations can leverage advanced technologies to navigate the complexities of modern markets and gain a sustainable competitive edge.

## Review of Literature

AI/ML adoption improves an establishment's ability to identify, seize, and change in response to environmental alterations, as well as how these expanded capabilities contribute to long-term innovation and business success. These transformative technologies offer new ways to recognise market prospects, seize them, and reconfigure internal and external resources to maintain agility in a competitive landscape. The literature on AI/ML, dynamic capabilities, organisational innovation, and competitive gain underscores the significance of these technologies in shaping modern organizational strategies.

AI/ML Capabilities

AI/ML capabilities have garnered attention in academic literature due to their potential to revolutionize business processes and decision-making. AI encompasses technologies that simulate human intelligence through algorithms, while ML refers to systems that learn and enhance from data

without precise programming (Jordan & Mitchell, 2015). By processing large volumes of data, obtaining relevant insights, and automating repetitive operations, these technologies enable businesses to increase productivity and creativity.

Scholars argue that AI/ML enables organizations to make more informed strategic decisions (Shrestha et al., 2019). According to Brynjolfsson and McAfee (2017), organizations leveraging AI/ML experience faster decision-making processes and more accurate predictions of market trends. AI/ML tools also allow firms to analyze customer behavior, leading to product innovations tailored to specific consumer needs. Davenport and Ronanki (2018) highlight how AI systems in retail have helped optimize inventory management and enhance customer experiences through predictive analytics. Moreover, AI/ML capabilities improve organizational efficiency. As demonstrated by research from Agrawal, Gans, and Goldfarb (2019), AI-based automation significantly reduces operational costs and improves task accuracy, which is critical for organizations aiming to scale rapidly. These technologies not only enhance existing processes but also create opportunities for entirely new business models, driving innovation and growth. Artificial intelligence and emotional intelligence jointly influence organizational performance and employee outcomes. Vanitha and Latha (2026) demonstrate that emotionally intelligent employees exhibit higher adaptability to AI tools, which enhances satisfaction, commitment, and retention. Their findings indicate that AI amplifies the impact of human capabilities, thereby aligning with the broader theory of dynamic capabilities. Complementing this perspective, Gupta and Sharma (2024) emphasize that AI, technological innovation, and entrepreneurial thinking are essential drivers for bridging institutional gaps and achieving sustainable competitive advantage. Together, these studies support the argument that AI and ML act as strategic catalysts that strengthen organizational innovation and dynamic capability frameworks.

## Dynamic Capabilities

Teece, Pisano, and Shuen (1997) established the idea of dynamic capabilities, which describes a company's ability to combine, develop, and reorganize its external and internal skills in response to altering conditions. The dynamic capabilities framework comprises three core functions: sensing opportunities, seizing opportunities, and transforming resources to stay competitive.

AI/ML plays a vital role in enhancing each of these components. In terms of sensing opportunities, AI-driven data analytics allow organizations to identify market trends and consumer preferences with unprecedented precision (Mikalef et al., 2020). Firms that invest in AI/ML tools for data collection and processing are better positioned to anticipate shifts in customer demands and market conditions.

The seizing dimension, which involves capturing opportunities by deploying appropriate resources, is also greatly enhanced by AI/ML. AI systems assist in decision-making by providing real-time insights and to respond faster to emerging opportunities (Ghobakhloo & Ching, 2019). According to Teece (2018), firms with superior AI/ML capabilities can more effectively seize market opportunities, thus gaining a competitive edge.

The ability to reorganize resources to accommodate shifting circumstances is referred to as the transformation component of dynamic capabilities. AI/ML-driven automation and optimization allow organizations to rapidly adapt their operations, leading to more flexible and resilient business processes (Wamba et al., 2021). AI/ML technologies thus serve as catalysts for organizational transformation, enabling firms to remain competitive in dynamic markets.

