

PUBLIC ANXIETY VISIBILITY AS AN ETHICAL ISSUE IN THE ERA OF TECHNOLOGICAL DISRUPTION: A CSQCA STUDY BASED ON BAIDU INFORMATION INDEX

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Abstract: *In the era of technological disruption, digital platforms increasingly shape how public concerns are made visible, circulated, and commercialized. This study examines public anxiety visibility as an ethical issue in human-centered technological innovation. Using Baidu Information Index data from 2021 to 2025, it constructs 30 topic-year cases from six anxiety-related categories in China and applies within-category normalization and exploratory csQCA. The analysis examines how technological disruption, structural social pressure, commercial relevance, event trigger, and personal consequence combine to produce Relative High Anxiety Visibility. The findings show that technological disruption acts as a foundational digital context, while high visibility emerges through configurations involving commercial relevance, personal consequence, and event-based amplification. Two patterns are identified: sustained commercialization in appearance-related anxiety from 2023 to 2025 and event-triggered amplification across multiple categories in 2023. The study suggests that digital systems do not merely record public concerns, but may also make anxiety-related issues more visible, comparable, and commercially actionable. It contributes to human-centered digital governance by emphasizing information transparency, proportionate presentation, and safeguards against the commercialization of emotional vulnerability.*

Keywords: *public anxiety visibility; technological disruption; Baidu Index; crisp-set QCA; digital trace data; human-centered governance*

Introduction

Digital technologies have become central to the organization of information, education, communication, and everyday decision-making. In the era of technological disruption, search engines, social media platforms, online news systems, algorithmic recommendation tools, and data-driven infrastructures increasingly shape how individuals access knowledge and respond to social uncertainty. These developments have created new opportunities for educational and technological innovation, but they have also raised important ethical questions (Aragani et al., 2025; Bilal, 2025). A human-centered approach to technology requires more than efficiency, connectivity, and innovation. It also requires attention to how digital systems affect human vulnerability, public well-being, and the integrity of information environments.

One increasingly visible issue is the digital circulation of anxiety-related public concerns. In contemporary society, anxieties about employment, education, health, appearance, housing, and digital technology are not only experienced privately. They are also expressed through online searches, information flows, keyword trends, and platform-mediated public visibility (Gruszka & Böhm, 2022). These forms of digital visibility matter because they can influence how people perceive risk, make decisions, and understand their future opportunities. For example, education-related anxiety may be connected to examination pressure and family expectations, while employment-related anxiety may reflect labour market uncertainty and career competition (Yang et al., 2026). Appearance-related anxiety may be linked to body image and commercial beauty services, while technology-related anxiety may involve concerns about algorithms, big data, and privacy. These issues show that anxiety visibility is closely related to both social pressure and technological mediation.

Although previous research has examined digital anxiety, social media use, platform engagement, and online well-being, less attention has been paid to anxiety-related visibility as an ethical issue in technology-mediated environments (Fehintola & Ogunniyi, 2025). Existing studies often treat anxiety as an individual psychological outcome or as a consequence of digital media exposure (An et al., 2023). This perspective is useful, but it does not fully explain why certain anxiety-related issues become more visible at particular moments, or how technological, social, commercial, and event-based conditions jointly shape such visibility. From a human-centered perspective, this gap is important because digital systems do not simply reflect public concerns; they may also organize, amplify, and commercialize them.

This study addresses this gap by examining the configurational pathways associated with relative high anxiety visibility in China. Using Baidu Information Index data from 2021 to 2025, the study constructs topic-year cases across six anxiety-related categories: employment-related anxiety, education-related anxiety, health-related anxiety, appearance-related anxiety, housing-related anxiety, and technology-related anxiety. Methodologically, this study uses macro-level digital trace data rather than survey-based psychological measurement. Baidu Information Index is used to capture issue visibility, while exploratory crisp-set Qualitative Comparative Analysis is used to examine how multiple conditions jointly relate to Relative High Anxiety Visibility. The study applies exploratory crisp-set Qualitative Comparative Analysis to identify which combinations of conditions are associated with relatively high visibility of anxiety-related issues. Rather than asking whether a single factor causes anxiety visibility, this study examines how technological disruption, structural social pressure, commercial relevance, event trigger, and personal consequence combine to produce different visibility patterns.

Although six anxiety-related categories are included, this study does not aim to provide an exhaustive account of each domain. Instead, these categories are used as comparative topic-year cases to identify broader configurational patterns of anxiety visibility. The analytical focus is therefore not on describing each anxiety domain in isolation, but on explaining how different domains reveal two wider visibility mechanisms: sustained commercialization and event-triggered amplification.

The study is guided by the following research question: What configurations of technological, social, commercial, event-based, and personal conditions are associated with relative high anxiety visibility in the era of technological disruption? This question is closely aligned with ethical and integrity-driven research because it focuses on how digital infrastructures make human concerns visible, measurable, and potentially exploitable. It also responds to the need for human-centered approaches to educational and technological innovation by considering how technology interacts with emotional vulnerability and public well-being.

Literature Review

Public Anxiety Visibility in Digital Environments

Public anxiety has commonly been studied as an individual psychological response to uncertainty, perceived risk, and social pressure. In digital media research, anxiety is often linked to social media use, online comparison, fear of missing out, information overload, and problematic digital engagement (Bui et al., 2022). Studies on social media and mental health suggest that digital media may be associated with anxiety and reduced well-being, although such relationships are shaped by usage patterns, social context, and individual vulnerability (Orben et al., 2024). This stream of research is valuable because it shows that anxiety is increasingly embedded in digital environments. However, it mainly treats anxiety as a psychological outcome experienced by individuals rather than as a public issue that becomes visible through digital information systems.

