Fault Tolerance and Error Correction Mechanism from the Perspective of Information Technology Thinking and Construction

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Abstract. Aiming at the difficulty of developing fault-tolerant and error-correcting mechanism in the reform and innovation, a new system of fault-tolerant and error-correcting mechanism in the field of information technology is proposed. Through the use of the systematic concept of reform and innovation, responsibility and achievements to promote the work of fault-tolerant and corrective mechanism into the working system, fault-tolerant and corrective pre-inspection information database, Error-tolerant and corrective procedures, error-tolerant cases, legal accounting information database and relevant departments, personnel to establish a fault-tolerant and corrective pre-inspection information database. The construction of this information system is helpful to improve the scientificity, systematicness, standardization and maneuverability of fault-tolerance and correction work. It can lighten the ideological burden of cadres in exploiting and innovating work, and encourage cadres to take active actions and take actions, providing a new implementation path for fault-tolerance and correction work.

1. Concept and Introduction of Fault-tolerant and Error-correction Mechanism

Fault-tolerance and error-correction mechanism stipulates that CPC and government organs as well as civil servants may be exempt or relieved from related responsibilities or given lesser punishments if they derive from expected goals during their reform, innovation and work promotion, but they abide by laws, rules and policies, don’t seek private gains, and can make corrections in time. General Secretary Xi Jinping put forward the basic principles for establishing a fault-tolerant and error-correction mechanism at the seminar for main provincial and ministerial leaders and cadres to learn and implement the spirit of the Fifth Plenary Session of the 18th Central Committee of the Communist Party of China (CPC) as follows: distinguish cadres’ errors and mistakes arising from lack of experience and first attempts in promoting reform from deliberate rule and law-breaking behaviors; discriminate errors and mistakes in exploratory experiments indefinitely restricted by higher authorities from arbitrary rule and law-breaking behaviors committed after higher authorities’ explicit bans; differentiate accidental negligence in promoting reform and development from rule and law-breaking behaviors for seeking private gains. [1] “The three differentiations” are made to encourage CPC cadres to reform, innovate, and take on their responsibilities. In the 21st meeting of the Central Leading Group for Comprehensively Continuing the Reform held in the same year, Xi Jinping highlighted that “the CPC committees at...
varying levels should strive to improve leaders’ abilities to plan, promote and carry out the reform, and guide leaders to develop thoughts and sense of responsibility for comprehensively continuing the reform. Efforts should be not only made to encourage innovations and praise advanced figure, but also to permit trials and errors and tolerate failures, in order to maximize cadres’ enthusiasm, initiative and creativity.” [2] This further reflects the tolerance to trials and errors as well as the motivations for being creative and responsible. In the same year, it was firstly pointed out in the report on the work of the government at the 4th Session of the 12th National People’s Congress that “incentive mechanisms, fault-tolerant and error-correction mechanisms should be improved to support and motivate people to carry out reforms and innovations, in order that cadres are willing to do, dare to do, and can do things well.” [3] At the Sixth Plenary Session of the 18th Central Committee of the Communist Party of China, it is clearly stipulated in the Several Principles for Political Lives within the CPC under the New Circumstances that “a fault-tolerant and error-correction mechanism should be established to tolerate cadres’ mistakes in work, especially in reforms and innovations.” [4] In the report of the 19th National Congress of the CPC, the fault-tolerant and error-correction mechanism is expounded as follows: “Insist on combining rigorous management with benevolence, attaching equal importance to incentives and constraints, improving the mechanism for evaluating cadres, establishing incentive mechanisms and fault-tolerant and error-correction mechanisms, expressly supporting and encouraging responsible and steadfast cadres who don’t act for private gains.” [5]

Under this background, corresponding fault-tolerant and error-correction mechanisms have been actively established in different areas. They are generally manifested from following five aspects: Firstly, cadres who make mistakes due to objective factors and actively make corrections aren’t deemed to commit the errors deliberately; secondly, as to motives, cadres who act and conduct businesses for their organizations and people are not regarded to seek private gains; thirdly, work shall be carried out in accordance with the spirit of higher authorities’ policies, disciplines and laws; fourthly, work procedures ought to be public, transparent and democratic, but shall not be arbitrary; last but not the least, the errors don’t lead to severe consequences. According to the fault-tolerant and error-correction mechanisms implemented in different areas, the fault-tolerant identification process mainly comprises of application, acceptance, inspection, identification and implementation. The identification results are mainly used for various evaluations, appraisals, cadre selection and appointment as well as qualification accreditation.