## Organizational Innovation Capabilities

Organizational Innovation Capabilities denote the use of novel procedures, products, or concepts within a company to enhance performance and competitiveness (Schumpeter, 1934). AI/ML have been recognized as essential catalysts for organizational innovation across all sectors. AI/ML technologies offer opportunities for both product innovation, process innovation, enhancing an company's ability to introduce new offerings and improve operational efficiency Fichman, Dos Santos, and Zheng (2014).

In product innovation, AI/ML facilitates the new product development process by providing insights on market demands, customer preferences, and competitive landscapes (Chui et al., 2018). AI technologies such as NLP and computer vision enable firms to create intelligent products that offer enhanced functionality and personalized experiences for customers (Bock et al., 2017).

With respect to process innovation, AI/ML enables organizations to streamline operations by automating routine tasks and optimizing workflows. Research from Westerman et al. (2014) suggests that firms that adopt AI/ML tools can achieve significant improvements in process efficiency, and lead towards cost savings and increased productivity. Moreover, AI/ML technologies have been shown to foster service innovation by enabling companies to deliver more personalized and responsive services (Fountaine, McCarthy, & Saleh, 2019).

AI/ML also promotes marketing innovation by allowing businesses to examine customer data and devise more targeted and successful marketing strategies. According to Bughin, Hazan, and Ramaswamy (2017), companies that integrate AI/ML into their marketing operations can increase customer engagement and loyalty by delivering more personalized content and recommendations.

## Competitive Advantage

Competitive advantage denotes the elements that allow a company to surpass its competitors. (Porter, 1985). AI/ML technologies contribute to competitive advantage by enhancing a organisations ability to innovate, optimize operations, and thereby respond to the changes in the marketplace. Firms with unique, valuable, and difficult-to-imitate resources, such as AI/ML capabilities, are more likely to acquire long-term competitive advantage Barney (1991).

AI/ML technologies enhance competitive advantage by enabling firms to make better strategic decisions, optimize resource allocation, and innovate more effectively (Ransbotham et al., 2017). AI/ML solutions enable companies to evaluate massive data, resulting in well informed decision-making. Firms that utilize AI/ML for decision-making can react more quickly to market changes and stay ahead of competitors Makridakis (2017).

Furthermore, AI/ML improves operational efficiency, which is a significant source of competitive advantage. AI/ML technologies lower operating expenses and boost productivity by automating regular processes and optimizing resource use (Brynjolfsson & McAfee, 2017). This increased efficiency allows firms to deliver higher-quality products and services at lower costs, further strengthening their competitive position. Additionally, AI/ML technologies enable businesses to tailor client experiences, which is a crucial source of competitive advantage in today's market. Firms that leverage AI/ML for customer relationship management can deliver more tailored and relevant experiences to their customers, resulting in increased loyalty and higher lifetime value (Bock et al., 2017).

## Subjects and Methods:

A cross-sectional approach has been followed in this research to analyze the dynamic capacities and AI/ML skills of IT professionals, as well as related challenges and enablers, within the IT sector in Chennai. Given the extensive and potentially vast population of IT professionals in this region, the sample size was determined to be assuming an infinite population. The criteria for including participants were as follows: (a) currently employed in the IT sector, (b) possessing knowledge or experience with AI/ML applications relevant to their job, and (c) having a minimum of six months of continuous experience in their current role. Exclusion criteria applied to temporary employees or those without relevant AI/ML exposure in their roles, ensuring data accuracy and alignment with the study's focus. To obtain respondents who satisfied the given criteria, a convenience sample method was used. With the assumption of an infinite population the sample size was determined using the Cochran's formula, which provides a statistically sound foundation for obtaining a sample size that minimizes error within a particular confidence level. Using Cochran's formula:

$$n_0 = \frac{z^2 * p * (1-p)}{e^2} \qquad (1)$$

Where the Z-value is 1.96 at a confidence point of 95%, p represents the population with the desired attribute (set at 0.5 for greatest variability), and e is represented as the error margin (0.05). With this calculation a lowest possible required sample size of 384 respondents is required to achieve a confidence level 95% with a 5% of error margin. Accordingly, a sample size of 415 valid responses was obtained, exceeding the minimum requirement and ensuring robust representation for subsequent analyses. Participants were selected using convenience sampling, aligned with the inclusion criteria, across various IT organizations in Chennai.