A related body of literature shifts attention from individual emotion to public visibility. Research on digital traces argues that online searches, clicks, keyword trends, and information flows can provide observable indicators of public attention and social concern (Ohme et al., 2024). From this perspective, digital platforms do not simply transmit information. They also make certain issues searchable, measurable, comparable, and publicly observable (Hirvonen, 2022; Leerssen, 2024). Search-based data, including Baidu Index, have therefore been used to examine public attention toward health risks, environmental issues, consumer concerns, and social events in China (Li & Zhang, 2026). Such data cannot directly measure people's internal emotional states, but they can reveal how particular issues become more salient within online information environments.

This distinction is important for understanding public anxiety visibility. A high level of visibility for anxiety-related keywords does not necessarily mean that individuals are clinically anxious (Senaratne et al., 2022). Rather, it indicates that anxiety-related concerns have become prominent in digital circulation. Employment, education, health, appearance, housing, and technology-related concerns may all appear as public issues when they are repeatedly searched, reported, discussed, and circulated online (Mitra et al., 2022). In this sense, public anxiety visibility refers to the observable salience of anxiety-related concerns in digital information environments, rather than the psychological condition of individual users. This conceptual distinction is necessary because the present study does not attempt to diagnose anxiety or

measure individual mental health. Instead, it examines how anxiety-related issues become publicly visible through digital traces.

Existing studies have not fully connected these two research streams. Studies on digital anxiety tend to emphasize mental health and individual experience, while studies using digital trace data tend to focus on public attention without sufficiently considering emotional vulnerability and ethical implications. This leaves an important gap. We still know relatively little about why certain anxiety-related issues become more visible at particular moments and how such visibility is shaped by digital infrastructures, social pressures, commercial mechanisms, and public events. Addressing this gap is important for human-centered technological innovation because digital systems may not only reflect public concerns, but also organize, amplify, and commercialize them. Therefore, this study examines public anxiety visibility as both a digital phenomenon and an ethical issue in the era of technological disruption.

More specifically, this study treats public anxiety visibility as a meso-level phenomenon located between individual emotion and platform-level information circulation. It is not equivalent to clinical anxiety, but it is also not merely neutral public attention. It represents the way anxiety-related concerns become digitally observable, socially meaningful, and potentially actionable within platform-mediated environments. This perspective provides the conceptual basis for examining Relative High Anxiety Visibility through Baidu Information Index data and csQCA.

Conceptualizing Anxiety Visibility and Its Conditions

The outcome of this study is Relative High Anxiety Visibility, which refers to whether an anxiety-related issue reaches a relatively high level of visibility within its own yearly trajectory. This concept does not assume that online visibility is equivalent to actual psychological anxiety. Rather, it treats visibility as a public and digital signal through which anxiety-related concerns become observable in online information environments (Senaratne et al., 2022). In this sense, Relative High Anxiety Visibility captures the prominence of an issue in digital circulation, not the mental condition of individual users. This distinction is important because the study focuses on issue visibility rather than individual-level anxiety symptoms.

Understanding this outcome requires attention to the conditions under which anxiety-related issues become visible. Anxiety visibility is unlikely to emerge from emotional concern alone. In technology-mediated environments, public concerns become visible when they are searchable, circulated, linked to social pressures, connected to market responses, activated by events, and personally meaningful to individuals (Coombes et al., 2022; Lampinen et al., 2022). Therefore, this study conceptualizes anxiety visibility as a configurational phenomenon shaped by digital, social, commercial, event-based, and personal conditions. These conditions are not treated as isolated linear predictors. Instead, they are understood as visibility conditions that may combine in different ways to produce high public anxiety visibility.

Technological Disruption provides the broader environment in which anxiety-related issues become digitally traceable and publicly observable. Search engines, online platforms, algorithmic curation, and data-driven infrastructures allow public concerns to be recorded, ranked, circulated, and compared (Lazer et al., 2024). Without such a digital environment, anxiety-related concerns may still exist, but they are less likely to appear as measurable forms of public visibility (Dewitz, 2025). For this reason, technological disruption is treated as a foundational enabling environment in the analysis, rather than as a direct or independent cause of anxiety visibility.

However, digital visibility is not generated by technology alone. Anxiety-related issues are more likely to attract public attention when they are connected to structural social pressure (Zhu et al., 2023). Employment competition, educational pressure, health insecurity, and housing burden are not merely individual concerns; they are linked to institutional arrangements and life opportunities (Frank et al., 2023). These pressures give anxiety-related issues wider social relevance and make them more likely to be shared as public concerns. Structural social pressure therefore explains why some anxiety-related issues acquire broader public significance beyond individual experience.

At the same time, public concern becomes more persistent when it is connected to commercial relevance. Digital platforms often link anxiety-related issues to products, services, training, consultation, medical treatment, beauty consumption, housing services, or digital security solutions (Herrick et al., 2024). This commercial connection may not create anxiety directly, but it can make anxiety-related concerns more visible, repetitive, and actionable within platform environments (Balaskas et al., 2022). Commercial relevance therefore explains how anxiety visibility can be sustained and monetized. It also shows why public anxiety visibility is not only an information phenomenon, but also a platform-mediated commercial phenomenon.

