

Research Progress on the Competency of Explosive Ordnance Disposal Police

Ting Zhang, Xiang Chen*

Zhejiang Chinese Medical University, Hangzhou, Zhejiang, China

*Corresponding Author

Abstract: Explosive Ordnance Disposal (EOD) police is a specialized police force undertaking high-pressure and highly technical operational tasks. The level of their competence overtly impacts social stability and people density. Explosive equipment in the situation at hand is becoming intelligent, concealed and diversified, and security situation is becoming more complex thus exerting strain on professional abilities of EOD police. Even though academic studies on the domestic context have already started to investigate the competency of this group, related literature is still young, and it suffers some specific evidence problems, including inadequate theory, the scarcity of research instruments, and no uniform evaluation assessments. In this regard, the present paper takes the competence theory approach to conduct a systematic review of conceptual attributes and other components of EOD police competence and gives an overview of the future research orientations. Intended to build a scientific, systematic, and operational competence system, the study attempts to provide the references and help in the professionalization and modernization of EOD units.

Keywords: Explosive Ordnance Disposal (EOD) Police; Competence; Research Progress; Public Safety

1. Introduction

The EOD Police is an essential unit in the national security system and the structure of social governance in China, and performs significant duty including the explosion prevention and security tolerance, explosive disposal, and responding to unforeseen occurrences. Their performance in the workplace has a direct connection with social stability and safety of the population. This job position compared to traditional police work is

High risk, technical, low substitutability, and high responsibility loading which places very high demands on the professional qualification, technical and psychological strength, and professional ethics of the practitioners. Over the recent years, as the situation in the field of the domestic and international security has been evolving deeply, the public security environment has become more and more complex due to the factors of rapid urbanization, infrequent large-scale events, and the cross-border risks overlap. There are trends of diversification, concealment, and technicalization of explosive device, and terrorist methods of attacks are also becoming more and more sophisticated more complex and unpredictable, and more significant pressure is exerted on the professional level of EOD Police by a greater number of urgent and high-level tasks.

In theory, because the competency theory was developed in 1970s, it has been greatly utilized in various areas of practice including enterprise management, public administration and the military. The first countries to establish competency models into the police recruitment and training as well as evaluation systems were countries such as the United Kingdom, the United States and Australia that developed comparatively well-developed mechanisms of application. Conversely, much of domestic research on police competency has been done in traditional occupations of police like special police, criminal police, and traffic police. The range of systematic research on the topic of EOD Police is comparatively low, and all the successes have been limited to the summary of experience, without the theoretical development or statistical foundation.

Practically, EOD activity is both very professional and dangerous and the competence level determines the outcomes of disposal and the safety of operations directly. Nevertheless, there are still practical issues in current capacity

building in this area in China such as incomplete training system, insufficient psychological training, matching equipments distribution and insufficient assessment mechanism. It is with this background that this paper is arranged in a systematic way to arrive at the connotative features and constituent components of EOD Police competency with reference to competency theory model, and an anticipation of the research directions in future. It also tries to establish theoretical basis in building a scientific, systematic and operable competency system, thus, providing academic assistance to the professionalizing and modernizing of the EOD police teams.

2. Basic Concepts

2.1 Competency and Competency Model

David McClelland, a Harvard University psychologist was the first to present the notion of competency in a systematic way having done so in 1973. In his article Testing for Competence Rather Than for Intelligence [1], he has indicated that the traditional intelligence tests are not easy to correctly predict the performance of an individual in the real line of work. His contribution was to concentrate on quantifiable aspects that are closely linked to job performance including knowledge, skills, motivation, and characteristics, and brought about an essential paradigm shift in ability testing that was previously intelligence-based to that which is performance-based, which formed a significant theoretical base in the contemporary human resource management.