## Objectives of the study:

With an eye on how artificial intelligence and machine learning integration improves dynamic capacities, this research aims primarily to study the influence on the firm's performance in the IT sector. Specifically, the study aims to (1) identify how dynamic capabilities influence performance, (2) the role of AI/ML in strengthening these capabilities, and (3) determine the impact of these enhanced capabilities on organizational innovation and competitiveness.

## Study Limitations:

While this study contains useful information, it has a few shortcomings. The cross-sectional study design limits causal reasonings as data are collected on a particular period of time. (Levin, 2006). Second, the convenience sampling method may introduce sample bias, affecting generalizability. Third, focusing solely on the IT sector in Chennai restricts the findings' applicability across other sectors and regions. Finally, responses are self-reported, which may lead to response bias, impacting data accuracy. These limitations can be addressed in future research could employ longitudinal designs and greater geographic samples (Rosa Angela Fabio 2024).

## Research Gap:

To identify the research gap for the study it is essential to delve into existing literature surrounding these concepts, highlight the advancements made in research, and uncover areas that remain underexplored. This section will analyze the present state of knowledge on AI/ML capabilities, dynamic capabilities, organizational innovation, and competitive advantage and discuss the gaps that the proposed research aims to address.

## AI & ML in Organizations

AI&ML are widely recognized as important drivers of organizational efficiency, creativity, and competitiveness in the current era of digital transformation. Research has shown that the AI/ML technology implementation leads to more efficient business operations, better decision-making, and improved customer experiences. Brynjolfsson and McAfee (2017) highlight that AI applications across industries are transforming productivity, customer service, and business models. Similarly, Jordan and Mitchell (2015) emphasize how AI & ML algorithms are used to detect patterns in large datasets, enabling organizations to derive valuable insights for innovation.

However, much of the existing research is centered around the operational benefits of AI/ML, focusing on how these technologies improve efficiency, automation, and data-driven decision-making. While these are vital areas, there remains a lack of comprehensive understanding of how AI and ML capabilities influence an organization's dynamic capabilities to maintain competitiveness in a rapidly changing environment. Current research often addresses AI/ML from a technological standpoint, leaving an underdeveloped area related to the strategic and organizational transformation driven by these technologies.

## Dynamic Capabilities and Organizational Change

Over the past two decades the notion of dynamic capabilities created by Teece, Pisano, and Shuen (1997), has been of considerable interest, especially in the context of firm performance and strategic

management. Gaining a long-term competitive advantage requires dynamic capabilities because they allow firms to adjust to new opportunities and obstacles Eisenhardt and Martin (2000). Studies have also looked into the specific components of dynamic capabilities—sensing, seizing, and transforming—and their impact on organizational agility and competitiveness. Despite the breadth of literature on dynamic capabilities, there has been limited research in exploring the role of emerging technologies, particularly AI and ML, in enhancing these capabilities. The majority of research has focused on how organizations generate dynamic skills through internal processes such as leadership, culture, and innovation strategies, but few have comprehensively explored the interaction of AI/ML and dynamic capabilities. There is a lack of awareness of how organizations can use AI/ML to increase their ability to sense market shifts, capitalize on new possibilities, and transform their operations. This research intends to address this gap by studying how AI/ML capabilities can be strategically deployed to enhance dynamic capabilities and subsequently lead to organizational innovation and competitive advantage.