Visibility also varies across time. Some anxiety-related issues become especially prominent when public events, annual peaks, policy changes, media attention, or social uncertainties activate public discussion (Rimé, 2026). Event Trigger captures this temporal dimension. It helps explain why the same issue may remain relatively low in one year but become highly visible in another (Lawrence et al., 2024). This condition is especially important for a topic-year case design because the unit of analysis is not only the issue category, but also the specific year in which the issue appears. Event Trigger therefore captures the time-sensitive character of anxiety visibility.

Finally, anxiety-related visibility is more likely to intensify when the issue carries direct personal consequences (Roldán Merino et al., 2025). Concerns that affect education, employment, health, finance, body image, privacy, identity, or future planning are more likely to be perceived as urgent because they are closely tied to individual life chances and everyday decision-making (Khogali & Mekid, 2023). Personal consequence therefore connects public anxiety visibility to human vulnerability and well-being, which is central to the ethical focus of this study. When an issue is personally consequential, public visibility is more likely to become emotionally salient and behaviourally relevant.

In this sense, Relative High Anxiety Visibility should be understood not as a direct consequence of any single condition, but as the result of conditions that become meaningful only when they appear together. This configurational understanding provides the conceptual basis for examining how different topic-year cases may reach similar visibility outcomes through different combinations of conditions. It also justifies the use of csQCA, because the study is concerned with how multiple visibility conditions jointly form sufficient pathways toward RHAV rather than with estimating the isolated effect of each condition.

Research Framework

Public anxiety visibility is unlikely to be explained by a single linear factor. As discussed above, anxiety-related concerns become visible when digital infrastructures, social pressures, commercial mechanisms, public events, and personal consequences interact. This makes a configurational perspective appropriate for the present study. Crisp-set Qualitative

Comparative Analysis is suitable because it focuses on how the presence or absence of multiple conditions jointly relates to an outcome, rather than estimating the isolated effect of each variable. It also allows for causal complexity, meaning that different combinations of conditions may lead to the same outcome. In this study, the outcome is Relative High Anxiety Visibility, while the five conditions are Technological Disruption, Structural Social Pressure, Commercial Relevance, Event Trigger, and Personal Consequence. These conditions capture the digital, social, commercial, temporal, and personal dimensions through which anxiety-related issues may become publicly visible. They are treated as configurational visibility conditions rather than as independent linear predictors. In particular, Technological Disruption is understood as a foundational digital environment that enables anxiety-related concerns to become searchable, measurable, and circulatable, rather than as a direct cause of anxiety visibility.

Based on this logic, the study develops a configurational research framework in which the five conditions combine to produce Relative High Anxiety Visibility. The six anxiety-related issue categories, including employment, education, health, appearance, housing, and technology-related anxiety, are used to construct topic-year cases rather than serving as explanatory variables. This means that the study does not compare these categories as causal factors. Instead, each category-year observation is treated as a case through which different combinations of visibility conditions can be examined. Each case is assessed according to the five calibrated conditions, and the analysis examines which combinations are associated with the outcome.

The framework therefore shifts attention from whether one factor directly causes anxiety visibility to how multiple conditions jointly form visibility pathways in the era of technological disruption. This logic is consistent with the exploratory purpose of the study, which is to identify configurational patterns such as sustained commercialization and event-triggered amplification rather than to test a single-variable causal model. Figure 1 presents the research framework of this study.

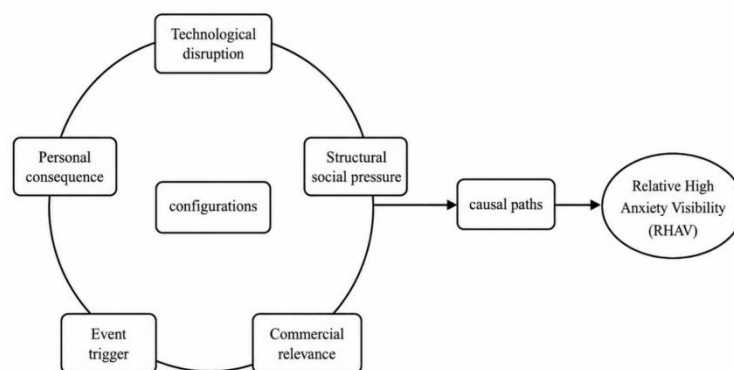


Figure 1: Configurational Research Framework

Methodology

Data Source and Case Construction

This study uses the Baidu Information Index to examine the digital visibility of anxiety-related issues in China from 2021 to 2025. The index reflects the extent to which selected keywords appear in the online information environment, making it suitable for analysing issue visibility rather than individual psychological anxiety.

Six anxiety-related categories were included in the analysis: employment-related anxiety, education-related anxiety, health-related anxiety, appearance-related anxiety, housing-related anxiety, and technology-related anxiety. For each category, three proxy keywords were selected to represent commonly discussed public concerns. The unit of analysis is the category-year observation. Therefore, the dataset contains 30 cases, derived from six anxiety categories across five years.

