Journal of Information Systems Engineering and Management
2025, 10(46s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Understanding Gig Economy Participation: A K-Means Clustering Approach

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ARTICLE INFO

Received: 18 Dec 2024

Revised: 10 Feb 2025

Accepted: 28 Feb 2025

ABSTRACT

The gig economy reshapes the traditional employment frameworks, providing flexible job opportunities across different industries. Hence, the gig employees encounter various satisfaction levels and challenges depend on their engagement patterns. This study collects real-time data among the gig workers. The 201 respondents are responded to this study. Initially, Exploratory Data Analysis (EDA) is performed to understand the trends within the dataset and discovers the meaningful pattern among the gig workers. EDA assists knowing the insights such as various gig platforms, working hours per week, satisfaction level, and challenges encountered by multiple worker segments. In this study, the K-means Clustering algorithm classifies the gig workers as Active Seekers, Stable Performers, and Low Engaged. These three different cluster separation is based on various key metrics such as work per week, satisfaction level, challenges, and continue-to-work in gig platforms and recommending to another user. The finding shows both Active Seekers and Low Engaged users experiencing huge challenges, due to lack of stable opportunities and workloads. In contrast, Stable Performers tend to have balanced experiences. The study highlights the important inferences for gig platforms, underscoring the necessity health benefits, enhanced worker support and standard policy that encourage sustainable engagement. These findings can help the gig platform to increase the worker retention, improve satisfaction and develop a more resilient gig workspace.

Keywords: frameworks, industries, engagement,

1. INTRODUCTION

A gig economy is a free market system where temporary jobs are common and organizations hire independent workers for short-term commitments[1]. The term "Gig Economy" refers to the sharing economy, which defines the job market where a group of people are hired to work on a digital platform. Traditionally, gig employment differs from conventional employment because gig work is typically based on specific tasks or projects rather than a continuous employment contract [2]. The gig economy is an important element of economic growth [3]. Gig workers have the freedom to choose when and where they work, as well as the projects they undertake. Gig workers are often known as independent contractors, their job includes freelancers, project-based workers and temporary or part-time hires. They often enjoy greater flexibility in terms of schedule control and work-life balance. People participating in the gig economy can find flexible work opportunities for profitable income and skill development through online platforms, while balancing their work lives [4]. The gig economy is more flexible because workers can work remotely, giving students the flexibility to work around their academic schedules. The various Gig jobs are Online Tutoring, Freelance Writing/Editing, Virtual Assistant, Social Media Management, Data Entry, Graphic Designing, Task Rabbit and various delivery services such as Swiggy, Zomato, Porter etc. Although many opportunities are available in the gig work system, many gig workers are dissatisfied with their role in this emerging

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sector[5]. Therefore, individuals' perceptions are changed due to limited job security, unstable gig work, and lack of conventional employment benefits such as insurance or retirement plans [6]. The study applied the Machine Learning algorithm to understand the behaviour of the Gig Workers. Machine Learning algorithm can identify patterns and insights from a large dataset that helps in solving complex problems. This study uses the K-Means clustering algorithm, one of the unsupervised machine learning algorithms. The algorithm partitions the data into K groups based on similarity. In the gig system, the K-Means clustering algorithm segments workers based on the similarity features.

2.LITERATURE REVIEW

The author examines the flexibility and autonomy in gig work among college students. The study indicates that students are attracted to the gig economy because it allows them to manage their working hours. This shows that the student can continue with their academic program, and personal commitments. Therefore, the study says that many students face challenges in financial stability and career prospects [7]. Author analyses the impact of digital platforms like Uber, Zomato, and Fiverr on students' perceptions of gig work. The results show that students tend to view gig work as an attractive employment opportunity when using well-known digital platforms that provide transparent payment structures and ratings. In summary, students are more favourable to perceive gig work when it is facilitated by trusted gig platforms that provide clear guidelines and user protections[8]. The study examines the challenges faced by the student in gig economy such as financial instability, job insecurity. The gig workers also concerned about the lack of job security and are unable to obtain a consistent flow of work from the gig platform during times of economic downtime [9]. The author examines the students' perceptions of the gig economy in relation to long-term career plan. The study shows that individuals are view gig work as an opportunity for their professional growth and entrepreneurial development. Several key factors such as lack of job security, lack of benefits, stress pose significant obstacles for individuals to relay on gig platforms. The study suggests that gig platforms are more of a temporary solution than a long-term career path[9]. In [11] author discussed the challenges, advantages and disadvantages of the gig economy in both the global and Indian contexts. This study examined the recent ingenuity of the Indian Government. The study examines workers' awareness and perceptions of the gig system. The authors analyse the challenges of gig platform and proposed some possible solutions. This study found that the gig economy has no skill constraints and enables better connectivity among workers [12]. The study applies various machine learning algorithm such as Linear Regression, Decision Tree, Random Forests, XGBoost, AdaBoost, and Support Vector Regression, to forecast employee job satisfaction. The result shows that the Support Vector Regression performs well compared to other algorithms [13].