## Organizational Innovation and Technological Disruption

Organizational innovation has been extensively researched in literature, particularly in relation to product, process, and business model innovation. According to Damanpour (1991), innovation is a fundamental driver for long-term organizational performance and competitiveness. Moreover, technological innovation, as highlighted by Schumpeter's theory of creative destruction, plays a pivotal role in enabling organizations to disrupt traditional business practices and create new markets.

While there is a substantial relationship between innovation and company performance, current research often isolates innovation as a product of organizational culture, leadership, and market conditions. There is a limited exploration of how advanced technologies such as AI and ML directly influence organizational innovation, particularly in the context of enhancing dynamic capabilities. The existing studies either focus on innovation as a reactive measure to market demands or analyze it from a purely technological adoption perspective without considering the strategic capabilities that organizations need to develop to leverage these innovations effectively. This research gets to bridge the variance by investigating in what way AI/ML can drive organizational innovation through dynamic capabilities, integrating both technological and strategic dimensions.

## Competitive Advantage in the AI Era

The role of AI/ML in building and sustaining competitive advantage has been widely acknowledged. According to studies, organizations that use artificial intelligence to improve consumer experiences, manage supply chains, and build individualized marketing tactics are more likely to outperform their competition. AI technologies enable firms to create data-driven strategies, enhance productivity, and enter new markets with innovative solutions. Porter and Heppelmann (2014) highlight how smart, connected products are reshaping industry boundaries and competition.

However, much of the research on competitive advantage in AI is focused on short-term operational improvements rather than long-term strategic skills. While operational efficiencies are important, they are not sustainable in the long run if an organization cannot adapt its strategic processes to continuously innovate and respond to external challenges. The strategic use of AI/ML to create a long-lasting competitive advantage through improved dynamic capabilities and ongoing innovation is not well understood. This study fills the gap by concentrating on how AI/ML can be combined with organizational innovation and dynamic capacities to generate a long-term competitive advantage.

The review of the literature reveals several key gaps. First, while there is ample research on the operational and technological impacts of AI/ML, there is limited focus on how these technologies influence organizational dynamic capabilities, which are crucial for long-term strategic adaptation. Second, although dynamic capabilities have been extensively studied in terms of leadership and organizational culture, the integration of AI/ML as an enabler of these capabilities remains underexplored. Third, while technological disruption is recognized as a driver of innovation, there has been very limited research on AI/ML and its abilities to enhance organizational innovation through

dynamic capabilities. Finally, the majority of studies on AI and competitive advantage focus on short-term operational benefits rather than long-term, strategic advantages derived from continuous innovation and dynamic capability enhancement.

The proposed research attempts to solve these gaps by investigating the impact of AI/ML in improving dynamic capacities, which promote organizational innovation and lead to long-term competitive advantage. The study will add to both theoretical and practical understanding by delivering insights into how firms might employ AI/ML strategically, rather than merely operationally, to stay competitive in a fast-fluctuating business environment.

## Research Framework:

The research framework of this paper is based on examining how dynamic capabilities, enhanced through Artificial Intelligence (AI) and Machine Learning (ML), impact organizational performance with a focus on the IT sector. This paradigm is based on the dynamic capacities' hypothesis, which states that an group's ability to recognize, seize, and alter resources is crucial to adapting to rapidly changing surroundings (Teece, Pisano, & Shuen, 1997).

## Dynamic Capabilities:

Dynamic capabilities have been referred as the organization's processes and skills that enable it to adapt and respond to environmental changes (Eisenhardt & Martin, 2000). In this framework, dynamic capabilities are represented through three core constructs: sense, seize, and transform.

*Sensing* involves identifying market opportunities and potential risks.

*Seizing* entails leveraging these opportunities through resources and strategic actions.

*Transforming* refers to ability of the firm to continually renew and reconfigure its internal capabilities.

## AI and ML Integration:

The framework incorporates AI and ML as catalysts that enhance each dimension of dynamic capabilities. For instance, AI-driven data analytics aids in sensing market trends by processing vast amounts of data for valuable insights. ML models enable seizing opportunities by automating tasks, streamlining decision-making, and improving accuracy in predictions. Finally, AI and ML facilitate transforming by supporting adaptive processes, enabling faster scalability, and fostering continuous innovation.