Table 1: Anxiety Categories and Proxy Keywords

Anxiety category	Proxy keywords
Employment-related anxiety	job seeking, civil service examination, unemployment
Education-related anxiety	postgraduate entrance examination, college entrance examination, tutoring
Health-related anxiety	insomnia, anxiety, depression
Appearance-related anxiety	hair loss, weight loss, medical aesthetics
Housing-related anxiety	mortgage, home purchase, housing price
Technology-related anxiety	big data, algorithm, privacy

Outcome Calibration

The outcome variable is Relative High Anxiety Visibility (RHAV), which indicates whether an anxiety-related issue reaches a relatively high level of visibility within its own yearly trajectory. Since the raw Baidu Information Index varies greatly across categories, within-category min-max normalization was applied before calibration. This procedure ensured that each category-year case was evaluated relative to its own category-specific visibility range rather than against categories with naturally higher information volumes.

The normalized index was calculated as follows:

$$\text{Normalized Index} = \frac{X - X_{\min}}{X_{\max} - X_{\min}}$$

Where X refers to the Baidu Information Index value of a specific anxiety category in a given year, $X_{\min}$ refers to the minimum value of that anxiety category during 2021–2025, and $X_{\max}$ refers to the maximum value of that anxiety category during 2021–2025.

After normalization, cases with a normalized index of 0.60 or above were coded as 1, indicating the presence of RHAV. Cases below 0.60 were coded as 0, indicating its absence. The 0.60 threshold was selected as the baseline calibration point because it identifies cases that are clearly above the midpoint of their own category-specific visibility trajectory, while avoiding an overly restrictive definition that would only capture the single peak year. In other words, this threshold captures relatively high visibility rather than only maximum visibility.

Since crisp-set calibration may be sensitive to the selected cut-off point, additional sensitivity checks were conducted using alternative thresholds of 0.55 and 0.65. These checks were used to examine whether the main visibility patterns remained stable under moderately lower and higher calibration rules.

Table 2: Outcome Calibration

Variable	Full name	Calibration rule
RHAV	Relative High Anxiety Visibility	1 = normalized index ≥ 0.60 ; 0 = normalized index < 0.60

Condition Calibration

Five conditions were calibrated for the csQCA analysis: Technological Disruption (TD), Structural Social Pressure (SP), Commercial Relevance (CR), Event Trigger (ET), and Personal Consequence (PC). Each condition was coded as a crisp set, where 1 indicates the presence of the condition and 0 indicates its absence.

Table 3: Condition Calibration

Condition	Full name	Calibration rule
TD	Technological Disruption	1 = the case is directly related to digital technology or located in the post-2023 technology-disrupted context; 0 = otherwise
SP	Structural Social Pressure	1 = the issue reflects structural pressure related to employment, education, health, or housing; 0 = otherwise
CR	Commercial Relevance	1 = the issue is linked to marketable products, services, or platform-based solutions; 0 = otherwise
ET	Event Trigger	1 = the case shows a visible increase from the previous year or a clear event-related peak; 0 = otherwise
PC	Personal Consequence	1 = the issue directly affects individual life chances, health, finance, identity, or future planning; 0 = otherwise

This calibration allows the study to examine whether relative high anxiety visibility emerges from single conditions or from specific combinations of technological, social, commercial, event-based, and personal factors.

Analytical Strategy

This study applies exploratory crisp-set Qualitative Comparative Analysis (csQCA) to identify configurations associated with Relative High Anxiety Visibility. The analysis was conducted in three steps. First, a necessary condition analysis was performed to examine whether any single condition was consistently present when RHAV occurred. Second, a truth table was constructed based on the five calibrated conditions: TD, SP, CR, ET, and PC. Third, sufficient configurations were identified through Boolean minimization.

Given the exploratory nature of the study and the medium-sized dataset of 30 cases, the frequency threshold was set at 1, and the consistency threshold was set at 0.80. The analysis focuses on identifying configurational patterns rather than estimating the independent effect of each condition. Therefore, the results are interpreted as set-theoretic associations between condition combinations and relative high anxiety visibility.

In addition to the baseline csQCA analysis, sensitivity checks were performed by recalibrating RHAV with alternative thresholds of 0.55 and 0.65. These checks were not intended to replace the baseline model, but to assess whether the main configurational interpretation remained stable under moderate changes in the outcome calibration threshold.

Results

Descriptive Results

Before presenting the csQCA results, this section first reports the descriptive patterns of anxiety-related visibility across categories and years. This step is important because the Baidu Information Index shows not only the absolute visibility level of each anxiety-related category, but also the temporal changes that justify the later calibration of Relative High Anxiety Visibility. Table 4 presents the yearly average Baidu Information Index for the six anxiety-related categories from 2021 to 2025. The results show clear differences in both visibility levels and temporal patterns across different anxiety-related issues. Education-related anxiety and appearance-related anxiety recorded the highest overall visibility, while employment-related anxiety and technology-related anxiety remained relatively lower in absolute index values.

Table 4: Yearly Average Baidu Information Index by Anxiety Category

Anxiety category	2021	2022	2023	2024	2025
Employment-related anxiety	81,994	259,234	497,869	371,862	267,747
Education-related anxiety	3,713,372	2,608,973	5,205,821	4,091,848	3,296,439
Health-related anxiety	58,329	353,433	1,653,893	1,303,796	1,146,481
Appearance-related anxiety	1,293,456	2,236,574	7,085,817	6,738,168	5,032,928
Housing-related anxiety	1,704,856	1,762,529	3,089,306	1,959,870	1,486,760
Technology-related anxiety	80,197	182,888	278,322	162,674	190,747

Across the six categories, 2023 appears as a common peak year for most anxiety-related issues. Employment-related, education-related, health-related, appearance-related, housing-related, and technology-related anxiety all reached their highest yearly average index in 2023. This suggests that 2023 was a period of intensified digital visibility for anxiety-related concerns across multiple domains.

