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Prompt Engineering Awareness: A Study on Google Trends Data[1]

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A b s t r a c t

Human intelligence learns by identifying events in its surroundings through the five senses. On the contrary, artificial intelligence learns by analysing data and knowledge. Today, the rapid advancement in generative artificial intelligence necessitates the collaboration of human and artificial intelligence. This collaboration has given rise to hybrid intelligence, which combines human and artificial intelligence capabilities. For hybrid intelligence to be effectively developed and to ensure efficient collaboration between human and artificial intelligence, appropriate inputs must be provided to artificial intelligence. The discipline that addresses this process is known as prompt engineering. In this context, this study aims to evaluate and compare the awareness of the prompt engineering discipline among the Organization of Turkic States and G7 member countries. Awareness was measured using Google Trends data. The study concluded that while the member countries of the Organization of Turkic States and G7 countries exhibit a high level of awareness regarding artificial intelligence, the member countries of the Organization of Turkic States, except Türkiye, have a lower awareness of prompt engineering than G7 countries.

Sufle Mühendisliği Farkındalığı: Google Trends Verileri Üzerine Bir Çalışma

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Ö z e t

İnsan zekâsı, beş duyu aracılığıyla çevresindeki olayları tanımlayarak öğrenir. Buna karşılık, yapay zekâ veri ve bilgiyi analiz ederek öğrenir. Günümüzde, üretken yapay zekâ alanındaki hızlı ilerleme, insan ve yapay zekanın birlikte çalışmasını gerektirmektedir. Bu iş birliği, insan ve yapay zekâ yeteneklerini birleştiren hibrit zeka kavramını ortaya çıkarmıştır. Hibrit zekânın etkin bir şekilde geliştirilebilmesi ve insan ile yapay zekâ arasında verimli bir iş birliğinin sağlanabilmesi için yapay zekâya uygun girdilerin sağlanması gerekmektedir. Bu süreci ele alan disiplin ise prompt mühendisliği olarak bilinmektedir. Bu bağlamda, bu çalışma Türk Devletleri Örgütü ve G7 üyesi ülkeler arasında prompt mühendisliği disiplininin farkındalığını değerlendirmeyi ve karşılaştırmayı amaçlamaktadır. Farkındalık, Google Trends verileri kullanılarak ölçülmüştür. Çalışma sonucunda, Türk Devletleri Teşkilatı üye ülkeleri ve G7 ülkeleri yapay zekâ konusunda yüksek düzeyde farkındalık sergilerken, Türk Devletleri Teşkilatı üye ülkelerinin, Türkiye hariç, G7 ülkelerine kıyasla prompt mühendisliği konusunda daha düşük bir farkındalığa sahiptir.

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INTRODUCTION

Human intelligence (HI) perceives, i.e. learns, all events occurring around it through the five sense organs (Audrin and Audrin, 2023; Salovey and Mayer, 1990). The events perceived by the five sense organs are transmitted via nerves to the brain and lead to various decisions, which are transmitted via the nervous system to the body's organs. In contrast, artificial intelligence (AI) converts events in the physical environment into digital data through sensors and transfers these data to the digital environment (Cannataro et al., 2022). AI uses software technologies to draw new conclusions by combining data and information from the physical environment with other data and information in the digital environment. AI covers many sub-branches and application areas, including machine learning (Gülbaşı, 2023), natural language processing and autonomous systems (Liu and Zeng, 2021). Today, the rise of generative artificial intelligence (Gen AI) applications due to developments in natural language processing has started to affect education, business, health, manufacturing and all other sectors.

The rapid progress of AI necessitates collaboration between HI and AI. This collaboration is called hybrid intelligence (HyI) (Liu and Zeng, 2021). The combination of AI's experience-based tacit knowledge, emotional intelligence (Prentice et al., 2021) and the ability to make different inferences according to the situation, i.e. adaptability (Ali, 2018) with AI's agility, stability (not experiencing human-specific processes such as fatigue, emotional problems and excitement) and fast learning ability shows that the concept of hyperintelligence will contribute more efficiently to the business world, education, health and other sectors (Audrin and Audrin, 2018). Today, intensive collaboration between artificial intelligence and human intelligence is emerging within the scope of productive artificial intelligence applications. By inputting the right inputs to productive artificial intelligence applications, the right outputs can be obtained, and an intense interaction between productive artificial intelligence applications and humans emerges. In this way, HyI is also rising. The development of HyI, i.e. the collaboration of AI and HI, is only possible with the correct orientation of the AI. Providing the right inputs to AI results in the correct outputs, thus increasing the efficiency of AI. In this context, the discipline of prompt engineering (PE), also called AI literacy, has recently gained importance. PE ensures that the correct inputs are provided to obtain the right outputs from AI, thus maximising the utility of AI technologies and facilitating appropriate interaction (Korzynski et al., 2023). However, prompt engineering is nowadays associated with generative AI technologies.

The literature on PE primarily focuses on various applications of this discipline. In these studies, how AI affects the outputs obtained from ChatGPT (Henrickson and Merono-Penuela 2023; Park et al. 2023), its use in academic research (Giray, 2023), its impact on education (Cain, 2024), its applications in cyber security (Trad and Chehab, 2024), examples of use in medicine (Meskó, 2023; Venerito et al., 2024), its applications in computer graphics (Feng et al., 2023), and its importance as a new digital capability for businesses (Korzynski et al., 2023) are examined. In the existing literature, no studies measure the awareness of the PE discipline using Google Trends data. To address this gap, this study investigates PE awareness among the member countries of the Organization of Turkic States (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan and Turkey, abbreviated as T5 countries) and the G7 countries (the United States, Canada, France, Germany, Italy, Japan and the United Kingdom). In the study, T5 countries, except Turkey, are called T4 countries.

The origins of artificial intelligence can be traced back to the work of Al-Jazari, who lived in the 9th century and made significant contributions in the fields of engineering, mechanics,

cybernetics, and robotics. The region of Mardin, where Al-Jazari lived, was under the control of the Artuqids, an Oghuz Turkmen principality (Külcü, 2015; Türkiye Gazetesi Ansiklopedi Grubu, 2005: 164-69). Due to the first contributions to artificial intelligence from a Turkic region, the study's sample includes the Organization of Turkic States member countries. At the same time, G7 countries considered the most developed countries in the world, were also included in the study sample to reveal how the awareness of artificial intelligence and PE discipline differs within the scope of T5 and G7 countries. In addition, this study aims to make an important contribution to the AI discipline for academics interested in this field by supporting it with diagrams drawn for the literature section of the study. This study is designed as a descriptive study that utilizes quantitative data collection techniques to achieve its purpose.

As a result of the study, low awareness of PE discipline in T4 countries emerged; on the contrary, awareness in G7 countries was higher than in T4 countries. Turkey differed from T5 countries in this context. The low level of PE awareness in the T4 countries in the study led the researcher to expand the scope of the study and investigate how the awareness of artificial intelligence is through Google Trends data in the same sample and at the same date intervals. AI awareness was high and similar in both T5 and G7 countries.

LITERATURE REVIEW

Prompt Engineering

The working principle of AI applications is based on input and output mechanisms. Input refers to the data or commands provided to the AI by human interaction, software, sensors, etc. (Cain, 2023). For instance, a question such as "What are qualitative analysis techniques?" represents an input provided to AI by humans. In response, an output is generated by AI applications, which may include both accurate and inaccurate statements. Data obtained from sensors and digital data archives, where data from the physical environment are transferred to the digital realm, also serve as inputs to AI through various software (Trad and Chehab, 2024). These inputs and outputs can be automated and delivered instantaneously through software, resulting in the instantaneous production of outputs from the AI infrastructure. Consequently, the AI infrastructure integrates with different applications through these automation processes. The input/output process can be schematised as shown in Figure 1.