Above all, fault tolerance facilitates more scientific understanding of mistakes or errors in reforms and innovations, while error correction is for effectively coping with the mistakes or errors. Constituting a whole, fault tolerance and error correction are crucial for guaranteeing smooth reforms and innovations; they are complementary to each other and indispensable. [6] The purpose of establishing fault-tolerant and error-correction mechanisms is to tolerate faults, encourage cadres to reform, innovate and assume responsibilities. In case of any errors or mistakes, cadres are supposed to take prompt corrective measures to avoid or diminish losses. The fundamental purpose is to free cadres from worries in reforms, innovations and bold acts, in order to protect and escort steadfast entrepreneurs.

2. Difficulties in Practising Fault-tolerant and Error-correction Mechanisms

Coordinated promotion of fault-tolerant and error-correction mechanisms and implementation of ideas on fault tolerance and error correction are inseparable from CPC leaders’ and civil servants’ concerted efforts in reforms, innovations, deeds and entrepreneurship. During establishment of fault-tolerant and error-correction mechanisms, difficulties shall be constantly overcome in practices. In combination with the practical work for reforms and innovations, a summary is made as follows:
2.1. Difficulties in identifying fault-tolerant circumstances

At present, the fault-tolerant and error correction measures promulgated in different areas are generally over formalistic and generalized. How to exactly distinguish mistakes and errors from rule and law-breaking behaviors, and clarify the lists of positive and negative fault-tolerant circumstances is a dilemma for present fault-tolerant work. [7] The work differs among governments and departments of CPC committees at varying levels in terms of their features and highlights. This objectively makes fault-tolerant circumstances infinite and complicated. Meanwhile, the identification of fault-tolerant circumstances is subjective. The identification results might be different from judgments of the people concerned in “errors”. As a matter of fact, organs for investigating responsibilities make subjective judgments in some cases. As a result, it is more difficult to identify fault-tolerant circumstances. Therefore, how to definitely clarify fault-tolerant circumstances is a major difficulty for establishing fault-tolerant and error-correction mechanisms.

2.2. Difficulties in executing fault-tolerant procedures

Fault-tolerant procedures are initiated in sync with investigation procedures. Fault-tolerant and investigation subjects are the same departments. At work, they shall not only investigate responsibilities, but also have to be fault-tolerant. Thus, it is relatively hard to control these subjects’ discretions, and the subjects bear heavy pressure at work. From the perspective of fault-tolerant processes, whether the responsibilities can be exempted under a circumstance is closely associated with actors’ subjective motives, backgrounds, objective conditions, processes and results of their behaviors. Generally, these circumstances shall be evaluated in an authoritative, scientific and professional manner, whereas this can be hardly achieved in current fault-tolerant procedures. [8] In addition, vague fault-tolerant boundaries, incomplete articles on fault-tolerance and responsibility exemption, it is more difficult to objectively measure legitimacy of “errors” and discretions. Improper measures possibly result in wrong identification. Under this circumstance, fairness and authoritativeness of the identification results are questioned.

2.3. Difficulties in identifying fault-tolerant circumstances in depth.

At present, publicities and reports regarding fault tolerance and error correction are mostly about policies, but specific cases are rare. Therefore, many CPC leaders mostly know the fault-tolerant and error-correction mechanisms from policies. Without many cases around them, some CPC leaders doubt about the mechanisms. In addition, under the current social atmosphere, people are not highly tolerant to civil servants’ errors in reforms and innovations. Once civil servants commit any mistakes or errors, unfavorable public opinions might impact investigation organs’ judgement of errors or mistakes. [9] Furthermore, responsibilities may be exempted or mitigated under fault-tolerant circumstances. Responsibility mitigation only matters about severity of punishments. Owing to these factors, many CPC leaders don’t deeply and exactly understand how fault-tolerant they should be.