The descriptive results also show that different categories have very different baseline levels. Education-related anxiety remained consistently high, largely due to the strong public visibility of examination-related issues. Appearance-related anxiety also showed a sharp rise after 2022, reflecting the growing visibility of body image, beauty consumption, and medical aesthetics. In contrast, employment-related and technology-related anxiety showed lower absolute values, but they still displayed clear increases within their own trajectories. This difference confirms the need for within-category normalization before csQCA, because raw index values alone may overrepresent categories with naturally higher information volume.

Calibration Results

Given the large differences in the absolute Baidu Information Index values across anxiety categories, the next step was to transform the raw index values into comparable set-membership scores. Within-category normalization was applied to ensure that each case was evaluated relative to its own category trajectory rather than against categories with naturally higher information volume. Table 5 presents the normalized index and outcome calibration results. After normalization, cases with a normalized value of 0.60 or above were coded as 1, indicating the presence of Relative High Anxiety Visibility (RHAV), while cases below 0.60 were coded as 0. This baseline threshold was used for the main csQCA analysis.

Table 5: Normalized Index and RHAV Calibration

Case	Category	Normalized index	RHAV
EMP2021	Employment-related anxiety	0.000	0
EMP2022		0.426	0
EMP2023		1.000	1
EMP2024		0.697	1
EMP2025		0.447	0
EDU2021	Education-related anxiety	0.425	0
EDU2022		0.000	0
EDU2023		1.000	1
EDU2024		0.571	0
EDU2025		0.265	0
HEA2021	Health-related anxiety	0.000	0
HEA2022		0.185	0
HEA2023		1.000	1
HEA2024		0.781	1
HEA2025		0.682	1
APP2021	Appearance-related anxiety	0.000	0
APP2022		0.163	0
APP2023		1.000	1
APP2024		0.940	1
APP2025		0.646	1
HOU2021	Housing-related anxiety	0.136	0
HOU2022		0.172	0
HOU2023		1.000	1
HOU2024		0.295	0
HOU2025		0.000	0
TEC2021	Technology-related anxiety	0.000	0
TEC2022		0.518	0
TEC2023		1.000	1
TEC2024		0.416	0
TEC2025		0.558	0

The calibration results show that 2023 was the most common year of relative high anxiety visibility. All six anxiety categories reached their highest normalized value in 2023. In addition, appearance-related anxiety and health-related anxiety remained highly visible after 2023, indicating that these two categories showed more sustained visibility compared with employment-, education-, housing-, and technology-related anxiety. This result supports the use of csQCA to further examine which combinations of conditions are associated with RHAV.

To examine whether the baseline calibration was sensitive to the selected cut-off point, additional threshold checks were conducted using 0.55, 0.60, and 0.65. Table 6 presents the sensitivity check results.

Table 6: Sensitivity Checks for RHAV Calibration Thresholds

Threshold	RHAV cases	Interpretation
0.55	EMP2023, EMP2024, EDU2023, EDU2024, HEA2023, HEA2024, HEA2025, APP2023, APP2024, APP2025, HOU2023, TEC2023, TEC2025	Broader classification; adds marginal cases close to the baseline threshold
0.6	EMP2023, EMP2024, EDU2023, HEA2023, HEA2024, HEA2025, APP2023, APP2024, APP2025, HOU2023, TEC2023	Baseline classification
0.65	EMP2023, EMP2024, EDU2023, HEA2023, HEA2024, HEA2025, APP2023, APP2024, HOU2023, TEC2023	Stricter classification; excludes marginal cases near the threshold

The sensitivity checks show that the central substantive pattern remains stable. Under all three thresholds, 2023 remains the common peak year across the six anxiety-related categories. Appearance-related anxiety and health-related anxiety also continue to show relatively sustained post-2023 visibility. The changes mainly concern marginal cases located near the threshold, such as EDU2024, TEC2025, and APP2025. Therefore, the baseline findings are not driven solely by the 0.60 cut-off point.

Necessary Condition Analysis

After calibrating the outcome variable and conditions, the analysis first examined whether any single condition could be regarded as necessary for Relative High Anxiety Visibility. In QCA, a necessary condition is one that must be present whenever the outcome occurs, although it may not be sufficient to produce the outcome by itself. Following the conventional threshold, a condition is considered necessary when its consistency reaches or exceeds 0.90. Table 7 presents the results of the necessary condition analysis.

Table 7: Necessary Condition Analysis for RHAV

Condition	Consistency	Coverage	Interpretation
TD	1.000	0.55	Necessary condition
SP	0.636	0.35	Not necessary
CR	0.909	0.40	Nearly necessary
ET	0.545	0.50	Not necessary
PC	0.909	0.40	Nearly necessary

The results show that Technological Disruption (TD) is a necessary condition for RHAV, with a consistency score of 1.000. This result should be interpreted carefully. TD does not mean that technology independently causes public anxiety visibility. Rather, it indicates that RHAV occurs within a technologically mediated environment where anxiety-related concerns can become searchable, measurable, comparable, and circulatable. However, The coverage score of TD is 0.550, suggesting that technological disruption alone is not sufficient to produce RHAV. In this sense, TD should be understood as a foundational enabling environment rather than as a sufficient driver of high anxiety visibility.

Commercial Relevance (CR) and Personal Consequence (PC) also show high consistency scores of 0.909, approaching the conventional necessity threshold. This suggests that anxiety-related issues are more likely to become highly visible when they are connected to marketable

products, services, or solutions, and when they have direct implications for individuals' life chances, health, finance, identity, or future planning.