A competency model is a business model that puts to practice the competency theory, which is applied in practice to represent the most important elements of abilities held by high performers in certain roles in a systematic manner. Two of the most traditional theoretical models include the Iceberg Model and the Onion Model that focus on the hierarchical nature of competency among others. The Iceberg Model proposed by McClelland splits competency and presents the explicit parts above the water surface (e.g., knowledge and skills) and implicit parts below the water surface (e.g., self-concept, personality traits, and motivation). Even though the latter are not readily measurable and quantifiable, they have a determinant role to play in performance. In this extension, the hierarchical model of competency

elements, which is the Onion Model, [2], brings out the knowledge and skills that are more surface level moving to the core level of motivation and traits. It reflects the formation law of abilities—from explicit to implicit, and from variable to stable. Together, the two models indicate that knowledge and skills are the basic threshold for job competence, while in-depth motivation, values, and personality traits are the core factors driving high performance. Competency models provide a scientific basis for the "selection, training, utilization, and retention" links in human resource management, and are widely applied in personnel recruitment, training and development, performance evaluation, and other fields, promoting talent management towards systematization and precision.

2.2 Connotation and Characteristics of EOD Police Competency

Based on competency theory, EOD Police competency refers to the sum of an individual's inherent traits and external behavioral capabilities that are essential for effectively distinguishing high performers from average performers in a job environment characterized by high risk, high pressure, and high uncertainty. It allows performing tasks connected with explosive prevention and security checks, explosive disposal, and emergency response to unexpected incidents without any issues and in a safe manner. Its connotation is not only about the mastery of the hard knowledge and abilities like explosive principles, procedures of their disposal, and working with the equipment but also about deep-rooted qualities, which manifest themselves in the severe situation, i.e. its identification of risk and its ability to make decisions, psychological calmness, cooperation in the team and professional integrity.

EOD Police competency has four salient characteristics compared to conventional police position:

First, high risk. The work of EOD is in direct contact with explosive threats, and the working environment is highly unpredictable and life-threatening; any mistakes made in operations can have extremely negative consequences. The competency model should be strictly combined with real battle conditions, with the emphasis being on testing the emotional regulating abilities of the practitioners, their behavioral stability, and the effectiveness

of their responding to the emergency situations in case of extreme psychological stress to check their ability to remain calm in judgement and more accurate in disposal during crisis situations.

Second, high technicality. As the type of explosive device and the mode of attack keep changing, the job demands practitioners to have full understanding of professional knowledge and skills like explosive identification, risk management, and usage of technical equipment, have quick learning, and adaptation to technological changes. The use of high-tech equipment, including explosive machines, X-ray machines, and explosive detectors, has become a significant aid to the implementation of tasks. To solve more complex security issues, practitioners should use these tools in an effective way and establish effective human-machine-collaboration techniques to tackle the complex developments.

Third, low substitutability. The professional knowledge system and practice experience underpinning this position cannot be replaced in the short run by other police officers who cannot easily train them systematically and practice of their duties, and are only developed through years of experience. Not just physical and chemical properties of explosives the practitioners must have the ability to make swift decisions and with science in the face of a real battle. This is a composite capability structure whereby their professional role turns out to be unique and inseparable.

Fourth, excessive responsibility burden. EOD business is associated with the aspects of social order and the safety of people, and each decision and action has a great number of legal obligations and social demands. In the presence of high pressure, the practitioners should rely on the principles of the rule of law and professional ethics, as this issue is evaluated in detail regarding safety, compliance, and effectiveness of actions taken related to disposal. The professional technology and ethical judgment are two conditions metaparty to their decision-making process thus, giving them extremely heavy job responsibilities.

3. Analysis of EOD Police Competency Elements

The competency theory is a valuable theoretical framework that can be used to systematically analyze the EOD Police ability structure.

According to “Iceberg Model proposed by McClelland, the elements of competency may be classified into visible elements above the surface of water and hidden elements below the surface of water. They constitute a full range of competencies at EOD Police, and they interact in a mutually beneficial way in practice.

3.1 Explicit Elements: Professional Knowledge and Operational Skills

Explicit components predominantly mean the levels of knowledge and skills that may be readily seen, measured, and developed, as forming the background competencies regarding participation in the EOD work.

