Research on the Innovation of Intelligent Investigative Thinking in the Age of Big Data

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Keywords: Big data era; investigative thinking; change; intelligent investigative thinking; innovation

Abstract: With the advent of the era of big data, our way of life and understanding of the world has gradually become more intelligent, and it has also brought a new path to criminal investigation. Intelligent investigation has become an important trend of development in criminal investigation. In the era of big data, new changes of investigative thinking have been promoted, which makes the investigative concept tend to be multidimensional innovation and the investigative thinking tend to be multidimensional integration. Based on this, the innovation of intelligent investigative thinking must be much accounted in the era of big data. And the realization of intelligent investigation could be promoted through establishing a data-based thinking, holistic thinking and relevance thinking.

1. Introduction

In the physical movement of the universe, as one of the basic forms, thinking plays an important role in people's perceptual understanding and practical activities. Investigative thinking is a kind of thinking reaction formed by investigators based on the relationship between inside nature and regularity in the object of investigation. The scientific nature of investigative thinking is closely related to the detection of cases for investigative activities[1]. The investigation thinking is not static, but will change with the development of the times. There are different requirements for investigative thinking in different technical conditions. In the current big data environment, investigative thinking also needs to make new changes. In addition to being a resource, big data is still a research method and model. Data-intensive science based on big data has been applied to various fields of society. In the era of big data, great changes have taken place in people's way of life, which has also brought about new changes in the social phenomenon of crime. From the perspective of current form of crimes, data is gradually becoming an important trend. This actuality also puts new demands on investigative thinking, requiring it to become intelligent. Intelligent investigative thinking refers to apply advanced technologies such as the Internet and intelligent sensing relying on the concept of big data and being supported by massive data. The elements related to the case can be intelligently linked in series and parallel Through the mining of various social data, so as to achieve precise retrospective and prediction on the information of illegal and criminal offence, and then promote the improvement of the quality of investigation[2]. The reform of intelligent investigation is not simply required to rely on big data, but is closely related to multiple aspects such as investigation concept and thinking. In particular, the innovation of investigative thinking has an important impact on intelligence investigation. Therefore, how to reform and innovate the investigative thinking is an urgent problem to be considered in the era of big data.

2. The Change of Investigative Thinking in the Era of Big Data

In the era of big data, intelligent investigation has become the inevitable development direction of criminal investigation. Big data only provides us with a model of intelligent investigation, and the investigative thinking of investigators is still irreplaceable. The development of intelligence investigation in the era of big data has also promoted the change of investigation thinking. In general, the changes in investigative thinking are mainly reflected in the following two aspects.

  DOI: 10.25236/iseah.2018.085

2.1. The concept of investigation tends to be of multidimensional innovation

In the process of investigative activities launched by investigators, the concept of investigation is an important guiding concept which needs to be penetrated throughout the whole process of investigation. And it shows prominent orientation and foresight in investigation. In the face of the current prominent data-oriented situation of crime, the concept of investigation has also begun to move towards multiple innovations and emphasize the use of big data concepts to provide guidance for investigation[3]. This multiple innovations concept is mainly reflected in three aspects. The first is the concept of "data investigation", which uses big data mining technology to retrospect the whole dimension and cut in with high precision, and then locks the suspects through orderly inquiry and investigation. Public security organizations are required to be good at using big data mining technology to establish a new type of investigation and evidence-taking thinking relying on data to make data to be evidence. This is also the soul of intelligent investigation in the new era. The second is the concept of "full-dimensional investigation". Due to the influence of technical means and investigation costs, the investigation of cases is mainly limited to local investigations in the traditional investigations, and the suspects are determined mainly by on-site investigations and visiting investigations. In the era of big data, through the relevance of big data, all kinds of information can be searched in an all-round way and the case can be analyzed from various angles. This kind of full-scale investigation concept can make the investigation realize the transformation from point to area. The third is the concept of "compatibility and openness". People, things, materials and other elements of information are integrated into the Internet in various forms of data in the era of big data, and the criminal elements tend to be virtualized and digitized. This requires that public security organizations must have the concept of "compatibility and openness". They should strengthen the collection and extraction of various data with this attitude to enrich the intelligent police cloud data center and to construct the virtual and real sharing bridge, thus providing guidance and service for the investigation[4].

2.2. Investigative thinking tends to be multidirectional integration

In traditional practice of investigation, investigators often use horizontal thinking, vertical thinking and reverse thinking to cut in the investigation after the incident. While in the era of big data, the investigation is increasingly diversified with the increasingly close relationship between data and investigation, and the investigation thinking tends to be multidirectional integration. Today, with the "Internet +" strategy deepening, the network tentacles can be said to be everywhere. The boundaries of various industries re becoming increasingly blurred. This kind of cross-border subversive change has pushed the public security policing model to also undergo transformation and upgrading. It is required to attach great importance to modern information technology such as cloud computing and big data. It should be integrated with the investigation to fully investigate the case with the help of "Internet +" thinking and build "intelligent investigation" based on the construction of "intelligent public security"[5]. In addition, the investigative thinking in the era of big data needs to be with the idea of "incorporating artificial intelligence". In the current era, the combination of artificial intelligence and brain science has become the second largest trend in the development of big data. Based on this background, the intelligence investigation must transform the concept, establish a multidirectional integration thinking, and achieve accurate analysis in the criminal space, tendency and trace tracking through the "high-level human-machine interaction".