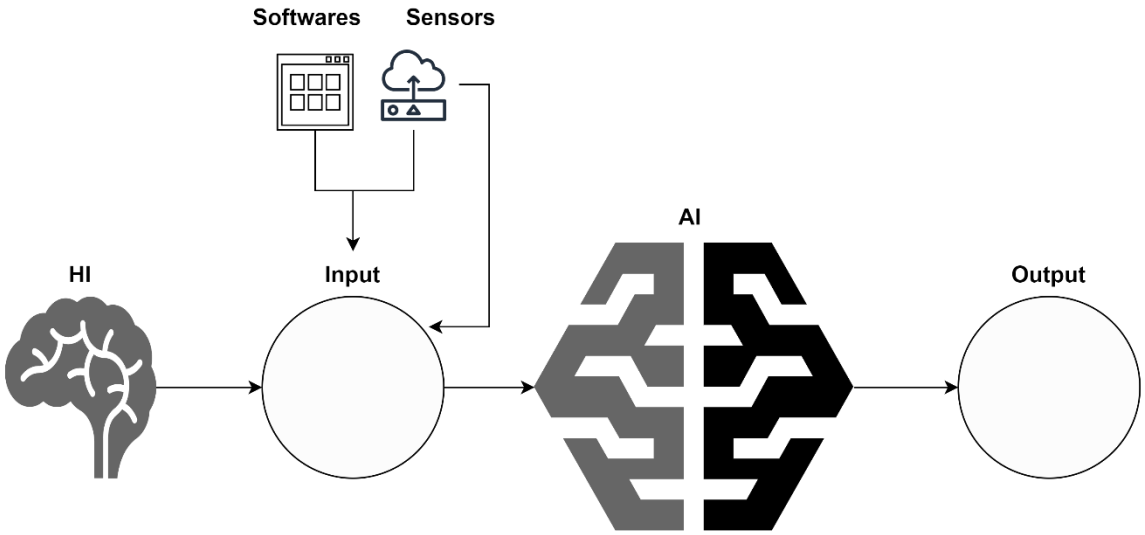

Figure 1: General working principle of AI (Source: Author elaboration)

PE is a discipline that ensures appropriate inputs are provided to maximise the utility of AI technologies and facilitate the correct interactions, thereby yielding the desired outputs (Walter, 2024). PE involves designing and optimising prompts to guide AI systems in generating accurate and relevant outputs. This discipline is currently associated with productive AI applications but can also be applied to other domains of artificial intelligence. While the input for generative AI applications consists of text, graphics, images, or video, machine learning applications rely on data sets as inputs. This discipline may also be referred to as AI literacy. For example, instead of asking a generative AI application, "What are qualitative analysis techniques?" a more specific question such as "What are the qualitative analysis techniques that can be used in the human resources units of businesses?" narrows the scope of the answer and enhances its accuracy. Furthermore, by asking, "We have the workplace performance results of 100 employees. Which qualitative analysis techniques can we use to evaluate these performance results using the personal opinions of unit supervisors?" the likelihood of obtaining the desired output from the productive AI infrastructure increases. From this point of view, it can be said that the PE discipline is a discipline that emerged within the scope of the cooperation of human intelligence and artificial intelligence, that is, in line with HyI. Figure 2 illustrates the PE concept based solely on inputs from human interaction.

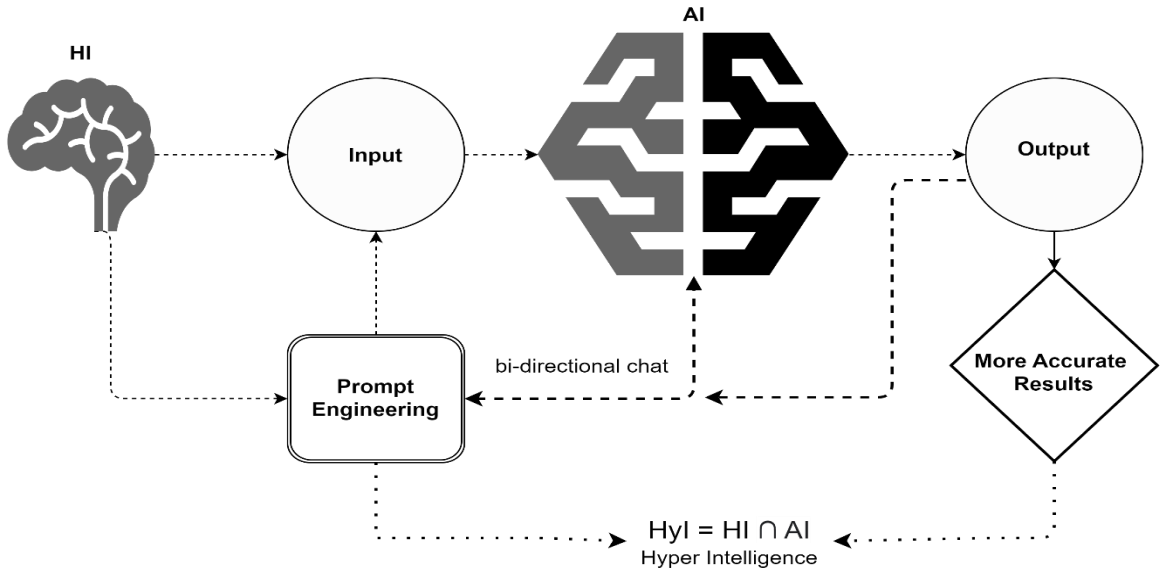

Figure 2: Prompt engineering (Source: Author elaboration)

The development of the PE discipline and the increasing industrial use of AI (Korzynski et al. 25-27) may enhance the collaboration between humans and AI. As this collaboration intensifies, the concept of hyperintelligence is expected to be fully realised. This phenomenon occurs when tacit knowledge, based on human experience (Maurseth and Svensson, 2020), emotional intelligence (Salovey and Mayer, 1990), and the ability to adapt by making situational inferences, combines with AI's agility, stability (independent of human-specific processes such as fatigue, emotional issues, and excitement), and rapid learning capabilities (Salovey and Mayer 185-87; Cannataro et al. 29-31; Johnson et al. 1-3).

Methodology

This study aims to compare the awareness of the PE discipline in T5 developing countries with that in G7 countries, which are among the most developed in the world, by utilizing search intensity data from the Google Trends database. Additionally, artificial intelligence awareness

was examined within the same sample. The study also investigates whether there is a similarity between the awareness of artificial intelligence and the awareness of the PE discipline. The hypotheses of the study are formulated as follows.

H1. A significant difference exists in the awareness level regarding PE between T5 and G7 countries.

H1$_a$. A significant difference exists in the awareness level regarding AI between T5 and G7 countries.

This study is designed as a descriptive study that utilizes quantitative data collection techniques to achieve its objective. The population of the study consists of five member states of the Organization of Turkic States (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Türkiye) (T5 countries - those outside Türkiye are designated as T4) and G7 countries (America, Canada, Germany, France, Italy, Japan, and the United Kingdom). Observer countries other than the Organization of Turkic States and full members of the G7 were excluded from the sample due to time and effort constraints.

The Google Trends data used in the study consists of weekly search intensity data from January 1, 2023, to July 31, 2024. There is no data before January 2023 as PE discipline is a new concept. These data are in the form of weekly time series. All data were converted into monthly time series by calculating the arithmetic mean and median for ease of understanding. The awareness data from the Google Trends database is presented every week for each month. As a result, certain months contain four data points, while others include five. When calculating the arithmetic mean, a single average value was determined for each month, considering the number of data points available for that particular month. In total, there are 19 months of data in the series. In the Google Trends database, weekly awareness data within a given month can occasionally be zero. For example, if four out of five weekly data points are zero in one month while one is 40, the arithmetic mean would be 8, whereas the median would remain zero. This highlights that search intensity is not sustained throughout the entire month but fluctuates, occurring in some weeks and absent in others. Therefore, the arithmetic mean and median closeness indicates that awareness is maintained throughout the entire month. This proximity suggests that the level of awareness is distributed across all weeks.