3. RESEARCH METHODOLOGY

3.1 DATA COLLECTION

This study presents a comprehensive approach to data collection among gig workers. Data collection is conducted ethically and systematically through a standardized Google form. The total number of respondents is 201. The Questionnaire are,

1. Age Group
2. Type of Gig work
3. Average working hours per week
4. Level of satisfaction in gig work
5. Challenges faced in gig work
6. Plan to continue gig work
7. Willingness to recommend gig work to others
8. Motivation factor for engaging Gig work

3.2 EXPLORATORY DATA ANALYSIS

3.2.1 Distributions of Age Group:

Fig:1 illustrates the distribution of age distribution of gig workers. The majority of 125 respondents belong to the 18-20 age group, indicating that most of them are young undergraduate students. Approximately 40 of the respondents

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between 21-24 years old. Nearly 20 participants are 25-30 age group. The fewest respondents 15 are above 30 years old.

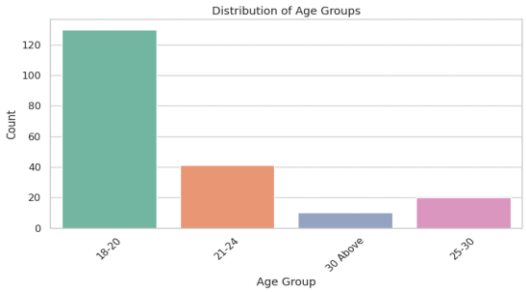

Fig:1 Distribution of Age Groups

3.2.2. Distribution of Work Types in the Gig Economy:

Around 61 respondents preferring online tutoring, which shows the increasing demand for knowledge-sharing platforms and remote education. In addition, 50 respondents choose delivery services (e.g., food or packages), and 44 respondents are choosing freelance digital services (e.g., graphic design, content writing), highlighting the rapid expansion of e-commerce platforms and demand on digital freelance platforms. Subsequently, 24 respondents are choosing household tasks (e.g., cleaning, repairs), showing the minimal involvement in physically demanding gig work. The remaining 22 respondents selected the other tasks. The existence of various opportunities for the development of gig work is shown in Fig:2.

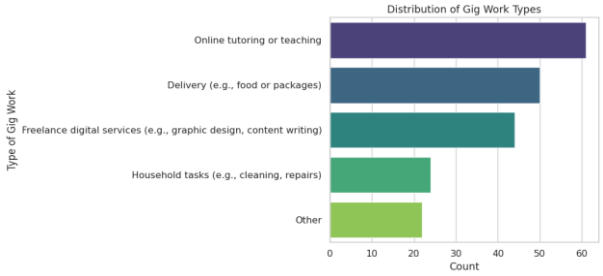

Fig:2 Distribution of Work Types in Gig Economy

3.2.3. Satisfaction Level among Gig Workers:

Gig workers satisfaction depends on various factors such as job security, work-life balance, and compensation. These factors can increase gig worker satisfaction and enhance the retention rates within the gig platform. Polarization of satisfaction: A total of 56 respondents (satisfied: 36 and highly satisfied: 20) expressed positive opinions. Although 101 respondents (Dissatisfied: 34 and Very Dissatisfied: 66) expressed dissatisfaction this suggests that gig workers are face systematic problems such as insecure employment, irregular pay, and lack of employee benefits. This imbalance demonstrates that the of gig work situation may not be generally favourable for all workers and could be influenced by various metrics such as income stability, type of job, and flexibility. Neutral Responses: A significant number of 45 respondents were neutral; that emphasizing the uncertainty in gig sector. These respondents expressed both positive and negative aspects, pointed out areas where improvements to the platforms and policies could enhance their overall satisfaction. Fig. 3 shows the distribution of satisfaction levels among gig workers.