3.1.1 Professional Knowledge

The fundamental backbone of the EOD Police competency system is comprised of professional knowledge, as well as it is the prime capability toward achieving safe and efficient removal of explosives. Based on the relevant studies, the professional knowledge system required for this position can be systematically constructed from two dimensions: technical knowledge and institutional knowledge.

At the technical knowledge level, EOD Police should establish a systematic professional knowledge system. Firstly, they need to master basic disciplinary knowledge such as electronics, and deeply understand the fundamental properties of explosives—either as energetic materials with special chemical properties or as components and devices with pyrotechnic, mechanical, electronic, and other structural characteristics [3]. Secondly, they should possess a solid theoretical foundation in explosives, be able to systematically grasp the characteristics of various common explosives and the working principles of different explosive devices, and have the practical ability to independently manufacture and dismantle simulated explosive devices [4]. Foreign studies also emphasize that EOD personnel need to establish a complete explosive knowledge graph to accurately identify the differences between traditional explosive devices and new types of intelligent explosives [5,6].

At the institutional knowledge level, practitioners must be proficient in legal and regulatory knowledge, systematically study national policies and related legal norms, and firmly establish the guiding ideology of law enforcement for the people [7]. Meanwhile, they need to practice the concept of standardized

work, strictly operate in accordance with standardized procedures in EOD work, establish a sense of standardization, and ensure that there are pre-action plans, strict in-action execution, and proper post-action filing [4].

It is worth noting that with the continuous escalation of terrorist methods and the increasing trend of intelligent explosive devices, the cycle of knowledge renewal has been significantly shortened. This calls on the practitioners to have the benefits of continual learning, and to continuously advance the professional level by long term learning, training, summary and enhancement [4] so as to meet the new and growing challenges in security that are more complex.

3.1.2 Operational Skills

The EOD Police has operational skills that are the most important connection between the professional knowledge and practical disposal capabilities and these characteristics indicate the great integration of theory and operation. Based on the current research, it is possible to distinguish two types of their skill system soft and hard skills that are complementary and mutually facilitate the fluent performance of the work.

Regarding hard skills, equipment operation ability is at the heart of it. To work in the EOD, along with a good professional background and deep practical experience, a practitioner is expected to adhere to the norms and procedures of operation and be able to competently master the modes of operation of different types of professional equipment [7]. Namely, they must be capable of performing skim-through of the search with such tools like mine detectors and video telescopic inspection mirrors, depending on the conditions of the site [8], and understand how different special EOD devices work [4]. As science and technology evolve, new varieties of EOD equipment are being popularized on a continuous basis hence the importance of being able to work and maintain high-tech EOD equipment all the more important [9]. Such hard skills must be converted into muscle memory by high intensive and repetition training in order to get the accuracy and reliability of the operation process.

About the soft skills, the correct judgment abilities are the fundamental requirement in handling the complex and unpredictable explosive gadgets [4]. The competency of risk assessment involves management of the risk

levels of tasks to be performed in a scientific manner and development of efficient plans to offer a sound foundation on which decisions can be made in the field [4]. The emergency disposal ability must receive constant professional training, and the response and on-site flexibility of the police officer must be enhanced by the simulation of complex situations [10]. Moreover, information technology application capability assists in establishing an information-based expert support system to continuously increase the professional capabilities [8]; overall coordination capability focuses on the reasonable division of labor, distinct definition of the roles, and the introduction of grid management in the execution of the task to work rigorously and collaboratively [11].

3.2 Implicit Elements: Professional Literacy, Personality Traits, and Needs Motivation

The most important intangible qualities that make high performers outstanding compared to their average counterparts are the implicit elements. They are hard to keep track of, but they will have a decisive effect on work performance of EOD Police.

3.2.1 Professional Literacy

One of the underlying pillars of the competency system of is professional literacy. Despite the fact that it is challenging to measure and directly observe it, it has an ultimate effect on the quality of work and efficiency of operations. This pedagogical system consists primarily of two dimensions, namely, professional attitude and professional ethics, the combination of which conditions the norms of the behavior and value orientation of the practitioners.