Overall, the necessity analysis indicates that technological disruption is an important enabling context for RHAV, while commercial relevance and personal consequence also play strong supporting roles. However, since none of these conditions alone can fully explain the outcome, it is necessary to further examine the sufficient configurations through truth table analysis.

Sufficient Configurations

Since no single condition fully explains Relative High Anxiety Visibility, the analysis further examined whether specific combinations of conditions were sufficient for the outcome. The truth table was constructed using the five calibrated conditions, namely TD, SP, CR, ET, and PC. Based on Boolean minimization, two sufficient configurations were identified, as shown in Table 8.

The typical cases in Table 8 should be understood substantively rather than only as case codes. APP2023, APP2024, and APP2025 refer to sustained visibility around appearance-related concerns, including hair loss, weight loss, and medical aesthetics. These concerns are personally consequential because they are related to body image, self-presentation, identity, and everyday consumption decisions. They are also commercially relevant because they are directly connected to beauty products, medical-aesthetic services, treatment services, and lifestyle consumption.

Table 8: Sufficient Configurations for RHAV

Path	Configuration	Consistency	Raw coverage	Typical cases
P1	TD * CR * PC * ~SP	1.000	0.273	APP2023, APP2024, APP2025
P2	TD * CR * ET * PC	1.000	0.455	APP2023, EDU2023, EMP2023, HEA2023, HOU2023
Overall solution		1.000	0.636	—

By contrast, EMP2023, EDU2023, HEA2023, and HOU2023 represent event-amplified visibility peaks in domains related to employment competition, examination pressure, health insecurity, and housing burden. Their visibility is not only related to structural pressure, but also to the event-based intensification of public attention in 2023.

The configuration TD * CR * PC * ~SP shows that RHAV can occur when technological disruption, commercial relevance, and personal consequence are present, even without structural social pressure. This pathway can be interpreted as a sustained commercialization pattern. This pathway mainly explains appearance-related anxiety from 2023 to 2025, suggesting that appearance-related concerns become highly visible when they are commercially connected and personally consequential.

The configuration TD * CR * ET * PC shows that RHAV can also occur when technological disruption, commercial relevance, event trigger, and personal consequence are jointly present. This pathway mainly explains the 2023 visibility peak across multiple anxiety categories, including appearance, education, employment, health, and housing-related anxiety.

Overall, the sufficiency analysis confirms that RHAV is a configurational outcome. Rather than being produced by a single condition, it emerges through combinations involving a technologically mediated visibility environment, commercial relevance, personal consequence, and event-based amplification.

Discussion

Configurational Discussion

The csQCA results suggest that Relative High Anxiety Visibility is not a simple outcome of technological disruption, social pressure, or public events alone. Instead, it emerges when anxiety-related concerns are positioned at the intersection of digital visibility, commercial relevance, and personal vulnerability. This finding is important because it challenges a common assumption that public anxiety visibility is mainly driven by the severity of social problems. The results show that issue severity alone is insufficient. Anxiety-related issues become highly visible when they are digitally traceable, connected to marketable responses, and closely related to people's everyday life decisions.

The necessity analysis shows that Technological Disruption reaches the necessity threshold for RHAV. This does not mean that technology directly causes public anxiety visibility. Rather, it suggests that technological disruption provides a foundational enabling environment in which anxiety-related concerns become searchable, measurable, comparable, and circulatable. Search engines, information platforms, algorithmic recommendation systems, and data-driven communication environments create the conditions under which public concerns can be transformed into visible digital signals. However, the relatively limited coverage of TD indicates that technological disruption is not a sufficient driver by itself. It becomes meaningful only when combined with other conditions, especially commercial relevance, personal consequence, and event-based amplification.

The role of Commercial Relevance and Personal Consequence is particularly significant. Both conditions appear in the two sufficient configurations, showing that anxiety-related issues become more visible when they are connected to available products, services, or solutions and when they directly affect individual life chances, health, identity, finance, or future planning. This explains why public anxiety visibility should not be understood only as emotional expression. It is also shaped by the practical and marketable character of the issue. When a concern can be translated into a service, consultation, course, treatment, or consumption decision, it becomes more likely to circulate repeatedly in digital environments.

The configuration $TD * CR * PC * \sim SP$ reveals a sustained commercialization pattern. This pathway mainly explains the high visibility of appearance-related anxiety from 2023 to 2025. The absence of Structural Social Pressure in this pathway is meaningful. It shows that an issue does not need to be rooted in traditional structural pressure, such as employment competition, educational pressure, or housing burden, to become highly visible. Appearance-related anxiety is strongly tied to body image, self-presentation, identity, and consumer services such as weight loss, hair-loss treatment, beauty products, and medical aesthetics. Its visibility is sustained because digital platforms provide channels for comparison and display, while commercial markets provide continuous solutions. In this pathway, anxiety visibility is maintained less by institutional pressure and more by the interaction between personal insecurity and commercial circulation. This pattern suggests that anxiety visibility may persist when personal insecurity is continuously attached to market-based solutions.