Google Trends search intensity data is rated by Google from 0 to 100 based on search interest, with 0 indicating the weakest interest and 100 indicating the most intense interest. Search intensity data in Google Trends is categorised into topic and search criteria. Subject relevance data represents search intensity data related to the same topic regardless of the language. Since language is significant in search criteria data, only the data of trending technologies that fall within the scope of the topic were analysed in this study (Google Trends). Google Trends data can be used to predict topics of public interest (Behnert et al. 1-5) to understand public awareness about a topic (Ertürk 1-3); in short, Google Trends data can be used when researching a topic of public interest (Shin et al. 1-2).

Each state in the study is abbreviated according to its internet country extension. Thus, Azerbaijan is AZ, Kazakhstan is KZ, Kyrgyzstan is KG, Uzbekistan is UZ, and Türkiye is TR for T5 countries. For the G7 countries, America is the US, Canada is CA, France is FR, Germany is DE, Italy is IT, Japan is JP, and the United Kingdom is the UK. The arithmetic mean is abbreviated as Mn and median as Md.

Findings

The findings and discussions section includes compiling and presenting the data collected about the research questions and hypotheses. This section is structured to provide answers to the research questions and explanations for the hypotheses.

H1. A significant difference exists in the awareness level regarding PE between T5 and G7 countries.

Table 1 below presents the monthly arithmetic mean and median search intensity data for the PE discipline from the Google Trends database for T5 countries.

Table 1: PE search intensity data for T5 countries

PE	AZ		KZ		KG		UZ		TR	
Month	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**
2023-01	0	0	0	0	0	0	0	0	0	0
2023-02	0	0	0	0	0	0	0	0	0	0
2023-03	0	0	0	0	0	0	25	0	35,25	44
2023-04	0	0	0	0	0	0	0	0	58,2	50
2023-05	0	0	25	0	0	0	0	0	60,5	59
2023-06	0	0	0	0	0	0	0	0	31	45,5
2023-07	0	0	0	0	0	0	0	0	28,6	41
2023-08	0	0	0	0	0	0	0	0	44,25	39,5
2023-09	0	0	0	0	0	0	0	0	37,75	44,5
2023-10	0	0	0	0	0	0	18,4	0	22,2	0
2023-11	0	0	0	0	0	0	0	0	48,25	48,5
2023-12	0	0	0	0	0	0	0	0	63,2	70
2024-01	0	0	0	0	0	0	0	0	22,75	20,5
2024-02	0	0	25	0	0	0	0	0	71,5	70
2024-03	0	0	0	0	0	0	0	0	44,6	49
2024-04	0	0	0	0	0	0	0	0	59	70,5
2024-05	0	0	0	0	0	0	0	0	43,8	59,5
2024-06	0	0	0	0	0	0	0	0	28,6	41
2024-07	43,25	36,5	5	5	0	0	2,5	0	32	35,5

According to Google Trends search intensity data, awareness of PE in T5 countries is either non-existent or minimal, except in Türkiye. This situation is presented in Figure 3.

Figure 3: Monthly mean of search intensity graph for PE across T5 countries.

To understand how awareness in G7 countries compares to the low awareness in T5 countries, the month-based arithmetic Mn and Md of Google Trends data for the same date range are presented in Table 2.

Table 2: PE search intensity data for G7 countries

G7-PE	US		UK		CA		FR		DE		IT		JP	
Month	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**
2023-01	11,4	12	6,2	0	11,4	18	0	0	9,4	13	0	0	1,8	0
2023-02	27,25	26,5	21,25	21	28	28,5	12,25	15	23	23	0	0	5,25	4,5
2023-03	51,25	39,5	46	38	46,25	37,5	24	22	35,75	30	0	0	56,25	57,5
2023-04	76,6	73	58,6	48	68,2	64	71,6	76	71,2	70	29,6	34	83	90
2023-05	67,25	68	55,5	58	61,75	62	30	29	62	60	39,25	41	83,5	82
2023-06	50	67	38,75	49	40,5	50,5	27,5	32,5	39,25	57,5	29,5	40,5	39,5	48,5
2023-07	59,6	61	52,4	49	66	69	23,4	27	56,6	56	15,8	0	48,6	50
2023-08	42,5	42,5	35,75	35,5	43,75	47,5	28	24	44,75	44	9	0	35,25	35,5
2023-09	40,25	38,5	34,75	33	48,75	45	39	26,5	38,75	35	13,25	0	35	34
2023-10	37,6	38	34,6	34	37,8	40	34	33	41,4	41	36,2	43	54,4	51
2023-11	43,5	37,5	40,5	41,5	47,75	50,5	31,25	31	55,75	52,5	15	0	70,75	73
2023-12	41,4	41	37,4	43	44,8	40	21,2	23	51	50	32,8	40	42,2	47
2024-01	39,75	39	40,5	40,5	46,75	47	24,75	23,5	62,5	63	24,75	18,5	45,75	45,5
2024-02	45,75	45	47,5	47,5	46	50	34,25	34,5	61,5	61	38	45	43,5	44
2024-03	46,6	47	50,8	51	56,4	61	35	32	63,8	67	48,2	50	50,4	46
2024-04	47	47	44,25	44	45,75	43	55	59,5	63,5	68	54,25	53,5	54,75	59,5
2024-05	37,2	47	41,8	51,5	38,6	47	25,8	33,5	44	58,5	16,4	20	51,8	64
2024-06	44	45	48	48	46	46	25,6	32	57,2	57	78,6	78	62,4	66
2024-07	38,25	37,5	40,5	41,5	39	39	25,5	20,5	49,75	51	58	51	73,5	68,5

According to the search intensity data from the Google Trends database, there is an awareness of the PE discipline in G7 countries. It is noteworthy that the arithmetic mean and median data are not significantly different from each other. This indicates that the awareness persists throughout the month rather than concentrated in specific weeks. Figure 4 is presented below for a clearer understanding of this awareness.

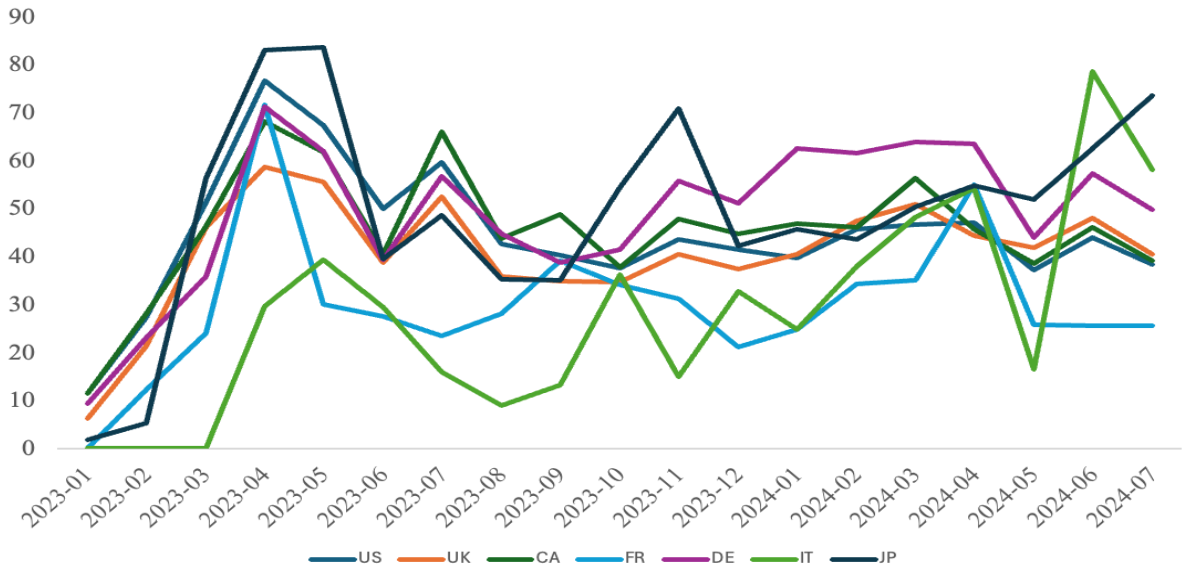

Figure 4: Monthly mean of search intensity graph for PE across G7 countries.

