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# Chat GPT adoption in cultural domains in India: A diffusion of innovation analysis

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### Abstract

This study explores the adoption and usage of ChatGPT, an intelligent chat companion developed by OpenAI, focusing on its application in the cultural and related domains. By leveraging Google Trends data for India over a six-month period and employing Rogers' theory of diffusion of innovation, the study examines metrics related to awareness, interest, evaluation, trial, and adoption. Results show that 5% of the sample has transitioned into the adoption phase, regularly employing the tool for practical purposes. The research investigates the different ways within the cultural space in which consumers use ChatGPT, including the use as a writing and research aid, for specific text processing tasks like paraphrasing and summarization and for monetizing hobbies and creative output. Another application showing promise is AI-based travel and itinerary planning. These findings provide valuable insights into the evolving expectations and preferences of individuals regarding culture and leisure activities. Policymakers, cultural studies researchers, content creators, and technology developers can leverage these insights to understand evolving social norms, facilitate creative expression, foster economic empowerment, and boost tourism.

**Keywords:** Chat GPT, diffusion of innovation, cultural studies, generative artificial intelligence, mass communication

### Introduction

It took humanity over three hundred years to transition from the printing press to the telegraph, but only a hundred years to witness the emergence of two ground-breaking technologies—telephone and television. The evolution from television to the internet, smartphone, and social media, was yet more rapid, happening in less than five decades (Roser, 2023) <sup>[27]</sup>. With each new technological innovation, adoption rates have outpaced those of previous technologies. While the landline phone took almost six decades to reach 80% penetration, the mobile phone as took less than fifteen years to reach the same levels of adoption. Not only is the time between newer innovations becoming shorter, the adoption rates of each new technology are higher than the previous generation, and this trend has persisted historically. The impact of rapid changes technologies on culture, and the emergence of new modes of cultural expressions has been well studied in literature. Academic disciplines like cultural studies, media studies and sociology have systematically explored and developed theoretical models to explain the complex interplay between culture and technology. As Murphie and Potts (2003, p. 1) <sup>[20]</sup> note, “the pervasive influence of technology makes the culture/ technology issue pertinent to any number of pursuits and discipline – including medicine, sports and leisure studies.”

Launched in November 2022 by OpenAI, ChatGPT is one of the most popular and widely used AI chatbots, and in less than three months of its launch, it transitioned from being, the fastest-growing consumer application in history (Hu, 2023) <sup>[12]</sup> to a “cultural sensation” capable of providing “endless entertainment” (Thorp, 2023) <sup>[32]</sup>. From the perspective of communication technologies, it is another innovation in a long list of human endeavors to offer seamless dissemination of information, and the rapid spread of this technology, reinforces the close relation that exists between new technological innovations and their swift adoptions by consumers. In the months following the release of this novel technology, media reports in India extensively covered how ChatGPT was being adopted and used across different demographic groups and in diverse domains spanning education, finance, and healthcare among others.

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So extensive has been the adoption of ChatGPT in India, that the CEO of OpenAI Sam Altman met Prime Minister Narendra Modi in India in June 2023 to explore potential opportunities for AI, and to understand how and why India had “embraced ChatGPT so much and so early” (Sharma, 2023) <sup>[31]</sup>.

One model for understanding the way new innovations like ChatGPT are adopted is the diffusion theory, which explores how information about novel ideas or products spreads within a social context. By studying the factors that influence the adoption process, researchers can gain insights into the dynamics of innovation diffusion and its implications for individuals, organizations, and society at large. The present paper endeavors to explore the spread and adoption of ChatGPT in India, employing Rogers's theory of diffusion of innovation as the theoretical framework. Google Trends data for India spanning six months has been used for analysis. Widely used by researchers, digital marketers, media researchers, and content creators, Google Trends provides access to a sizable and unfiltered sample of actual search requests submitted to Google. As noted by Ghosh *et al.* (2021) <sup>[8]</sup>, over 98% of internet users use Google as their preferred search engine, and so in this analysis, Google Trends data on ChatGPT related searches has been used as a proxy for the spread of ChatGPT.

A number of studies have already examined the application of ChatGPT, or related technologies including chatbots and different AI tools, in so-called professional and technical domains such as sciences, technology, and finance. Thus, this study seeks to address a significant gap by exploring the adoption and utilization of ChatGPT within the cultural and related domains, shedding light on its specific applications and potential impact within these realms. This study uses the definition of cultural and related domains, as delineated by UNESCO's Framework for Cultural Statistics (FCS). The cultural domains, as outlined in the FCS, encompass a shared array of economic activities (e.g., production of goods and services) and social activities (e.g., participation in cultural activities) that have conventionally been deemed as “cultural” in nature. The related domains encompass additional economic and social activities that may be deemed as “partially cultural” or are more commonly associated with “recreational or leisure” pursuits rather than being purely cultural (UNESCO Institute for Statistics, 2009, p. 24) <sup>[33]</sup>.