The configuration TD * CR * ET * PC reveals an event-triggered amplification pattern. This pathway explains the visibility peak in 2023 across several anxiety categories, including employment, education, health, appearance, and housing-related anxiety. The presence of Event Trigger indicates that anxiety visibility can rise sharply when public events, annual peaks, media attention, or issue-specific shocks activate public concern. However, the pathway also shows that event triggers alone are not enough. They become more influential when the issue is commercially relevant and personally consequential. This explains why different anxiety-related issues may peak in the same year even though they belong to different domains. What they share is not the same content, but a similar configurational structure. In this pattern, events operate as visibility accelerators rather than isolated causes.

The comparison between the two pathways further shows that anxiety visibility has both persistent and episodic forms. Appearance-related anxiety represents a more persistent form because it remains visible through continuous commercial connection and personal identity concerns. Employment-, education-, health-, and housing-related anxiety show a more episodic pattern because their visibility is more strongly activated by temporal triggers. This distinction is useful because it shows that public anxiety visibility is both category-specific and time-sensitive. Some anxieties are sustained by ongoing market mechanisms, while others are amplified by events or visibility shocks.

Overall, the configurational results show that public anxiety visibility is not merely a reflection of what people worry about. It is shaped by the conditions under which worries become digitally visible, commercially actionable, and personally urgent. This supports the central argument of the study: anxiety visibility in the era of technological disruption should be understood as a configurational phenomenon. The key issue is not whether one factor independently causes anxiety visibility, but how digital infrastructures, commercial mechanisms, event-based triggers, and personal consequences combine to make certain concerns more visible than others. Therefore, RHAV should be interpreted as a product of configurational visibility conditions rather than as the direct result of any single technological, social, commercial, or event-based factor.

Ethical and Human-Centered Implications

The configurational findings raise an important ethical issue: digital systems do not merely reflect public concerns; they also help make these concerns visible, measurable, comparable, and potentially commercializable. In the context of technological disruption, anxiety-related issues are increasingly captured through keywords, platform content, search trends, and information flows. This process can improve public awareness and provide useful signals for social research. However, it may also transform human vulnerability into a form of digital visibility that can be ranked, circulated, and connected to commercial solutions.

This issue is closely related to the idea of human-centered technological innovation. A human-centered approach should not evaluate digital innovation only by its efficiency, reach, or technical capacity. It should also consider whether digital systems protect human well-being, reduce emotional harm, and support responsible information environments. The findings of this study show that relative high anxiety visibility is strongly associated with technological disruption, commercial relevance, and personal consequence. This means that anxiety-related issues become particularly visible when they are both personally sensitive and commercially actionable. Such a pattern requires ethical attention, because public concern may be repeatedly

amplified not only to inform users, but also to attract attention, sustain engagement, or promote market-based solutions.

The ethical concern does not arise simply because anxiety-related issues receive public attention. Rather, it arises when emotionally sensitive concerns are repeatedly transformed into commercial opportunities. When users search for information during moments of uncertainty, insecurity, or perceived personal inadequacy, they may become more exposed to market-based solutions, persuasive content, and algorithmically repeated problem framing. In this sense, anxiety visibility becomes ethically problematic when digital systems convert vulnerability into engagement, comparison, and consumption.

The appearance-related anxiety pathway illustrates this problem clearly. Concerns about hair loss, weight loss, and medical aesthetics are closely tied to personal identity, body image, and self-presentation. When these concerns are circulated through digital infrastructures and connected to commercial services, they may become normalized as problems requiring continuous consumption-based solutions. This does not mean that all commercial services are harmful. However, it suggests that platforms, advertisers, and content producers should be cautious about communication practices that intensify insecurity or present anxiety as a market opportunity. From an ethical perspective, the key problem is not simply the existence of anxiety-related information, but how such information is framed, repeated, recommended, and monetized. Therefore, responsible platform governance should pay attention not only to harmful or false content, but also to repeated commercial framings that turn personal insecurity into a continuous consumption problem.

The event-triggered anxiety pathway also has implications for information integrity. When public events or visibility shocks occur, anxiety-related issues may rise rapidly across several domains. In such moments, users may become more vulnerable to incomplete information, sensational content, commercial persuasion, or emotionally charged narratives. A responsible digital environment should therefore support balanced public communication, especially when issues involve employment, education, health, housing, or other areas that directly affect life chances. Information integrity requires that anxiety-related content should be accurate, proportionate, and not intentionally exaggerated for engagement or commercial gain. This is especially important during visibility peaks, when public concern can be quickly transformed into traffic, advertising exposure, or commercial conversion.

These implications are particularly relevant to education and technology innovation. In educational contexts, digital platforms are increasingly used for learning, examination preparation, career planning, and information seeking. If education-related anxiety is amplified through platform content or commercial services, technological innovation may unintentionally intensify pressure rather than support learners. A human-centered educational technology environment should therefore prioritize learner well-being, transparent information, and responsible guidance. Similarly, in broader technological innovation, attention should be paid to how algorithmic curation, data visibility, and commercial incentives shape public emotion.

Based on these implications, human-centered digital governance should place greater emphasis on transparency, proportionality, and cross-sector responsibility. Platforms need to improve the transparency of recommendation and advertising systems, especially when anxiety-related keywords are linked to commercial services. Anxiety-related information should also be presented in a proportionate and balanced manner, rather than being exaggerated to stimulate

engagement. At the same time, public institutions, educators, and platform operators need to cooperate in monitoring domains where personal vulnerability is repeatedly converted into market demand. These measures can help ensure that technological innovation supports public well-being rather than intensifying emotional insecurity.