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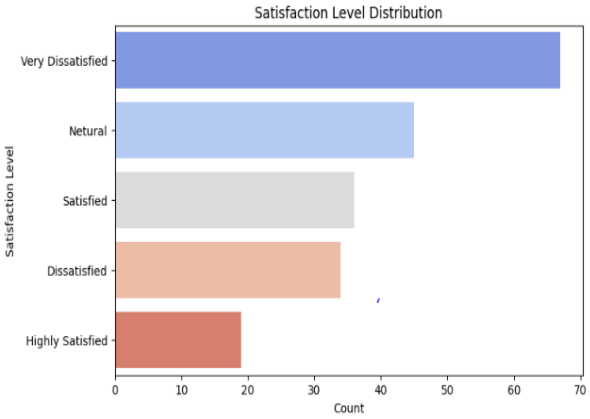

Fig: 3 Satisfaction Level among Gig Workers

3.2.4 Distribution of Working Hours per Week on Gig Platforms

Working hours on gig platforms differ based on nature of gig work, personal preferences, and market demand. Part-time Workers: The majority of the 62 respondents, works between 0-5 hours per week, stated that the gig work is used as an additional source of income instead of a full-time job. Moderate Working Hours: A notable number of respondents, approximately 53 individuals, engaged 11–20 hours per week, and about 49 respondents worked between 6-10 hours per week. This data shows that many gig workers manage their freelance activities with other commitments such as primary employment and education. Limited full-time participation: Around 25 respondents works between 21-30 hours per week. This indicates that few gig workers working full-time via gig platform. Around 7 people working 30+ hours. The existence of different categories of working hours, shows that the respondents' workloads fluctuate depending on availability and demand. Fig:4 shows the distribution of working on gig platform.

Fig: 4 Woking Hours on Gig Platform

3.2.5. Key Challenges faced by Gig Workers:

The main challenges faced by gig workers represents the various difficulties. Nearly 80 respondents have difficulty in time management between studies and work. Around 40 respondents report fluctuating income which affects their financial stability. About 38 respondents express lack of benefits on gig working platform such as health insurance, and professional development opportunities, etc. 28 respondents experience difficulties in handling customer which affect their job satisfaction and mental well-being. The remaining 13 respondents report that various gig platforms charge high commission, thereby reducing their overall earnings. Fig: 5 illustrates various challenges faced by gig workers.

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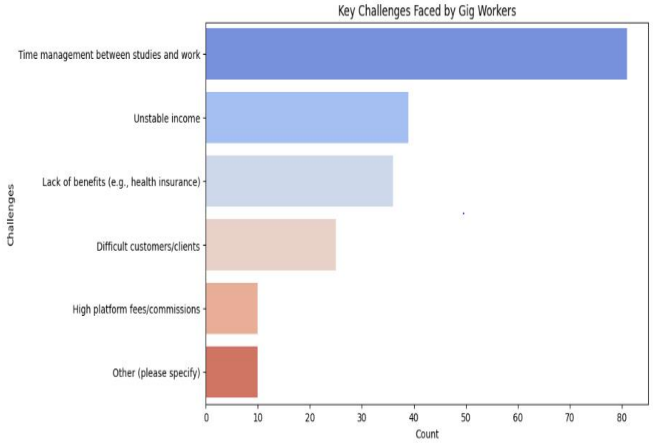

Fig: 5 Key Challenges faced by Gig Workers

3.2.6 Planning to Continue Gig Work:

Nearly, 110 respondents plan to continue the gig work, indicating the positive prospects and satisfaction with their work. Around 50 respondents are unwilling to continue the gig work due to lack of benefits and unstable income. About 41 respondents are undecided, highlighting the uncertainty about the future circumstances. In summary, 50% of respondents are willing to continue in the gig system, indicating that the gig economy offers flexibility.

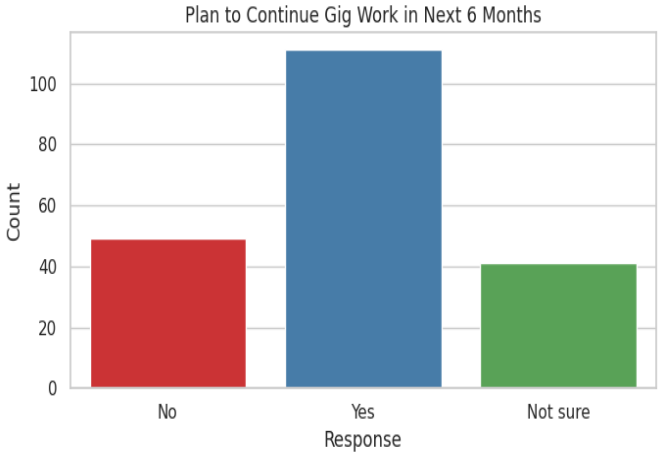

Fig: 6 Planning to Continue to Gig Work

3.2.7 Willingness to Recommend Gig Work :

A significant amount of the 112 respondents is happy to recommend the gig economy and report positive experiences. Around 52 respondents are unsure and have had mixed experience with the gig system. Nearly, 37 respondents would not recommend the gig system, due to unstable income and various challenges. Fig: 7 shows the willingness of gig workers to recommend Gig Work.