As a consequence, there are still no unified national frameworks and norms for implementing the fault-tolerant and error-correction mechanisms due to insufficient practical experience and short theoretical research, even though pertinent rules regarding applicable circumstances, application scope and identification procedures of the mechanisms have been promulgated in different areas since the mechanisms were brought forth by the Central Committee of the Communist Party of China in 2016. In practices, attention has been mainly paid to enact related rules and cope with cases. So far, no areas have been reported to have taken reforms, innovations and responsibility into account in a systematic and integrated manner.
3. Conceptions of Applying Information-based Measures in Fault-tolerant and Error-correction Mechanisms

After understanding fault-tolerant and error-correction mechanisms and analyzing their difficulties, this paper introduces an information system into the mechanism, and constructs a fault-tolerant and error-correction information system by integrating reforms, innovations and responsibility into the mechanisms. This information system facilitates scientific and efficient implementation of the mechanisms, in order to ease leaders’ concerns in entrepreneurship and encourage leaders to actively take measures, so as to handle the difficulties in implementing fault-tolerant and error-correction mechanisms. This model is built around the pre-inspection database for fault tolerance and error correction. It is composed of the pre-inspection database for fault tolerance and error correction, procedures and cases on fault tolerance and error correction, law and discipline databases, relevant departments and personnel. The information of the pre-inspection database for fault tolerance and error correction is from the work-related information autonomously reported by departments or leaders. The reports are mostly made in advance, but under special circumstances, they can be made during or after occurrence. After the information is reported to the pre-inspection database, the system will forward corresponding information to related departments according to their attributes, in order that the departments can evaluate and improve pertinent policies and measures. Meanwhile, the databases of the system on laws, disciplines, and cases regarding fault tolerance and error correction can intelligently discriminate and rectify their information. These procedures ensure that actions can be immediately taken as required by related disciplines, laws and higher authorities’ policies in practices upon identification of the work-related information. Besides, they protect leaders from being impacted by their lack of experience in practical work. Once fault-tolerant procedures shall be implemented, the system can trace all the work in the pre-infection database for fault tolerance and error correction. Furthermore, the system is quite helpful for identifying fault-tolerant circumstances, on the grounds that the information has been reported in advance, intelligently pre-inspected and rectified. The cases identified through the fault-tolerant procedures constitute the case database, which is useful for intelligently guiding the work-related information in the pre-inspection database for fault tolerance and error correction. Therefore, this system can solve the difficulties with respect to the fault-tolerant and error-correction mechanisms as follows: Firstly, reporters can detect errors and make prompt corrections in the database with the aid of the system; secondly, the pre-inspection database for fault tolerance and error correction offers fault-tolerant circumstances for reference, thus making fault-tolerant circumstances, audits and identifications more transparent and operable; thirdly, the system is helpful for relieving leaders’ concerns in doing things and starting up businesses, but makes them concentrate on their reforms and innovations, on the grounds that they can report the work-related information to the pre-inspection database; fourthly, synchronous construction of the case database on fault tolerance and error correction is beneficial to data analysis on mistakes or errors. This not only prevents the occurrence of similar problems, but also provides cases and discretionary references for other identical practices about fault tolerance and error correction.

Thus, it is evident that this information system is quite effective for making leaders responsible for their own duties, the superior responsible for the inferior, organizations responsible for leaders, and leaders responsible for their jobs. This system is operable and reproducible for the execution of fault-tolerant and error-correction mechanisms. This information system is shown in Figure 1.
4. Conclusion

Information-based measures, as effective management methods for making government decisions scientific, social governance refined and public services efficient, have gradually exhibited prominent strengths. In particular, the Central Committee of the Communist Party of China has clearly brought forth digital China. Pursuant to the Development Plan for a New Generation of Artificial Intelligence issued by the State Council on 8th July 2017, China will promote the application of artificial intelligence and modernization of social governance around hot issues and difficulties on social governance, including administrative management, judicial administration, urban management and environmental protection. In this context, areas have actively constructed and developed intelligent cities, governments, courts and discipline inspection commissions and so on. Moreover, big data management bureaus have been built in several areas. Therefore, it is feasible to implement the fault-tolerant and error-correction mechanisms by information-based measures under historical backgrounds and based on work. Nevertheless, the implementation of an information system is a systematic project. In practices, it is also necessary to fully guarantee organizational leaderships, human resources, financial resources, information technologies and other resources. Only in this way can an information system bring its functions into full play to attain the goals of reforms and innovations.

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