## Organizational Performance:

The ultimate outcome variable in this framework is organizational performance, which encompasses both market performance (customer satisfaction, market share, and brand reputation) and financial performance (revenue growth, profitability, and return on investment). The framework suggests that dynamic capabilities, when amplified by AI and ML, positively impact organizational performance by improving responsiveness, innovation, and operational efficiency.

## Innovation Capabilities as mediator:

Furthermore, the model incorporates innovation capacities as a mediating component. Innovation capabilities are an organization's ability to create new products, define new processes and services. These capabilities, augmented by AI and ML, mediate the relationship between dynamic capabilities and organizational performance, implying that companies with strong innovation capabilities are better positioned to use dynamic capabilities for performance benefits.

## Feedback Loop and Continuous Improvement:

The framework also includes a feedback loop indicating continuous improvement. As organizations enhance their dynamic capabilities through AI and ML, their increased performance provides further insights and resources, creating a cycle of ongoing adaptation and growth.

This paradigm is coherent with former studies on the role of digital technology in strategic management and dynamic capacities (Verhoef et al., 2021). By examining the interaction between dynamic capabilities, AI/ML, and organizational performance, this investigation seeks to contribute to understanding the character of advanced technologies in shaping competitive advantage in the IT sector.

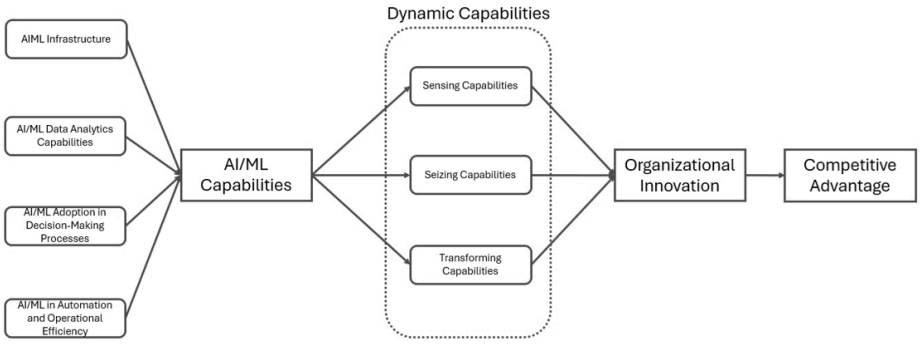


**Fig. 1. Conceptual Framework**

## Research Design:

Quantitative research strategy has been followed in this study, as it enables a controlled and objective approach to collecting numerical data and doing statistical analysis to test hypotheses. The cross-sectional survey method was chosen for data collection from employees working in the IT sector in Chennai. The justification for utilizing a cross-sectional survey is that it collects data from many respondents at a solitary point in time, delivering a picture of the relationship between AI/ML adoption, dynamic capacities, innovation, and competitive advantage in the IT industry. The study's target group is employees working in the IT sector in Chennai, which has developed as one of India's major hubs for technology-driven enterprises. The study's sample was taken from diverse IT enterprises operating in Chennai, including large international firms and smaller IT service providers.

To ensure the study captures a comprehensive perspective, purposive sampling method was used to select IT companies implementing or exploring AI/ML technologies. Within these companies, employees at different levels (managers, data scientists, software developers, and IT professionals) were invited to participate, as they represent key stakeholders involved in the adoption of AI/ML and its impact on dynamic capabilities and innovation.

Sample size determination using Cochran's formula for an unlimited population was applied for the study. The sample size was determined using a 95% confidence level and at a5 % margin of error. 415 valid responses were obtained, which is regarded acceptable for statistical analysis and representative of Chennai's IT workforce. A standardized questionnaire distributed to target respondents to accumulate the data for the study. The questionnaire was created using the characteristics specified in the conceptual framework: AI/ML capabilities, dynamic capabilities (sensing, seizing, and transforming), organizational innovation, and competitive advantage. Each questionnaire item was evaluated using a five-point Likert scale.