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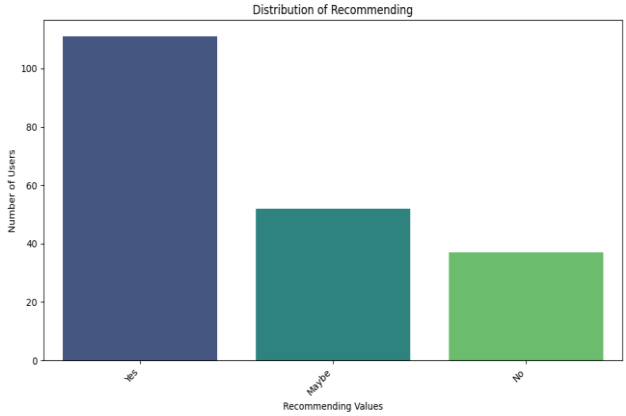

Fig: 7 Distribution of Willingness to Recommending Gig System

3.2.8 Encouraging Factor among Gig Works:

Fig:8 shows the various Encouraging Factor among the gig workers. The Higher Earnings is one of the leading motivational factor among participants, around 80 respondents preferring gig work, shows that the income is a crucial factor influencing their participation. Approximately 70 respondents selected the more student-focused work opportunities, which highlights the demand for platforms offering flexible job roles to students. Improved support from platforms was chosen by 40 users, which shows a moderate attention in improved platform responsiveness, and assistance. Nearly 10 respondents selected Access to benefits which shows that individuals are not preferring long-term employment benefits in their gig work.

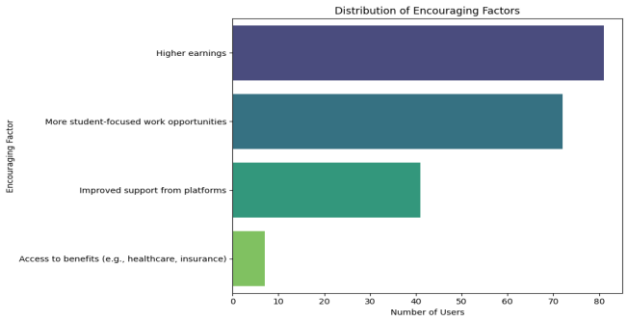

Fig:8 Distribution of Encouraging Factors

3.3 BACKGORUND OF THE STUDY:

3.3.1. K-Means Clustering Algorithm:

K-means Clustering is an unsupervised machine learning algorithm that organize the unlabeld dataset into various cluster based on their similarity. The similarity is calculated using Euclidean distance calculation formula which is defined in equation (1)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (1)$$

Where d - Euclidean Distance, (x_1, y_1) - Coordinate of the first point, (x_2, y_2) - Coordinate of the second point

The working process of algorithm defined as follows:

1. Initially, the random cluster centroid K points were initialized

2. Each data point are categorized to nearest mean value and update the mean coordinate, that are the average value of data points categorized in the corresponding cluster.

3. Repeat the process for given data points until find optimal cluster centroid point

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3.3.2. Proposed Work

K-Means clustering technique effectively groups the data into meaningful clusters. This method enables the categorization of gig workers based on their income, work frequency, and engagement patterns, providing valuable insights that can benefit both gig platforms and workers. K-Means Clustering identifies patterns among gig workers based on factors such as working hours, satisfaction, and frequency of work**.** The proposed K-means clustering algorithm implies the elbow method defined in equation (2) to find the optimal number of clusters for high dimensional gig worker dataset.

$$WCSS = \sum_{i=1}^{k} \sum_{j=1}^{n} distance\ (x_j^{(i)}, c_i)^2 \quad (2)$$

As a result of the elbow method, three cluster were formed that grouped individuals based on their similarity. The three different clusters are “Active Seekers”, “Stable Performers", and "Low Engaged".