Among the G7 countries, awareness is low in Italy, while in other countries, it is around 50 and above, except for France. In Italy, awareness is almost non-existent for the first 11 months compared to the median average.

To test hypothesis H1 concerning the difference in awareness between T5 and G7 countries, an t-test was conducted based on the average awareness values presented in Table 3.

Table 3: Overall search intensity data for PE in T5 and G7 countries.

PE	G7	T5
Month	**Mn**	**Mn**
2023-01	5,74	0
2023-02	16,71	0
2023-03	37,07	12,05
2023-04	65,54	11,64
2023-05	57,04	17,1
2023-06	37,86	6,2
2023-07	46,06	5,72
2023-08	34,14	8,85
2023-09	35,68	7,55
2023-10	39,43	8,12
2023-11	43,50	9,65
2023-12	38,69	12,64
2024-01	40,68	4,55
2024-02	45,21	19,3
2024-03	50,17	8,92

2024-04	52,07	11,8
2024-05	36,51	8,76
2024-06	51,69	5,72
2024-07	46,36	16,55

A t-test is a parametric analysis, the Shapiro-Wilk normality test was conducted to determine whether the average search intensity data for T5 and G7 countries, as presented in Table 3, were normally distributed. The results are shown in Table 4. According to Table 4, since $p > 0.05$, the data are considered to be normally distributed.

Table 4: Shapiro-Wilk normality test results.

Group	W-Statistic	p-Vlaue
T5	0,9667	0,7093
G7	0,9187	0,1067

The values of the t-test performed according to the average search intensity data of T5 and G7 countries in Table 3 are given in Table 5.

Table 5: t-test values.

Statistic	p-Vlaue
9,6808	1.47×10^{-11}

The statistic resulting from the t-test is 9,6808 and the p-value is 1.47×10^{-11}. Since $p < 0.05$, a statistically significant difference exists between the PE awareness averages of T5 and G7 countries. Thus, a significant difference exists between the awareness levels of T5 and G7 countries, leading to the acceptance of hypothesis H1.

$H1_a$. A significant difference exists in the awareness level regarding AI between T5 and G7 countries.

Table 4 below presents the monthly arithmetic mean and median search intensity data related to AI from the Google Trends database for T5 countries. According to Table 6, T5 countries exhibit a high level of awareness regarding AI.

Table 6: AI search intensity data for T5 countries

T5-AI	AZ		KZ		KG		UZ		TR	
Month	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**
2023-01	23,4	24	28	26	26,2	26	16,4	16	25,4	26
2023-02	26	27	42,75	43	32,5	34	23,5	23,5	24,25	24
2023-03	31	32	42,5	42,5	39	38,5	30,75	32	31,75	32
2023-04	44,2	44	61,8	66	66	64	36,8	37	50,8	48
2023-05	44,75	44	69,5	66,5	71,75	73,5	44,75	43,5	47,25	47

2023-06	32,75	42	45,25	60	52,25	66	31	39	42,5	52
2023-07	45,4	45	60,2	60	60,4	59	35,2	36	58,6	59
2023-08	41,25	41	61,5	60,5	56,75	57,5	34,25	35	51,5	51,5
2023-09	41,5	40,5	75,75	75,5	57,5	57,5	39,5	37	50,25	51
2023-10	49,8	49	84,4	81	71,8	72	50,2	47	68,6	67
2023-11	53,5	52	83,75	84	76,75	75,5	57,5	57	67,75	68
2023-12	57,4	58	79,4	81	83,8	81	54,6	53	75,2	76
2024-01	55,5	54,5	77,5	76,5	81,5	82,5	51,5	51	72,5	72
2024-02	64,75	63,5	88,75	88	88	88	52,25	52	85	86
2024-03	65,6	65	82,2	81	87,8	84	56,4	53	88,2	91
2024-04	68	68,5	84,5	83,5	87,25	88,5	59,75	60,5	82,75	85,5
2024-05	56,8	72,5	69,2	86,5	73,6	92,5	46,6	58	76,4	97
2024-06	65,8	65	83	78	82,8	83	52	51	86,8	91
2024-07	76,5	71	83,75	82,5	85,75	85,5	81,5	78	84,75	82,5

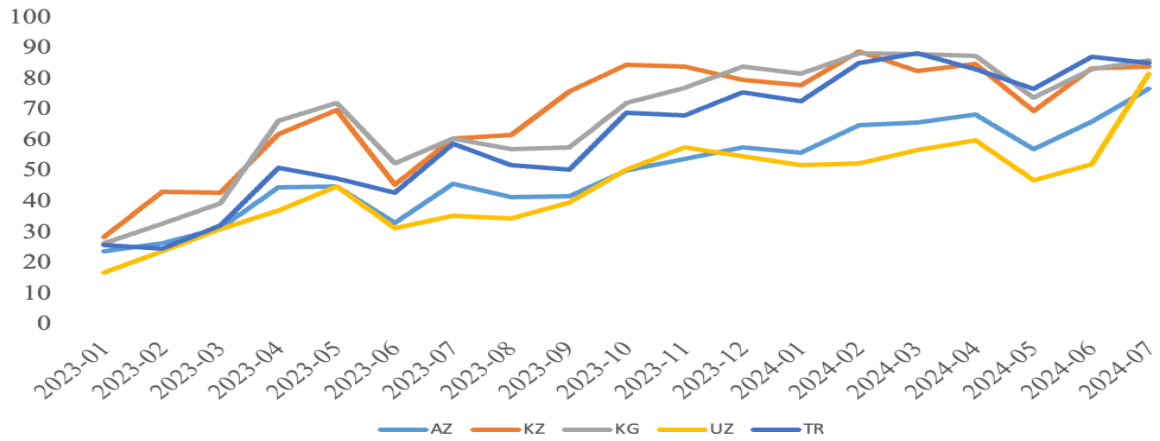

Figure 5: Monthly mean of search intensity graph for AI across T5 countries.

When the graph in Figure 5 is examined we can see that the awareness of AI in T5 countries is both high and similar among these countries. Moreover, the arithmetic mean and median values are close to each other, indicating that this awareness is spread consistently throughout the month. While AI's awareness is high, PE's awareness remains low, which is necessary to obtain maximum efficiency from AI.

Table 7 below presents the monthly arithmetic mean and median search intensity data related to AI from the Google Trends database for G7 countries. According to Table 7, G7 countries also exhibit a high level of awareness regarding AI.