3. Innovative Countermeasures of Intelligent Investigative Thinking in the Era of Big Data

3.1. Establish a data-based thinking

Big data covers not only big data technologies, but also big data applications. It is necessary to establish a consciousness of data-orienting thinking in order to achieve the intelligent investigative thinking. It mainly contains three aspects of content: One is to break away from the empirical thinking mode and to transform into a data-orienting thinking. Traditional investigative thinking is based on empirical thinking. The investigators mainly crack a criminal case by distinguishing the

criminal actions in terms of the exchange characteristics of “materials”. But in the era of big data, data has become an important carrier for recording changes in life and the world, and it is unprecedented abundant in the number and type of data. The words and deeds of criminals are also exposed in the data network and are recorded immediately [6]. Therefore, the current investigation thinking must turn to data-orienting thinking. Second, it is necessary to have the awareness of quantification of investigation. In the era of big data, criminal acts, means, and physical evidence of criminals can be quantified. Traditional investigative thinking based on experience and administrative order is inefficient. In the era of big data, every link of investigation should be quantified. Such as the detection of cases, the assessment of investigation performance, etc., can be quantified by scientific data. In this kind of quantitative investigation, the efficiency of investigation will be greatly improved. The third is the awareness of data visualization. In the era of big data, visualization has become an important trend and plays an important role in all walks of life. Not only the use of investigative measures, the acquisition of combat results and the allocation of resources must be quantified, but they must also be presented in a visual form. The investigation and the investigation thinking are further scientific in the form of image mind maps.

3.2. Establish a holistic thinking

Holistic thinking means conducting investigations with a holistic view. Subjected to technical and competence problems, only sample research can be conducted in many investigations in the traditional investigation. But after entering the era of big data, the application of big data technology can make holistic research a reality. At present, the investigation also needs to rely on big data technology to start to establish holistic thinking. Holistic thinking should follow the principles of continuity, cubism and system. Where the principle of continuity refers to vertical thinking, the principle of cubism refers to horizontal thinking and systematic principle refers to comprehensive analysis. These three principles are the principles that intelligent investigative thinking must follow in the era of big data. Specifically, it is necessary to make a comprehensive analysis of the elements of the case and collect investigation data one by one in the investigation when facing a case. On the element of "people", it is necessary to acquire the real identity data and the virtual identity data synchronously. On the element of "things", it is necessary to correspond to the actual crime behavior data and the virtual crime behavior data. On the element of "materials", it is necessary to collect actual crimes, stolen goods, etc., while collecting virtual crime tools and data such as fishing software and Trojans. On the element of "time", it is necessary to analyze the data of the continuous process in the whole crime process. On the element of "space", it is necessary to extend the crime scene, not only the actual space, but also the virtual space data needs to be collected and analyzed. On the element of "traces", it is necessary to not only collect and analyze the trace evidence of reality, but also simultaneously collect and analyze the virtual electronic data and electromagnetic traces[7]. Based on this foundation, further correlation analysis is needed on related data. The visualization of the data chart is made so that the overall appearance of the case is more intuitively presented.

3.3. Establish relevant thinking

This kind of thinking mainly requires high attention to the correlation between the quantified data, it is no longer obsessed with questioning "why", but focusing on the concern of "what". Traditional investigative thinking is mainly about the exploration of causality. However, it is very difficult to determine causality when facing massive data in the era of big data. Therefore, it is more important to turn to the exploration of relevant relations for determining the macro-laws in the context of this era. Establishing relevant thinking is an important requirement for responding to the data-based ecology of crime in the investigation. It is of great significance to promote the efficiency of investigation in the era of big data. In the era of big data, the investigation department needs to collect and analyze various structured, semi-structured and unstructured data with relevant thinking to expand the scope of sight, and thus promoting the improvement of the utility value of the investigation data. There are three main requirements for this kind of thinking In the investigation. The first is to conduct a multidimensional analysis on the case and to find relevant relationships and

richness. The second is to prove the crime in a relevant relationship. Seeking the causality through the expansion of the scope of investigation and analysis to enable the crime to be more widely proved. The third is to pay attention to monitoring crimes and predicting crimes. Detecting the change of criminal situation based on data analysis technology, finding the crime laws and establishing the data model to predict crimes. The University of California has analyzed the tens of millions of cases and determined that the occurrence of cases in various regions in Los Angeles is in a certain relevant relationship with traffic, weather and other factors. Thus, a data prediction model was established, which enabled police officers to conduct targeted patrols according to the model instructions, resulting in a 12% drop in property crimes and a 26% drop in theft crimes in California. It is a successful example of using relevant thinking intelligent investigation [8].

4. Conclusion

The current era of big data has put forward new requirements for investigations. The investigation thinking also needs to keep pace with the development of the times and actively adapt to this change to innovate investigative thinking and promote the formation of intelligent investigative thinking. This is also the inevitable choice for the development and change of investigative thinking in the era of big data.

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