By delving into cultural and related domains, like arts and entertainment, books and literature, hobbies and leisure, and travel, the study aims to contribute to the existing body of knowledge on ChatGPT's adoption and usage, offering insights into how this AI technology is being integrated into areas traditionally associated with cultural and recreational activities. Ray (2023, pp. 137-138) <sup>[25]</sup> enumerates a long list of applications in this space, including generating original ideas for stories, writing plot outlines, editing and proof-reading written content, screen writing, voice acting, script analysis, video game script generation, and composing music and songs across different genres and themes. Machines have, therefore, become embedded in realms of human engagement that were previously thought to be beyond the capabilities of computer programs – the creative arts and the social sphere. Humanity is entering an era of unprecedented human-technology interaction, and at this moment it is difficult to predict the degree of impact on the dynamics of creativity, cultural production, and social

interactions. This study may thus be situated within the broader ambit of cultural studies, and serves as a specific instance on how new innovative and disruptive technologies impact the dynamic interplay of power, society and culture in novel ways, especially facets like popular culture, media, art, literature, and everyday practices. This research fills an important void in the literature, offering a comprehensive understanding of ChatGPT's role within these domains and its implications for cultural participation, leisure experiences, and the developing landscape of technology adoption.

## Literature review

**Artificial Intelligence and ChatGPT:** ChatGPT has garnered significant attention in industry, academia and among the general populace, for its ability to answer any question posed to it, on a seemingly unending variety of subjects, and in different formats such as articles, social media updates, essays, code, and electronic mail. It can efficiently retrieve and combine information, provide instantaneous answers to seemingly hard questions, and deliver precise details that may exceed the limits of human memory or instant recollection. As Browne (2023) <sup>[3]</sup> notes, ChatGPT “can produce human-like responses to user requests — from poetry in the style of William Shakespeare to advice on what to do for a child’s birthday party.” It is not surprising that ChatGPT has been adopted across industries as well as in education. Haque *et al.* (2022) <sup>[10]</sup> based on a study of early adopters of ChatGPT concluded that the majority of them had “expressed overwhelmingly positive sentiments” related to dimensions like disruption, entertainment, and creativity. Chowdhary and Shamszare (2023) <sup>[6]</sup>, in an analysis of the various factors affecting the adoption of ChatGPT, suggested that the dimension of trust played a major role, and that companies and policymakers “prioritize building trust and transparency in developing and deploying chatbots.”

From a communications research perspective, to understand the massive adoption of ChatGPT across the globe, and especially in India, let us first define what it is from a technical standpoint. ChatGPT is a generative artificial intelligence (AI) engine which uses natural language processing (NLP) in order to provide an output similar to how people talk or write (Bozkurt, 2023) <sup>[2]</sup>. There are three key terms that are to be noted—NLP, Artificial intelligence, and generative AI. Chowdhary (2003, p. 51) <sup>[7]</sup> defines natural language processing as “an area of research and application that explores how computers can be used to understand and manipulate natural language text or speech to do useful things.” NLP is an interdisciplinary field that combines linguistics, computer science, mathematics, electrical and electronic engineering, robotics, psychology, and others, and has applications in various domains, including chatbots, voice assistants, information retrieval, and language translation.

Thanks to Hollywood movies and science fiction novels, in popular conception, people conflate AI with futuristic machines, often evil, intent on taking over the world and enslaving humanity. However, an AI system is essentially a computer system that can perform tasks that conventionally require human intelligence, and like any other technology, the desired outcome of how it behaves depends on the objectives and the method of its use (Mukhopadhyay and Reddy, 2023, pp. 241-242) <sup>[19]</sup>. An AI system can perform

tasks like understanding natural languages, making decisions, identifying patterns, and gaining knowledge from experience and learning from its mistakes. As Malhotra (2021, p. 6) <sup>[17]</sup> notes, artificial intelligence is not something new, but “an umbrella term encompassing a range of theories and technologies that have existed since the mid-twentieth century, undergoing numerous cycles of growth and decline.” Unlike earlier computer systems, which were based on pre-programmed coded logic known as algorithms, AI systems can learn from examples and constantly improve themselves through training and feedback. The implication is that even with no new learning source, ChatGPT six months down the line will likely be much more powerful than what it is today, simply by interacting with its millions of users and refining its knowledge, and learning from feedback.