## Results and Discussion:

The questionnaire was pretested with a subset of respondents (n = 30) to ensure precision and significance of the items. The feedback from the pretest was used to make minor adjustments to the words of some questions to improve understanding. The final version of the questionnaire was administered both online and in-person to accommodate the preferences of the respondents. The data

gathered from the 415 respondents was analyzed using SPSS and Jamovi. To investigate the correlations between the variables, descriptive and inferential statistics were used.

Correlation Study:

Correlation analysis was performed to study the connections between four key variables: AI/ML Capabilities (AIMLCAP), Dynamic Capabilities (DYNACAP), Organizational Innovation (ORGINNO), and Competitive Advantage (COMADVG). All correlations are statistically significant, as indicated by asterisks ($p < .001$), suggesting strong and meaningful relationships among the variables.

**Table 1. Correlation Matrix**

| | **AIMLCAP** | **DYNACAP** | **ORGINNO** | **COMADVG** |
|---|---|---|---|---|
| AIMLCAP | — | | | |
| DYNACAP | 0.588*** | — | | |
| ORGINNO | 0.516*** | 0.669*** | — | |
| COMADVG | 0.483*** | 0.585*** | 0.646*** | — |

*Note.* * p < .05, ** p < .01, *** p < .001

*AI/ML Capabilities (AIMLCAP) and Dynamic Capabilities (DYNACAP):*

The correlation coefficient is 0.588, which indicates a moderately strong positive relationship. This indicates that as AI/ML capabilities increase within an organization, the ability to sense, seize, and transform opportunities (dynamic capabilities) also improves.

*AI/ML Capabilities (AIMLCAP) and Organizational Innovation (ORGINNO):*

Correlation coefficient is 0.516, demonstrating a moderately positive relationship. This implies that organizations leveraging AI/ML capabilities tend to achieve greater levels of innovation in products, processes, and services.

*AI/ML Capabilities (AIMLCAP) and Competitive Advantage (COMADVG):*

The correlation coefficient is 0.483. This value represents a moderate positive relationship between the variables. This suggests that improved AI/ML capabilities contribute to enhanced competitive positioning in the market.

*Dynamic Capabilities (DYNACAP) and Organizational Innovation (ORGINNO):*

A strong positive relationship is observed with DYNACAP and ORINNO variables, the correlation coefficient is 0.669. This shows that organizations with strong dynamic capabilities are more likely to drive significant innovation.

*Dynamic Capabilities (DYNACAP) and Competitive Advantage (COMADVG):*

The correlation coefficient is 0.585, representing a moderately strong positive relationship. This suggests that dynamic capabilities significantly contribute to achieving a edge over the competition in the market.

*Organizational Innovation (ORGINNO) and Competitive Advantage (COMADVG):* The correlation coefficient is 0.646, representing a strong positive relationship. This highlights that higher levels of innovation are strongly linked to sustained competitive advantage.

Reliability of the research instrument:

Cronbach's alpha was used to assess the consistency and reliability of the items in the questionnaire and the internal reliability of each construct. The Cronbach's alpha value of 0.7 or higher was deemed acceptable for each scale. The alpha value obtained are presented in the table below

| Table 2. Scale Reliability Statistics | | | | |
|---|---|---|---|---|
| | **Mean** | **SD** | **Cronbach's $\alpha$** | **McDonald's $\omega$** |
| scale | 4.53 | 0.463 | 0.859 | 0.858 |

Exploratory Factor Analysis (EFA):

EFA was employed to recognize the inherent factor construct of the variables, ensuring that the items in the questionnaire corresponded to the predefined dimensions of AI/ML capabilities, dynamic capabilities, innovation, and competitive advantage.