Concerning professional attitudes, the EOD police must have a high level of responsibility and commitment. The sense of responsibility requires that the practitioners are very vigilant and show a very responsible attitude towards each step of work and make sure that the execution of the tasks is very strict, exhaustive, and without any possible risks [10]. Sense of professional identity and perseverance are seen in terms of work being hardworking, responsible, and work-excellence oriented and the psychological capabilities to be professionally cool in the face of extreme situations [4].

Professional literacy becomes externalized in the dimension of professional ethics in terms of normative behavioral standards and disciplines

of operations. The EOD police should conform to professional ethics, standard institutional operating procedures and a high level of self-discipline and standardization ought to be displayed [7]. This dimension highlights a high adherence to safety rules and working standards when approaching the main task performance in order to achieve the credibility and professionalism of all work, which is the direct behavioral implementation of professional literacy [12].

3.2.2 Personality Traits

The uniqueness of the work of an EOD practitioner and its riskiness demands the multi-dimensional and multi-faceted character of personality traits of an individual. Based on the research it was identified that the system of personality traits which is needed to take the job has four main dimensions which are; psychological quality, physical foundation, communication and collaboration, and development potential. These dimensions enhance one another and together, they provide the internal foundation of coping with complex EOD tasks.

The fundamental characteristic to EOD work is psychological stability. The practitioners must be of suitable psychological quality and strength to perform EOD work [10], must be calm facing risks, make sound judgements [7] and stay in a calm and undressable response state in undertaking work [4]. In a study conducted by Hogan on the psychological characteristics it was determined that the capability to make quick decisions and control emotions when under intense pressure is a prime indicator of levels of performance [13]. Proper judgment skill is also paramount, as solving problems that are complicated, multi-faced and dynamic explosive devices, professionals should make accurate identification on the basis of professional knowledge [4].

Physiological assurance of competent EOD operations is good physical fitness. The physical robustness and plenty of power have been considered as the key requirements to work due to the length of working hours, seriousness, and shocking mental exhaustion of EOD activities [10]. This characteristic augments psychological stability wherein they work together to maintain operational functionality of practitioners in harsh conditions.

Soft skills such as language expression ability and team spirit are relevant in making sure there

is efficient handling of the tasks. The former helps to develop the effective experience transfer and cross-departmental communication [14], whereas the latter is concerned with the efficient collaboration in the joint work of the departments, there is direct correlation between the good teamwork and the effective completion of the EOD tasks [15].

The ability to continuously learn is what can ensure the ability to keep up with the active evolution of the industry. The professional level of the EOD Police must be developed with the constant improvement based on long-term learning, training, summary, and enhancement [4], be directly engaged in professional training, be aware of the new situations and new cases, and supplement new information [7]. Technological innovation aptitude is seen through the adoption and observation of the consciousness of empowering police by science and technology. It presupposes practitioners expanding the range of their knowledge, developing a structural concept in agreement with recent accomplishments and breakthroughs in world scientific and technological progress [16], and subjective activity in practice to enhance equipment and improve techniques [14]. Moreover, it is essential to experience rich practical experience. The work of EOD is based on real battle experience, and professionals should constantly develop the possibility to work in complicated situations via training [7].

3.2.3 Demand Motivation

Being the internal engine that spurred the professional behaviors and constant involvement of the EOD police, demand motivation is one of the underlying factors that influence their professional identity, job involvement, and stability of the team. The motivational structure has been argued in existing studies to be systematically explained along two dimensions namely: intrinsic drive and extrinsic incentives.

In level of intrinsic drive, the desire of self-actualization as well as desire of social responsibility serves as the main motivation. It has been established that organic interplay of the self-actualization needs, achievement orientation, and social responsibility together works to create the distinct motivational profile of the EOD police [14]. This self-motivating force makes the practitioners constantly seek to perfect professionalism, ensure the higher notion of enhancing the police force with

technology [16], and achieve the combination of personal values and professional mission by means of a long-lasting experience of practical work.