Table 7: AI search intensity data for G7 countries

G7-AI	US		UK		CA		FR		DE		IT		JP	
Month	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**	**Mn**	**Md**
2023-01	33	31	32,8	35	40,8	44	44	46	43,2	46	27,6	30	40,8	42
2023-02	41,75	41	39,75	39	49,25	47,5	40,25	40	48	47	29	28,5	51,25	51,5
2023-03	48	48	46,5	46,5	58,25	56	48,75	45,5	53	51,5	37,5	33	59,75	59,5
2023-04	73,4	74	65,4	63	74,4	71	63,8	56	65,6	67	47,4	49	67,4	67

2023-05	70,25	71	64	63,5	67,5	67	60,25	60	67,75	67,5	51,5	51,5	77,5	77
2023-06	47,5	61,5	45,75	59	52,5	69	42	55	51	67	44,5	52,5	56	72,5
2023-07	62,8	63	56,8	56	64	65	48,4	49	62,8	64	46	45	69,6	70
2023-08	59,25	57,5	51,75	51	57,25	56	49,75	50	58,75	59	41,25	41,5	64,5	64,5
2023-09	62,5	63	52,5	52	63	63	57,75	57	64,25	64,5	46,75	47,5	63	63,5
2023-10	74,6	74	67,8	66	78,2	77	68,6	67	68,2	69	60,4	59	72,6	71
2023-11	77,75	80,5	74	74,5	87	87	75	74,5	78,25	79	70	69	77,75	77,5
2023-12	72,8	70	67,2	63	76	74	72	72	77	74	67,2	69	71,6	76
2024-01	82	81,5	74,75	74	88,25	89,5	81	81	84,75	84,5	77,75	78,5	79,5	79,5
2024-02	88,75	89,5	79	78,5	92,5	93	89,75	90,5	89	87,5	77,25	77	80	79
2024-03	85,4	85	77,2	81	91	92	93,4	94	86,2	87	75,2	75	77,2	78
2024-04	89,25	90	78,25	77,5	89,5	93	89,5	90,5	83,75	84,5	73,25	74,5	81	81,5
2024-05	76	95	62,2	78,5	69	86	73,2	98	69,6	88	67,8	87	71,6	90,5
2024-06	89,2	88	76	76	84	88	88,4	88	86,8	83	83,8	84	93,4	92
2024-07	82	81,5	69,75	70,5	76,25	77	72,25	72,5	78,5	79	68	68,5	86,25	84

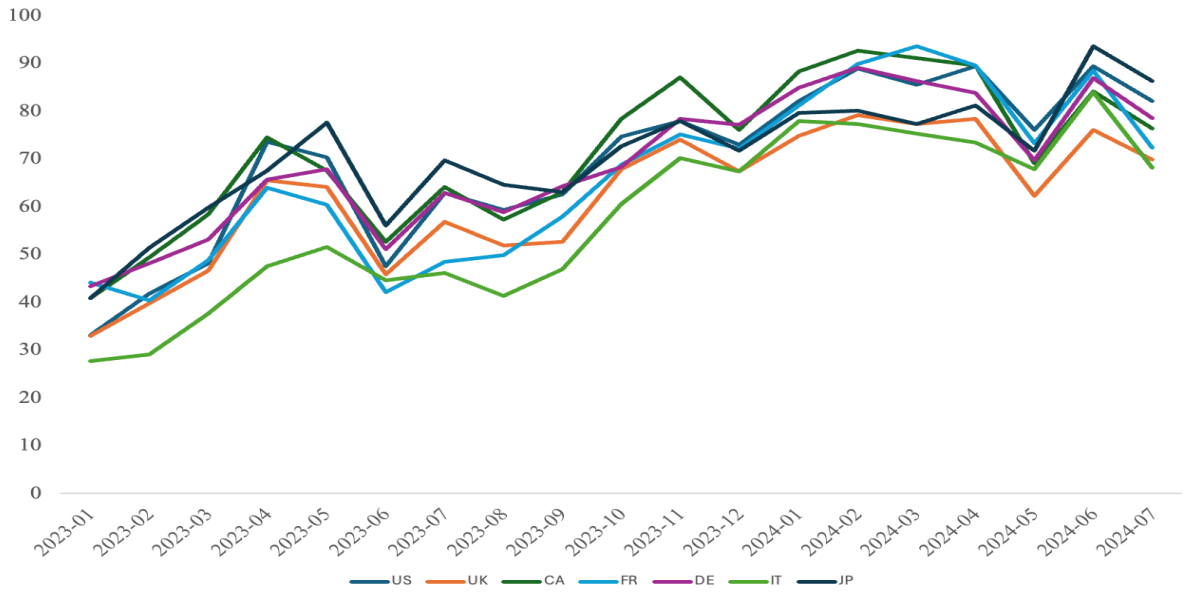

Figure 6: Monthly mean of search intensity graph for AI across G7 countries.

When the graph in Figure 6 is analysed, it is seen that the awareness of artificial intelligence in G7 countries is both high and similar among these countries. Moreover, the arithmetic mean and median values are close to each other, indicating that this awareness spreads consistently throughout the month.

Table 8: Average search intensity data for AI in T5 and G7 countries

AI	**G7**	T5
Month	**Mn**	**Mn**
2023-01	37,46	23,88
2023-02	42,75	29,8
2023-03	50,25	35
2023-04	65,34	51,92

2023-05	65,54	55,6
2023-06	48,46	40,75
2023-07	58,63	51,96
2023-08	54,64	49,05
2023-09	58,54	52,9
2023-10	70,06	64,96
2023-11	77,11	67,85
2023-12	71,97	70,08
2024-01	81,14	67,7
2024-02	85,18	75,75
2024-03	83,66	76,04
2024-04	83,50	76,45
2024-05	69,91	64,52
2024-06	85,94	74,08
2024-07	76,14	82,45

To test hypothesis $H1_a$ regarding whether there is a difference in awareness between T5 and G7 countries, an t-test was conducted based on the average awareness values presented in Table 8. As t-test is a parametric analysis, the Shapiro-Wilk normality test was performed to determine if the average search intensity data of T5 and G7 countries in Table 8 are normally distributed, and the results are provided in Table 9. According to Table 9, since $p > 0.05$, the data are considered to be normally distributed.

Table 9: Shapiro-Wilk normality test results.

Group	W-Statistic	p-Vlaue
T5	0,9187	0,1228
G7	0,9430	0,3265

The values of the t-test conducted based on the average search intensity data of T5 and G7 countries, as presented in Table 10, are provided in Table 8.

Table 10: t-test values

Statistic	p-Vlaue
1,5708	0,125

The F-statistic obtained from the t-test is 1,5708, and $p > 0,05$, indicating no statistically significant difference between the averages of AI awareness for T5 and G7 countries. Thus, there is no significant difference between the awareness levels of T5 and G7 countries, leading to the rejection of hypothesis $H1_a$

Conclusion

AI technologies are the subject of extensive research and development. The PE discipline has emerged as a critical approach to optimizing the effectiveness of these technologies. As AI continues to evolve, new disciplines are expected to address different aspects of application and integration. PE plays a crucial role in improving the efficiency of AI by facilitating a more

precise and effective interaction between HI and AI systems. This interaction is often referred to as HyI in the literature (Pescetelli 633-34), and PE functions as a regulatory mechanism bridging the gap between HI and AI.

Analysis of Google Trends data reveals that the AI awareness of T5 and G7 countries, as illustrated in the graph in Figure 7 based on Table 8, is similar. This observation is also supported by hypothesis $H1_a$. While T5 and G7 countries exhibit similar levels of AI awareness, they differ significantly in PE awareness, as demonstrated in Figure 8**.**

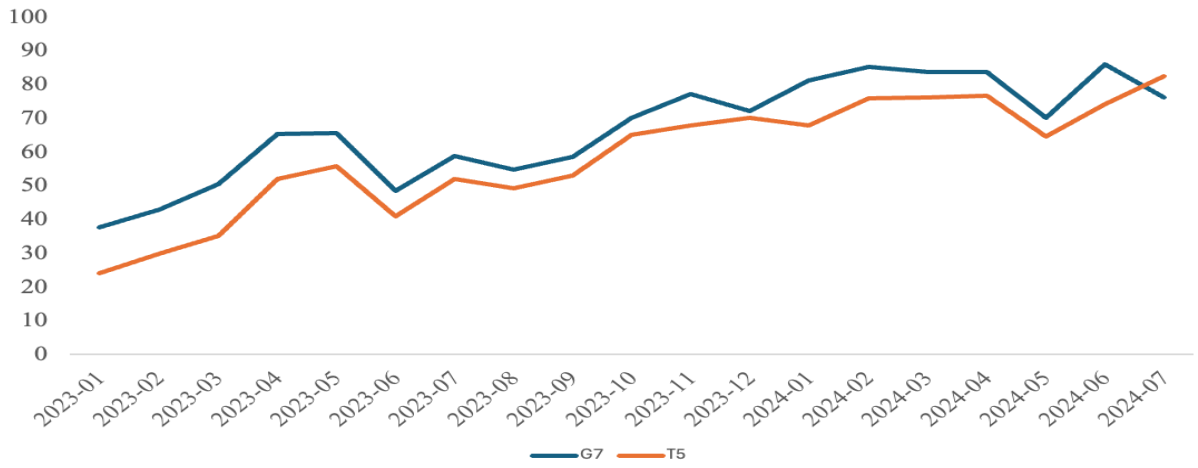

Figure: 7 Monthly mean of search intensity graph for AI across T5 and G7 countries.