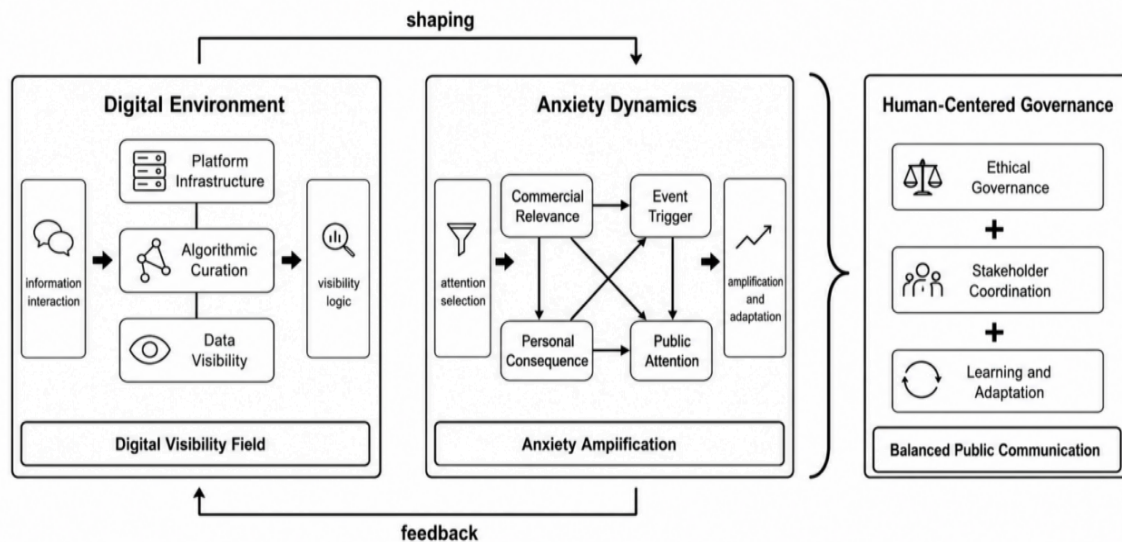


Figure 2: Digital Environment, Anxiety Dynamics, and Human-Centered Governance

Figure 2 summarizes the ethical logic suggested by this study. The digital environment creates a visibility field through platform infrastructure, algorithmic curation, and data visibility. Within this field, anxiety dynamics are shaped by commercial relevance, event triggers, personal consequences, and public attention. Human-centered governance should respond to this process by improving information transparency, reducing exaggerated commercial framing, protecting emotionally vulnerable users, and strengthening stakeholder coordination. In this way, the figure connects the empirical findings of the csQCA analysis with the broader ethical requirement for responsible technological innovation.

Overall, the ethical implication of this study is that technological innovation should not only ask how information can be efficiently distributed, but also how public vulnerability is made visible and acted upon. If anxiety-related visibility is shaped by digital infrastructures and commercial mechanisms, then human-centered governance must address the conditions under which public concern becomes amplified, monetized, or distorted. Ethical and integrity-driven research should therefore examine not only technological performance, but also the social and emotional consequences of digital visibility.

Conclusion

This study set out to understand why some anxiety-related public concerns become more visible than others in digital information environments. By using Baidu Information Index data from 2021 to 2025 and applying exploratory csQCA, the study examined how technological, social, commercial, event-based, and personal conditions combine to produce Relative High Anxiety Visibility.

The results show that anxiety visibility is not simply a reflection of public worry or the severity of a social issue. Instead, it emerges when public concerns become digitally traceable, commercially connected, personally consequential, and, in some cases, event-triggered.

Technological disruption provides a foundational digital context, but it does not work alone. High visibility is produced through configurations in which digital infrastructures interact with market mechanisms and human vulnerability. The sustained visibility of appearance-related anxiety and the shared visibility peak across multiple categories in 2023 illustrate these two patterns.

These findings suggest that public anxiety visibility should be understood as both a social signal and an ethical issue. Digital systems can help identify public concerns, but they may also make anxiety-related issues more comparable, repeatable, and commercially actionable. The ethical concern becomes especially important when anxiety-related visibility is linked to commercial mechanisms that transform emotional vulnerability into engagement, comparison, and consumption. For this reason, human-centered technological innovation should not focus only on efficiency, access, or data capacity. It should also consider how digital environments shape emotional vulnerability, information integrity, and public well-being.

This study remains exploratory. Baidu Information Index reflects issue visibility rather than actual psychological anxiety, and the selected keywords serve as proxy indicators. Therefore, the findings should not be interpreted as evidence of clinical anxiety or individual mental health outcomes. The topic-year case design is also limited to six anxiety-related categories in China, which may restrict the direct generalizability of the findings to other platform systems or national contexts. In addition, although csQCA is suitable for identifying configurational patterns, it does not estimate individual-level causal effects.

Future research may combine digital trace data with survey evidence, social media text analysis, or fuzzy-set calibration. More specifically, macro-level digital trace data can be used to identify when and where anxiety-related issues become publicly visible, while micro-level surveys or interviews can examine whether such visibility produces psychological pressure, platform stickiness, or consumption intention among users. Future studies could also compare different platforms, countries, or issue domains to examine whether the sustained commercialization pattern and event-triggered amplification pattern appear in other digital environments.

Nevertheless, the study highlights an important point for ethical and integrity-driven research: technological innovation should be evaluated not only by what it enables, but also by how it makes human concerns visible and actionable. By linking digital trace visibility, configurational causality, and human-centered ethics, this study contributes to a broader understanding of how technological disruption reshapes the public life of anxiety.

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