**Table 3. KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .820 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 2790.210 |
| | df | 276 |
| | Sig. | 0.000 |

Factor Analysis was used to analyse the items in the study to identify the relevant components. The KMO and Bartlett's tests were performed using SPSS. The sampling adequacy value was measured to be 0.823 for the entire sample. Bartlett's sphericity test shows a statistically considerable correlation between the variables (p=0.000). The KMO and Barlett's tests confirmed that the data was fit for factor analysis.

SEM Analysis:

To evaluate the relationships among the constructs: AI/ML Capabilities, Dynamic Capabilities, Organizational Innovation, and Competitive Advantage, SEM analysis was conducted. The model fit indices are presented in the table below.

| Table 4. Fit indices | | | | | |
|---|---|---|---|---|---|
| | | | **95% Confidence Intervals** | | |
| **Type** | **SRMR** | **RMSEA** | **Lower** | **Upper** | **RMSEA p** |
| Classical | 0.09 | 0.094 | 0.089 | 0.1 | <.001 |
| Robust | 0.077 | 0.117 | 0.111 | 0.123 | <.001 |
| Scaled | 0.077 | 0.082 | 0.077 | 0.088 | <.001 |

**Table 5.** Model tests

| **Label** | **$X^2$** | **df** | **p** |
|---|---|---|---|
| User Model | 1147 | 246 | <.001 |
| Baseline Model | 10101 | 276 | <.001 |
| Scaled User | 936 | 246 | <.001 |
| Scaled Baseline | 4536 | 276 | <.001 |

*Note.* Covariance matrix of latent variables is not positive definite.

The chi-square test for the user model yielded a significant result (x2=1147, df = 1147, p <.001). While a significant chi-square typically suggests some degree of model misspecification, it is sensitive to sample size and often significant in large datasets. Therefore, alternative fit indices were considered to evaluate model fit. Standardized Root Mean Square Residual (SRMR): The SRMR value for the classical model was 0.090, while the robust and scaled values were 0.077, all of which approach the acceptable threshold of 0.08, representing reasonable fit.

The RMSEA: The classical RMSEA value was 0.094 with a 90% interval of [0.089, 0.100], and RMSEA for the scaled model was 0.082 [0.077, 0.088], both significant (p<.001). RMSEA values below 0.08 are indicative of a close-fitting model. The path diagram illustrates the hypothesized relationships between the constructs. The covariance matrix of latent variables was not positive definite, which may indicate issues such as multicollinearity, model specification errors, or constraints within the model.

*AI/ML Capabilities:*

This construct positively impacts both Dynamic Capabilities and Organizational Innovation, as suggested by the directed paths.

*Dynamic Capabilities:*

These capabilities are positively associated with Organizational Innovation, which, in turn, drives Competitive Advantage.

*Competitive Advantage:*

This serves as the ultimate outcome variable, reflecting the influence of organizational innovation and other preceding factors.