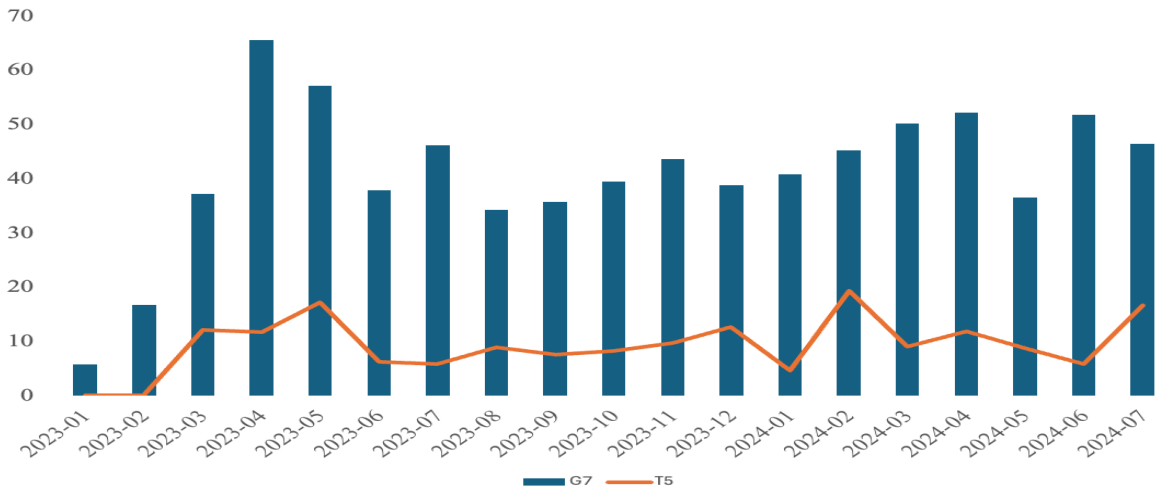

Figure 8: Monthly mean of search intensity graph for PE across T5 and G7 countries.

PE awareness in T5 countries primarily originates from Türkiye, as indicated by Table 1 and Figures 9 and 10, which are based on Table 1. Figure 9 shows that PE awareness is nearly absent in T4 countries. However, when Türkiye is included in T4 countries, PE awareness appears as illustrated in Figure 10.

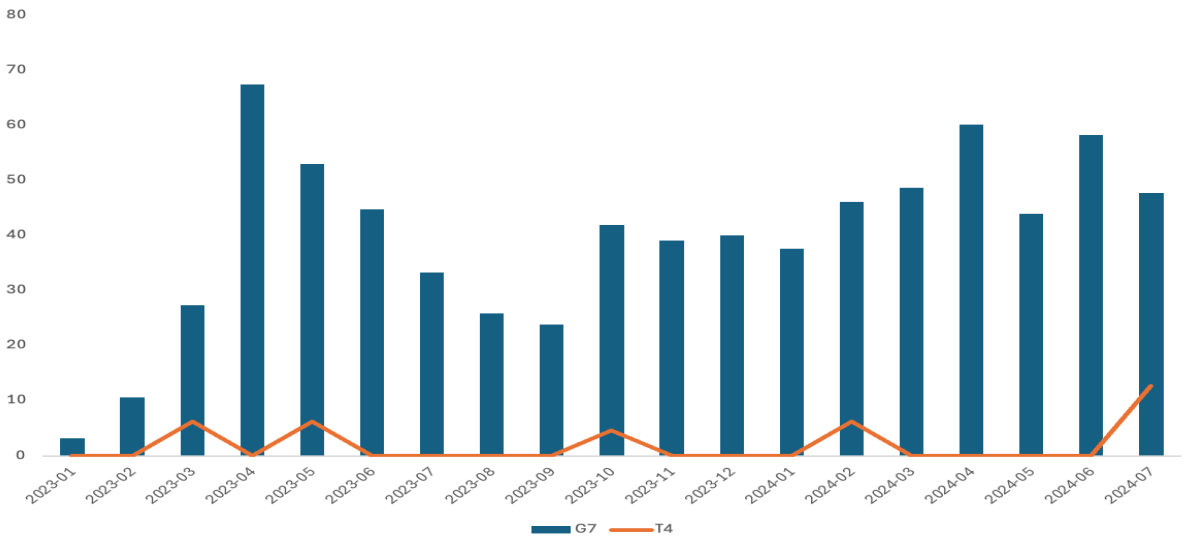

Figure 9: Monthly mean search intensity graph for PE across T4 and G7 Countries.

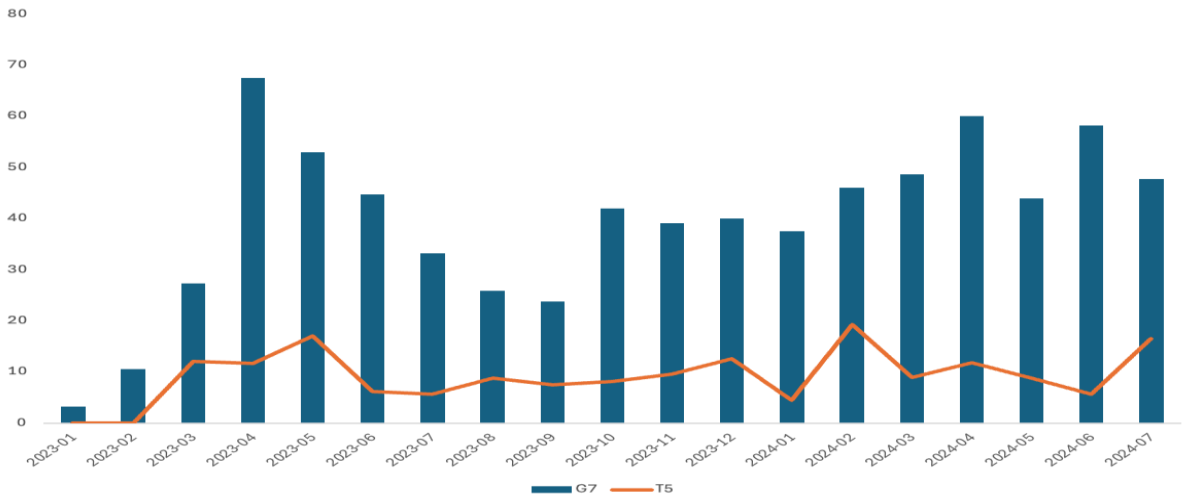

Figure 10: Monthly mean search intensity graph for PE across T5 and G7 countries.

Evaluating only Türkiye using the data from Table 1 transforms the graph in Figure 11 into Figure 12.