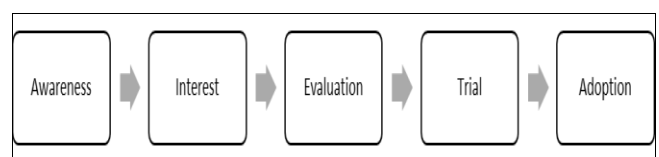
Artificial intelligence systems are of two types: discriminative and generative. Discriminative AI models learn the patterns and relationships within a dataset to make predictions or classifications. Since the beginning of AI as a discipline, the focus has been on developing better discriminative AI models and has been used across a range of fields, like weather forecasting, image classification, voice recognition, detecting diseases, and so on. Unlike generative AI, discriminative AI cannot produce new data. Generative AI models like ChatGPT, however, have the “ability to generate novel, human-like output rather than merely describe or interpret existing information” (Hatzius *et al.*, 2023) <sup>[11]</sup>. One distinguishing feature of ChatGPT, is its use of reinforcement learning from human feedback (RLHF) approach during its training process, which enables it to understand human preference, challenge erroneous assumptions, provide responses to follow-up inquiries, and acknowledge errors (Qin *et al.*, 2023) <sup>[23]</sup>.

**Diffusion of Innovation:** Innovation is a widely discussed and studied topic across academia, business, policy-making, and other domains, because of its crucial role in driving progress, fostering competitiveness, and addressing societal challenges. For example, in the first quarter of 2012, over 250 books were published with the word “innovation” in their title (Shah *et al.*, 2015) <sup>[30]</sup>. Although the word innovation means different things to different people (Gopalakrishnan 2000, p. 2) <sup>[9]</sup>, some of the common elements are the generation, advancement, and implementation of novel or enhanced concepts, methodologies, commodities, procedures, projects or amenities that result in substantial worth or transformation. Schumpeter, generally considered the founding father of innovation studies, defined innovation as the process of “setting up a new production function” (Schumpeter 1939, p. 84) <sup>[29]</sup>. While for some, innovation is an incremental process of “making today’s products and services a little bit better” (Morris, 2013) <sup>[18]</sup>, others like Rogers (2003, p. 12) <sup>[26]</sup> see innovation as “an idea, practice, or project that is perceived as new by an individual or other unit of adoption.” From this point of view, ChatGPT may be considered an innovation, as it is novel when considered as an information aggregator, and incremental when viewed as an AI model. In either case, it has fundamentally changed the way users seek information for computer systems.

Kinnunen (1996) <sup>[14]</sup> defines diffusion as the “spreading of social or cultural properties from one society or environment to another.” This process of dissemination of

innovation through specific channels, and the gradual adoption by the public at large within a specific social context, is known as diffusion of innovation. According to Rogers (2003, pp. 5-6) <sup>[26]</sup>, diffusion is “the process in which an innovation is communicated through certain channels over time among the members of a social system.” This process of dissemination is influenced by four elements, including the innovation in question, communication channels, the temporal aspect and the social context (Sahin, 2006) <sup>[28]</sup>. Therefore, as Agarwal (2000, p. 90) <sup>[1]</sup> notes, “potential users make decisions to adopt or reject an innovation based on beliefs that they form about the innovation.” Diffusion models have been successfully applied to diverse domains across different geographies, and have dealt with myriad issues like the adoption of family planning in South Korea (Valente, 1996) <sup>[34]</sup>, the spread of online games in Taiwan (Cheng *et al.*, 2004) <sup>[4]</sup>, the adoption of Automated Teller Machines (ATM) in Nigeria (Olatokun & Igbinedion, 2009) <sup>[22]</sup>, acceptance of online databases at University Zone of Iran (Nazari *et al.*, 2013) <sup>[21]</sup>, and leader-follower communications in the US (Kohles *et al.*, 2013) <sup>[15]</sup>.

The process of diffusion follows a five-step process when adopting new ideas or innovations: awareness, interest, evaluation, trial, and adoption (See Figure 1). Adopters first become *aware* of the existence of an innovation and gain knowledge about its features and potential benefits. They develop an *interest* in the innovation and seek additional information to understand its features, its advantages, and its compatibility with their needs or circumstances. The adopters, next, *evaluate* the innovation by considering its advantages and disadvantages, weighing the potential benefits against the costs and risks. They engage in a *trial* use to assess its performance, functionality, and suitability. If the adopter perceives the innovation positively after the trial, they decide to fully *adopt* and integrate it into their regular practices or routines (Wani and Ali, 2015) <sup>[35]</sup>.