4. RESULT ANALYSIS:

4.1. Principal Component Analysis (PCA):

The gig worker dataset contains a high dimensional dataset. PCA is used in the proposed work to identify significant features to improve cluster separation and speed up computation. PCA finds highly correlated feature and removes redundancy. Projecting the data into the two most significant features ensures better cluster separation. In the proposed work, PCA selects the two most important principal components based on the information (variance) they contain to reduce the dimension. The results of PCA show that motivation is the most important influencing factor for job stability and engagement. Furthermore, PCA defines that age plays a major role in cluster formation.

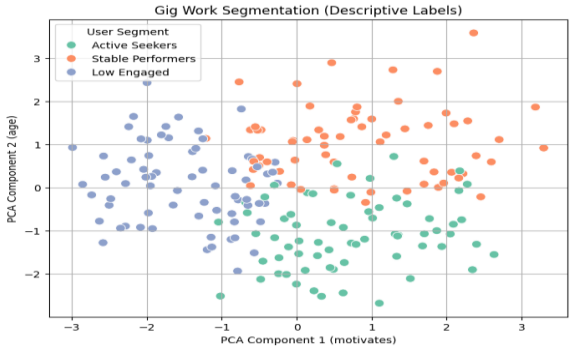

Fig: 9 K-means Clustering Visualization

Fig: 9 explains three different cluster based on working hours per week, satisfaction level, challenges faced by gig workers, recommending to other user. The first cluster, “Stable Performer” consists of gig workers who are working for long hours but they are neutral about satisfaction. The second cluster, “Active Seekers” where the workers are working low hours with high satisfaction. The third cluster,” Low Engaged”, represents the gig workers are highly satisfied workers and they are working average working hours.

4.2 COMPARING FEATURES ACROSS DIFFERENT CLUSTERS.

The Fig:10 shows the average scores for features across three unique clusters: Active Seekers (Blue), Low Engaged (Orange), Stable Performers (Green). The stable performers consistently score higher values across all the features such as hour per week, challenges and continuing in the same work, indicating a stable performers having strong and steady engagement with the gig platform.

The line plot compares multiple behavioural and psychographic features across user clusters: Active Seekers, Stable Performers, and Low Engaged. A noticeable trend is that Stable Performers consistently score higher in key dimensions such as Work Motivation, Platform usage, and Task Completion Rate, highlights strong and steady use of the gig platform. The Low engaged cluster defines the consistently low scores across the features, which indicates minimal interaction and low motivational levels. The Active Seekers group have moderate scores, suggests they are actively searching opportunities but may not adapt to long-term platform engagement.

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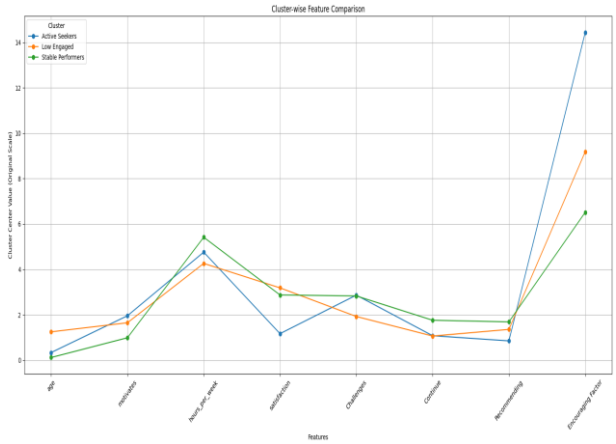

Fig:10 Comparing Features Across Different Clusters.

3.5 FINDINGS

Stable Performers: This cluster includes workers with average number of working hours. Although their satisfaction is not the low, it indicates that the platforms have need significant room for improvement. Their willingness to recommend gig work is moderately low, suggesting that improved working conditions, income, enhanced support systems could improve their perception of gig employment

Active Users: This group contains of individuals who work most hours per week and have the highest satisfaction. Even though, they face certain challenges and are most likely to recommend gig work to others. This indicates a positive experience with gig platforms.

Low Engaged: This group of gig workers spends fewest hours per week and has the lowest levels of satisfaction. They face various challenges, including income instability and job security. They are least likely to suggest gig work platform improvements, shows a negative experience with gig employment.

5. CONCLUSION:

The study shows that there is significant disparity in gig work experiences. Users who actively participate in work, report a higher level of satisfaction, while disengaged workers have more negative experiences. Engaging these moderately and disengaged users through thoughtful policies, better platform assistance and more earning opportunities would increase overall satisfaction and engagement in gig work.

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