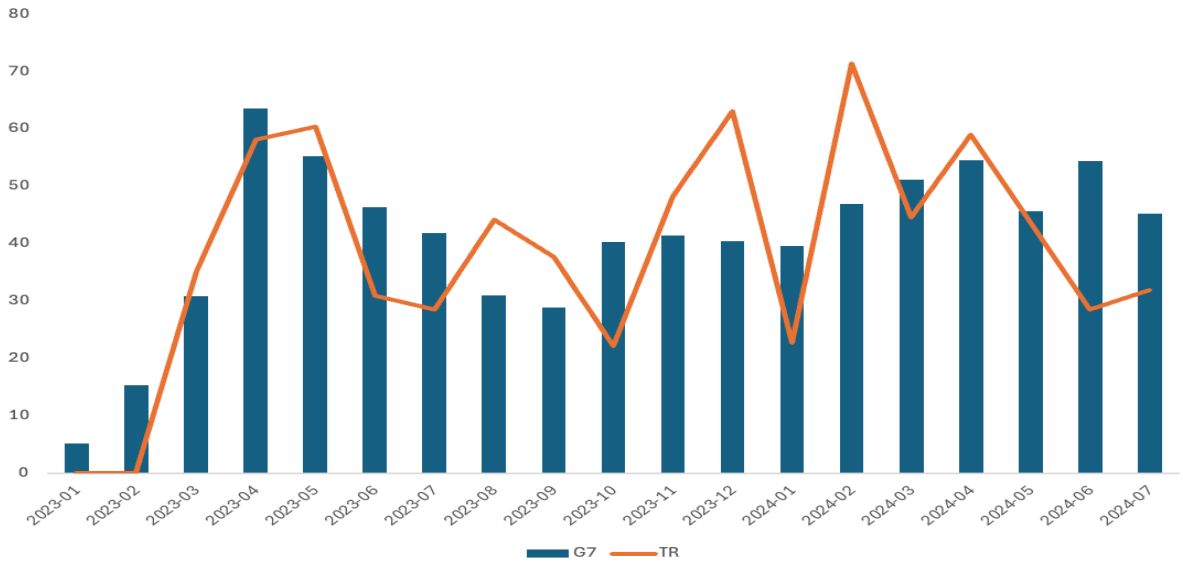

Figure 11: Monthly mean search intensity graph for PE across G7 countries and Türkiye.

Hypothesis H1 is accepted, indicating that PE awareness differs between T5 and G7 countries. This difference is also evident in Figure 10. However, Figure 11 shows that PE awareness in Türkiye is higher compared to T5 countries, similar to the pattern observed in G7 countries.

Figures 12 and 13 illustrate the relationship between AI and PE awareness. Figure 12 indicates that AI awareness is high while PE awareness is low in T5 countries. Conversely, Figure 13 shows that AI and PE awareness are comparable in G7 countries. Figure 14 presents the relationship between Türkiye's AI and PE awareness, demonstrating that Türkiye differs from T4 countries. Figure 15 illustrates the relationship between AI and PE awareness in T4 countries, revealing almost no relationship between AI and PE awareness.

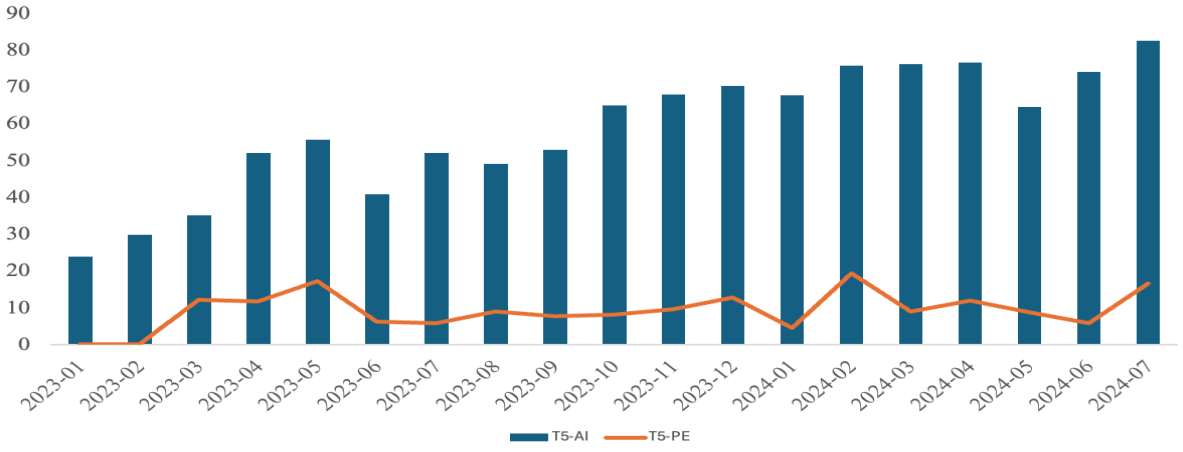

Figure 12: Relationship between AI and PE awareness graph for T5 countries (Mn Average)

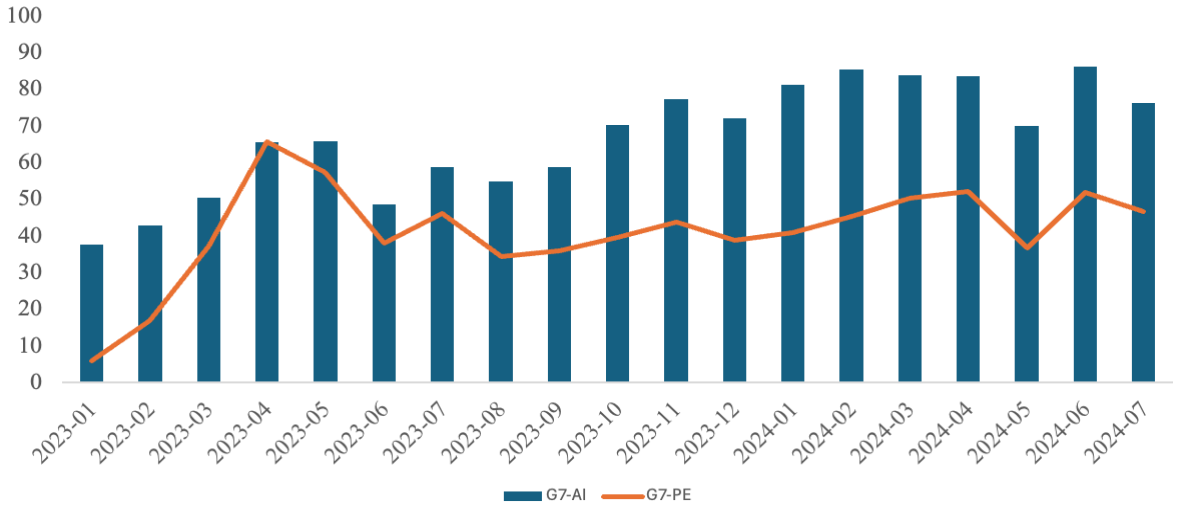

Figure 13: Relationship between AI and PE awareness graph for G7 countries (Mn Average)