When it comes to extrinsic motivation, an appreciation of the profession and career advancement opportunities are essential elements in ensuring that the team members remain stable. According to the surveys, the existing police force of EOD is in the dilemma of inadequate professional acknowledgment of their abilities. It can easily prompt practitioners to engage in professional burnout and psychological void as there is a relatively scarce space of professional development and promotion [14]. Thus, the professional title evaluation system must be created and improved in the case of EOD police, titles levels and evaluation criteria should be clarified and the connection between professional titles and the remuneration should be made effective. It will lead to a greater stability of the team as well as the development of the professional field and the improvement of the functioning [8].

4. Research Implications and Future Prospects

The studies of EOD police competence in China have begun rather late compared with foreign studies, and the general progress of the research falls behind. Regarding the research approach, the current success primarily depends on the theoretical inference and partial summarization of experience, and a compliant and unified way to build a competence model has not established yet. Specifically, there exists lack of constructive support and scientific validation using large-scale empirical evidences [17]. To define the contents of research, there has been no clear and cohesive definition of the elements of core competency that EOD police must constitute of. Existing research frameworks mostly focus on explicit skills such as equipment operation and EOD procedures, while the exploration of underlying competency characteristics—such as risk decision-making ability under high-pressure environments, psychological resilience, team collaboration mechanisms, and intrinsic demand motivation—remains insufficient.

The above limitations in the research field directly restrict the establishment of scientific talent selection criteria and systematic training systems for EOD police in practice [18,19].

Current talent training still mainly adopts the traditional mode of skill teaching and experience transmission. There is a clear disconnect between training content and the increasingly complex and ever-changing actual combat needs, which makes some frontline personnel unable to fully adapt to the requirements of high-tech and high-risk modern EOD tasks.

Faced with the complexity and severity of the current anti-terrorism and explosion-proof situation, there is an urgent need to promote the paradigm transformation and methodological innovation of competence research on China's EOD police. Future research should actively draw on advanced international experience, comprehensively adopt various research methods such as behavioral event interviews, psychological assessments, and situational judgment tests, and construct a competence model for EOD police that is compatible with the characteristics of China's policing practice. Based on this, there is need to further demystify the core competency standards of EOD personnel of various ranks and positions [20]. Under the leadership of competence, then, there is a tendency to systematically optimize the professional curriculum system, create practical training models, work on scientific and effective assessment tools, and, in the end, create an integrated competence development mechanism that embraces selection, training and assessment. This will enable strong theoretical framework and practical leadership in creation of professional and quality EOD police force.

5. Summary

The scientific creation of the competency system of is of paramount importance to the actual efficiency of the anti-terrorism and explosion-proof work and the cornerstone of the social stability as the last line of defense that protects the security of people. From the perspective of competency theory, this paper, combined with the practical challenge of increasingly intelligent and concealed explosive devices, systematically concludes that existing studies mostly focus on explicit skills such as equipment operation, while the exploration of in-depth competency characteristics like psychological resilience and risk decision-making remains insufficient. This inadequacy leads to the mismatch between talent selection and training mechanisms and the

high-risk, high-tech requirements of modern EOD tasks.

As a basic study focusing on theoretical construction, this paper attempts to propose a competency framework covering five dimensions: professional literacy, operational skills, professional knowledge, personality traits, and motivational needs. It aims to break through the limitation of "valuing skills over literacy" in traditional studies and provide a conceptual basis and directional guidance for subsequent empirical research. It should be noted that this framework has not yet undergone large-scale empirical verification. In the future, methods such as behavioral event interviews and situational assessment need to be used to further refine and verify its component elements. In particular, hierarchical and classified research should be carried out in combination with different task scenarios and rank systems to enhance the applicability and guidance of the model.

The improvement of the competency system for EOD police is a core link in promoting the professionalization and modernization of the team. It is expected that the theoretical discussion of this study can provide references for the continuous deepening and practical innovation in related fields, thereby contributing academic value to improving the effectiveness of EOD police work and consolidating the public security barrier.

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