**Fig 1:** Five Step Process of Diffusion of Innovation (Author’s conceptualization)

Adoption is determined by five key characteristics of innovation: relative advantage, compatibility, complexity, trialability, and observability (Lee *et al.*, 2011, p. 126) <sup>[16]</sup>. In a recent study, Raman *et al.* (2023) <sup>[24]</sup> used diffusion of innovation framework to study of the adoption of ChatGPT by Indian students in a higher education context. They concluded that the five factors of innovation significantly influenced ChatGPT adoption. Students perceived ChatGPT as innovative, compatible, and user-friendly, enabling independent educational pursuits. The study suggests that analyzing social media platform diffusion can provide insights into ChatGPT’s likely adoption trajectory. As ChatGPT evolves and more people become aware of it and perhaps adopt it, it is likely that researchers will conduct similar studies investigating different aspects of the diffusion process, the five characteristics of innovation and adoption across different domains like finance, healthcare, judiciary, and others.

The present study uses Google Trends data to investigate the pattern of diffusion of ChatGPT in cultural and related domains in India. Google Trends, a web-based platform developed by Google, has gained substantial popularity as a valuable tool for analyzing the popularity of top search queries across diverse regions and languages (Jun *et al.*, 2018) [13]. It normalizes search data to enable easy comparisons between different terms. The query share for a specific search term in a particular geographic region is calculated by dividing the total volume of queries for that term by the overall number of queries in that region during the specified time period (Choi & Varian, 2011) [5]. The maximum query share within the time frame is standardized to a value of 100. A score of 50 therefore indicates a query that is searched half as often as the most popular one. In the initial phase of analysis, a thorough examination of the dataset is conducted based on the five-step innovation diffusion paradigm to estimate the proportion of searches associated with each stage of the diffusion process. By categorizing and coding the search items, the percentage of searches that align with the identified stages, awareness, interest, evaluation, trial, and adoption, is quantified. In the second part of the analysis, the focus shifts towards the adoption process itself and analyzes the different ways in which the product is being used in real-world settings and the potential socioeconomic implications it may have.

**Methodology and Analysis:** The focus of the present study is to investigate ChatGPT diffusion among the public as well as adoption patterns within cultural and related domains using data from Google Trends

(<https://trends.google.com/trends>). Specifically, the study is confined to data from India, covering a six-month period spanning from 1st December 2022 to 31st May 2023. The chosen categories for analysis include arts & entertainment, books & literature, reference, travel, and hobbies, and leisure. By intentionally selecting non-technical areas, the study aims to examine the popularity and adoption trends in domains that encompass cultural, recreational, and leisure activities. To delve into the adoption patterns within these categories, two sources are considered: web and YouTube.

**Data Collection and Transformation:** The research process involved the collection of ten sets of Google Trends data, specifically focusing on five categories and two sources: arts & entertainment, books & literature, reference, travel, and hobbies and leisure, and Web search and YouTube. The data downloaded for further analysis, and each downloaded file contained two significant data columns: the search term itself and its corresponding relative score. To facilitate comprehensive analysis, the collected data sets were combined into a single file, while incorporating additional identifying details, such as the category and source of each search term. A total of 170 data points across the 5 categories and two data sources were acquired through this process. To ensure consistency and comparability, a transformation was applied to the relative scores. The conversion involved scaling the scores to weighted scores ranging between 0 and 1. Table 1 shows, how within the subset of Books and Literature from YouTube searches and, each relative score was divided by the total of the subset to get the weighted scores.

**Table 1:** Category and Source-wise Search Terms

Category	Source	Search Item	Relative Score	Weighted Score
Books & Literature	Web	how to use chatgpt	9	0.01
Books & Literature	Web	chat gpt login	9	0.01
Books & Literature	Web	open ai	9	0.01
Books & Literature	Web	quillbot	8	0.01
Books & Literature	Web	google scholar	8	0.01
Books & Literature	YouTube	chatgpt prompts	100	0.55
Books & Literature	YouTube	chatgpt how to use	30	0.16
Books & Literature	YouTube	chat gpt	26	0.14
Books & Literature	YouTube	chatgpt essay	19	0.10
Books & Literature	YouTube	best chatgpt prompts	8	0.04

This method of converting relative scores to weighted scores enabled a normalized representation of the data, allowing for meaningful comparisons and analysis across different categories and sources. The consolidated dataset, with its identified categories and transformed weighted scores, served as the foundation for subsequent data analysis and exploration of adoption patterns within the selected domains.