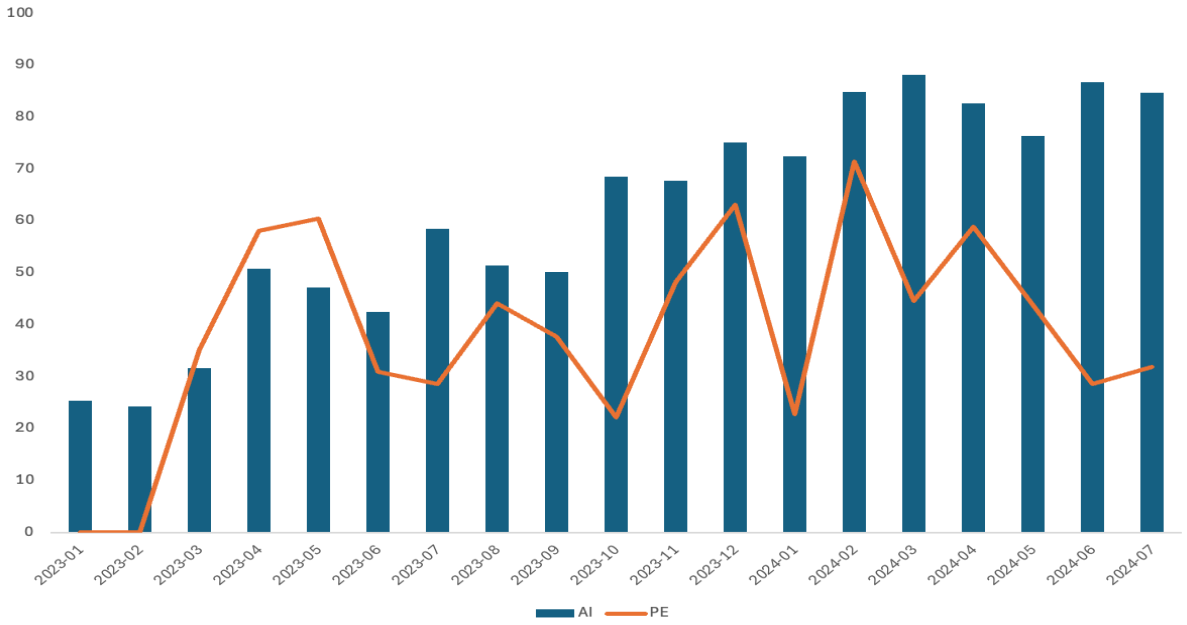

Figure 14: Relationship between AI and PE awareness graph for Türkiye.

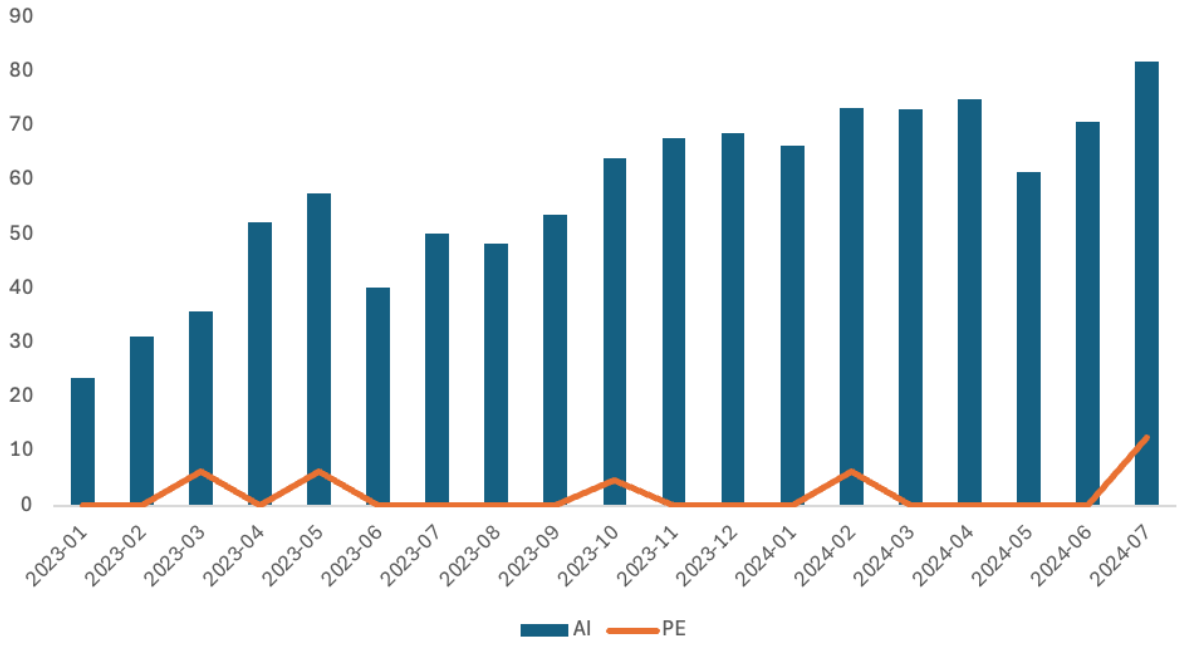

Figure 15: Relationship between AI and PE awareness graph for T4 countries.

Figures 12 and 13 reveal that while the AI awareness of T5 and G7 countries is similar (blue columns), there is a significant difference in their awareness of the PE discipline (orange indicators). Türkiye, one of the T5 countries, stands out by differing from other T5 countries in terms of PE discipline awareness, showing a pattern more akin to that of G7 countries.

The concept of PE is still relatively new; however, raising awareness in this field enhances the efficiency of researchers, businesses, students, and society as a whole in benefiting from AI. These results are supported by studies conducted by Korzynski et al. (2023), Walter (2024), and Giray (2023).

One possible reason for the low awareness of the PE discipline in T4 countries may be the lack of informative content regarding PE. To provide insight into the reasons behind the low awareness levels in T4 countries, Table 11 was compiled based on Google search results concerning the concept of PE on the websites of public institutions in T5 countries. Table 11 shows that PE awareness is nearly absent in public institutions, except in Türkiye.

Table 11: Google search engine results for T5 countries.

	AZ	KZ	KG	UZ	TR
.edu.	**1**	**3**	**1**	**0**	**43**
.gov.	**3**	**1**	**1**	**0**	**2**
	Search Criteria: site: edu.(**country extension**) “prompt engineering” Date Range: 01.01.2023 – 07.31.2024				

Based on these results, 45 PE-related search results were found on websites with "edu.tr" and "gov.tr" domain addresses in Türkiye within the specified date range. In contrast, almost no relevant results were found in other T5 countries. Data from the Google search engine further supports the low awareness the Google Trends database indicates for T4 countries.

This study examines the awareness of the PE discipline in T5 and G7 countries, comparing the levels of awareness between these two countries group. The findings indicate that AI awareness is similarly high among both T5 and G7 countries, as supported by hypothesis $H1_a$, PE discipline awareness shows significant variation, with G7 countries demonstrating notably higher awareness than T5 countries, except for Türkiye. Additionally, the relationship between AI and PE awareness is more positive in G7 countries, consistent with the graph in Figure 14. The relatively low awareness of PE in T5 countries, excluding Türkiye, can be linked to the limited focus on PE in universities and public institutions, as highlighted in Table 11. Although, the heightened awareness in Türkiye can be associated with significant interest from the private sector. For AI technologies to be utilized more effectively, it is essential to promote the concept of PE more broadly (Walter, 2023). Fostering greater emphasis on PE can facilitate more effective use of AI, enhance collaboration between humans and artificial intelligence (Zhang et al., 2023), and improve AI-related technological outcomes. The discipline of PE is important for achieving the most accurate results from AI applications. Due to the significance of this discipline, efforts should be made to increase PE awareness, especially among university students. Artificial intelligence and human intelligence (HyI) collaboration will likely be crucial in future professions. HyI, which emerges when the agility of artificial intelligence is combined with the emotionality (Yeke, 2023) and experience of human intelligence (Dai et al., 2023), can be a focal point for enhancing process efficiency in the business world. In this context, several measures can be taken to raise awareness of the PE concept:

a. Courses on PE could be offered in educational institutions to help students become more aware of the use of AI in their field.

b. Encouraging the publication of explanatory documents, articles, and books on the PE discipline.

c. Developing national AI infrastructures and offering a PE discipline appropriate to these infrastructures to raise awareness is essential. The Main-GPT (Havelsan) generative AI application developed by Türkiye could be a starting point for T5 countries.

Future research could focus on the focal points of the PE discipline and its contribution to professional life. Particularly in academia, the PE discipline should be considered a core subject to increase university students' interest in the PE discipline.

Due to time and labour constraints, this awareness study was conducted using Google Trends data. Larger-scale research on countries, societies, and businesses may yield more fruitful results. This study should be seen as a starting point. Additionally, studies that examine the scope of the PE discipline, its sectoral effects, and its impact on educational institutions can significantly contribute to the development of the field.

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