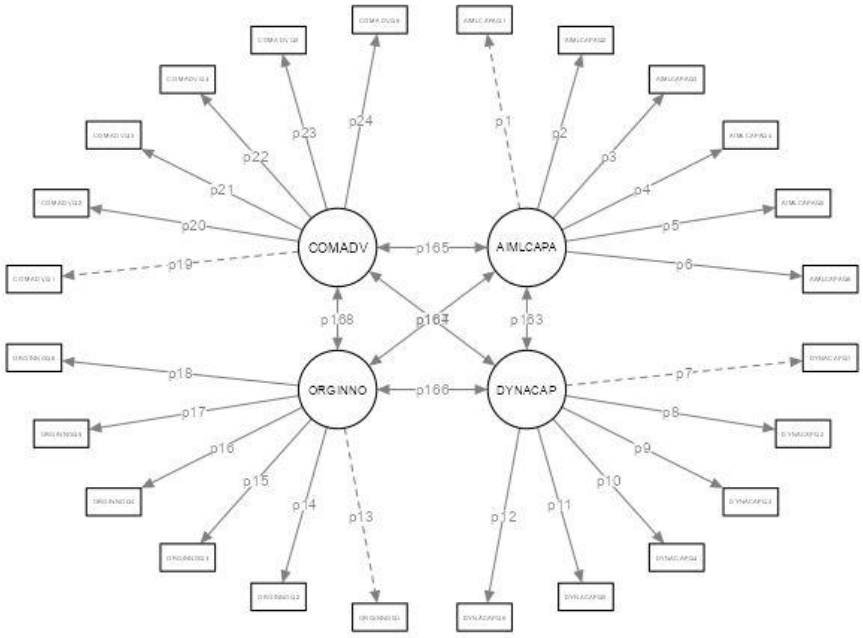


**Fig. 2. Path Diagram for SEM**

The findings highlight that while IT firms in Chennai demonstrate moderate AI/ML and dynamic capabilities, the integration and influence of these capabilities on competitive advantage are varied. The results support the theoretical framework linking AI/ML and dynamic capabilities to competitive advantage through organizational innovation, as outlined by Barney's Resource-Based View (1991) and Teece's Dynamic Capabilities Theory (2018). The variability in responses suggests that the implementation of AI/ML is uneven, which might reflect challenges related to skills, resources, and

technology infrastructure—issues commonly cited in literature on AI and innovation implementation (Choudhury & Chaturvedi, 2022).

The moderate scores in organizational innovation imply that IT firms are making efforts but may still face structural or cultural barriers limiting full innovation potential. Tushman and O'Reilly (2018) emphasize that innovation thrives when organizations are flexible and adaptable, allowing them to stay competitive in rapidly changing environments. However, the moderate scores in competitive advantage underscore the challenge of sustaining differentiation purely through AI/ML capabilities without a strategic alignment across dynamic and innovation capabilities.

## Conclusion:

This study investigates the transformative ability of AI & ML in enhancing dynamic capabilities to drive organizational innovation and secure a competitive advantage. The findings underscore the strategic interplay between emerging technologies and organizational agility, adaptability, and innovation capacity.

In theory, this research aids to the growing knowledge on the resource-based view and the dynamic capability framework (Barney, 1991 & Teece, Pisano, & Shuen, 1997). By incorporating AI&ML paradigms, the study features how technological capabilities extend traditional notions of organizational resources, turning them into proactive enablers of change rather than static assets. The insights align with prior work suggesting that technology can enhance the dynamic sensing, seizing, and transforming of opportunities and threats (Teece, 2018; Helfat & Peteraf, 2009). Additionally, this study bridges the gap between technology management and innovation literature, offering a nuanced understanding of how AI and ML recalibrate organizational responsiveness in volatile environments. This is coherent with findings from recent studies, which indicate that AI-driven systems are pivotal in augmenting decision-making and innovation processes (Brynjolfsson & McAfee, 2017; Shrestha, Ben-Menahem, & Krogh, 2019). The conceptual model developed here provides a foundation for future empirical studies to test the longitudinal impacts of AI on organizational resilience and competitiveness.

From a managerial perspective, this research emphasizes the need for organizations to embed AI and ML into their operational and strategic frameworks. Managers are encouraged to view these technologies not merely as tools for automation but as strategic assets capable of enhancing decision-making, predicting market trends, and fostering innovation (Davenport & Ronanki, 2018). Building AI-literate leadership and cross-functional teams is critical for organizations to connect the full potential of these technologies (Wilson & Daugherty, 2018). Furthermore, fostering a culture of malleability and investigation aligns with the dynamic capabilities framework and has been shown to amplify technological impacts on innovation (Volberda, Foss, & Lyles, 2010). Organizations should also invest in ethical AI and data governance frameworks to mitigate risks and ensure transparency, which is crucial for building trust with stakeholders (Floridi et al., 2018; Ransbotham et al., 2020)...

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