**Mapping roger's five step diffusion process to the dataset:** It is assumed that users are aware of ChatGPT, having been exposed to information about the technology through various sources such as social media, television, radio, and other communication channels. Consequently, interest in the technology, which corresponds to the second step of Roger's diffusion process, serves as the starting point for the analysis. To effectively identify and quantify the expression of interest among potential adopters, a systematic codification process is employed. The presence

of nouns such as ChatGPT, AI, OpenAI, and verbs like "how to" and "what is" are considered as indicators of interest. A little less than 60% of the searches about ChatGPT are in this phase. The next step of *evaluating* the product is codified based on the presence of specific keywords like "download" and "login," which implies a shift from mere interest to a more active engagement with the technology. This stage also encompasses the assessment of competition and alternative tools available in the market. Keywords associated with competing technologies like Bard, Bing, Quillbot, Canva, and similar terms are considered. More than 25% of the searches on ChatGPT pertain to product evaluation.

The *trial* stage is identified by specific keywords within the search items such as "prompts," "subscription," "tutorial," and "not working". Presence of these keywords shows different aspects of the trial process and the user's mindset. The keyword "prompts" suggests that users are actively experimenting with the technology, suggestive of a level of

hands-on engagement. "Tutorial" suggests a willingness to learn more about the tool and its functionalities. The keyword "not working" is also an identifier of a trial in progress, since only those who experiment with the tool are likely to face issues that need to be fixed. The keyword "subscription" signifies a potential interest in the paid version of the tool, as users may be seeking additional features or enhanced capabilities beyond the free version. These set of keywords reflect a serious consideration of adopting the tool, becoming more proficient in its use, and potentially upgrading to a paid version. The study revealed that 10% of users are seriously testing the product as potential adopters.

The remaining 5% of search terms have been identified as being associated with full-fledged adoption of ChatGPT (See Table 2). This will be elaborated on in the next section.

**Table 2:** Stage-wise distribution of searches

Stage	Percentage
Interest	59%
Evaluate	26%
Trial	10%
Adoption	5%

**Patterns of Adoption:** In order to gain a comprehensive understanding of the diffusion process, a thorough analysis was conducted on remaining search terms not associated with interest, evaluation, and trial stages. Out of the total

dataset comprising 170 search data points, a subset of 12 data points emerged that did not align with these stages. The analysis of this subset revealed specific patterns and themes, shedding light on the different adoption patterns and use cases observed within the dataset and across category types (Table 3). Within the domains of hobbies & leisure and arts & entertainment, a significant and prevalent theme was on monetizing their craft using ChatGPT. The prominence of this theme suggests that users within these domains recognize the potential of ChatGPT as a valuable tool for generating income from hobbies and creative pursuits. This finding aligns with the broader trend of individuals actively seeking ways to leverage new tools and platforms for financial benefits. Within the domains of books & literature and reference, notable and recurrent themes that emerged revolved around the tasks of research, writing, summarizing, and paraphrasing. This finding aligns with broader trends observed in the digital era, where individuals continually seek innovative tools to optimize their productivity and improve their academic performance.

An intriguing and unexpected finding within the dataset pertains to the utilization of AI based trip planning within the domain of travel. This signifies a growing trend among users to rely on intelligent algorithms and machine learning capabilities to facilitate their travel arrangements and itinerary planning. The table below provides a breakup of the application of ChatGPT in cultural and related domains in India.

**Table 3:** Adoption patterns across culture sub-domains

Application	Domains	Percentage
Writing and Research	Books & Literature	58%
How to make money	Arts & Entertainment, Hobbies & Leisure	21%
Paraphrasing	Reference	10%
Summarizing	Books & Literature	7%
Trip Planning	Travel	1%

## Conclusion

The analysis of search data reveals distinct patterns in the Indian user's behavior across the diffusion process. Findings show that around 60% of searches occur during the analysis phase, indicating high interest and active exploration. Additionally, 26% of searches signify the evaluation phase, reflecting a focused and critical approach. Furthermore, 10% of searches can be attributed to the trial phase, demonstrating user engagement and hands-on experimentation. Finally, 5% of searches represent successful adoption, showcasing early adopters who have made a commitment to incorporating the technology into their routine practices. The emergence of themes like monetization, usage of ChatGPT for paraphrasing, summarization and research, and trip planning, among the adopters, aligns with the broader trend of leveraging innovative technologies for financial benefits and productivity optimization, including in culture and related domains. Furthermore, the study sheds light on the evolving expectations of travelers and the industry's use of AI for personalized trip planning. Policymakers, cultural studies researchers, educators, businesses and content creators, can use these insights to develop targeted interventions, programs and educational resources aligned with emerging technology adoption trends, and harness its potential for economic empowerment and creative expression.

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