Architecture of Digital Integrated R & D Platform for Military Research Institutes

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Abstract

Under the background of "digital transformation", military scientific research institutes should seize the opportunity of the rapid development of the country. In order to improve the overall R & D level and work efficiency of scientific research enterprises, starting from the capacity-building of integrated R & D platform. And according to their own professional characteristics, a series of new information technologies, such as artificial intelligence, big data, cloud computing, are used to integrate by levels and categories to form a flexible and expandable digital integrated R & D platform of resource sharing and professional collaboration, which helps to form the core competitiveness of domestic ship system R & D. From the problems faced by the construction of the integrated R & D platform in the Research Institute of military engineering, this paper studies the connotation and characteristics of the architecture, and puts forward the idea, composition and construction content of the architecture of the digital integrated R & D platform for military R & D enterprises.

Keywords: *Innovation management, Military research institutes, Digital integrated R&D platform, Architecture*

I. Introduction

With the vigorous development of new technologies such as Artifical Intelligence, Big Data, Internet of Things, Cloud Computing, and Block-chain, a new generation of digital information technology is re-emerging Construct new business models and economic forms, and then promoting the transformation and upgrading of traditional enterprises.

Statistics show that 67% of the global top 1,000 companies and 50% of the top 1,000 companies in China will take digital transformation as their core strategy [1].

In the course of my country's national defense and modernization construction, the major military research institutes have made outstanding achievements and played a pivotal role. As the prelude to the digital transformation of enterprises kicks off, it is not easy to change habits, and transformation is even more difficult. Military research institutes are facing new challenges.

Although our country has reached the domestic advanced level in integration technology and level, there is a big gap between it and foreign countries. Mainly manifested in lack of automation, digitization, and intelligence. There are good individual products, but the system matching and coordination are poor, the product performance is not fully utilized, and the overall performance is not high. The product reliability design and verification are relatively mature, and the system reliability indicators are difficult to confirm, and there is no scientific method for verification. Early design is not sufficient, there are many late problems, long debugging cycle, and large capital investment. Long development cycle, it is difficult to quickly provide reliable system products according to user needs and meet the final assembly and general adjustment needs. This requires improved development models and R&D methods to meet the needs of product technology development.

In addition, the military industry research institute focuses on the construction of product guarantee conditions, and

currently needs to transform to professionalism to realize multi-specialty, multi-task, and multi-product guarantee. It is obvious that platform-based construction and core technology foundation/public information infrastructure construction are relatively lagging, technical resources, human resources, product resources, and information resources lack effective use, unable to exert overall benefits, and lack systematic construction to meet product research and development capabilities. In the digital age, in order to adapt to the new requirements and new trends of user participation and personalized service, military research institutes urgently need to use information technology to continuously develop towards flattening, process-oriented, flexible and network-oriented, facing a harsh competitive environment, respond quickly to external dynamic changes, take users as the center, in-depth mining, precise analysis, rapid response, continuous optimization, timely meet the diverse needs of users, and better create value [2-8]. Integrate multidisciplinary R&D tools at different levels and categories to form a flexible and expandable digital integrated R&D platform for resource sharing and professional collaboration. New technologies such as artificial intelligence, big data, cloud computing, and machine learning are mutually promoted. Integration as a link, technology integration as a means, and business integration as support have profound practical significance and application value for improving the overall R&D level, business innovation capabilities and core competitiveness of military research institutes.

II. Basic Theory of Digital Transformation

What is the definition of digitization? The concept of digitization is divided into narrow digitization and broad digitization [9-12]. Digitalization in a narrow sense mainly uses digital technology to digitally transform specific services and scenarios, and pay more attention to the cost-reduction and efficiency-increasing effects of digital technology itself. Digitalization in a broad sense refers to the use of digital technology to systematically and comprehensively reform the business models and operating methods of various organizations such as enterprises and governments, and pay more attention to the empowerment and reshaping of the entire organization system by digital technology. In a nutshell, digitization is "machine-based, manual-assisted."

Digital transformation is a high-level transformation, based on digitization and digitalization, mapping the real world to a digital intelligent world constructed by computing power. Its purpose is to comprehensively use various technical means to establish a new corporate culture, business model, organizational structure, and mechanism guarantees, to achieve organizational "operation digitalization", business "management flattening" and production "process intelligence", thereby freeing up labor force, improve the work efficiency of employees, and effectively reduce business costs.

Compared with enterprise transformation, digital transformation has a deeper meaning. It is not simply using WeChat to manage the team, nor is it using a remote meeting system for meetings, but the full-cycle and full-process data of the company's production, management, and operation. This allows employees to be released from repetitive work and effectively achieve efficiency increase and cost reduction. The purpose of digital transformation is to comprehensively utilize various technologies and methods to realize the complete digitization of the organization's operations, and finally to map the entire organization to the digital world.

Regarding digital transformation, some people believe that it is information technology represented by computing power, algorithms and data, which drives the transformation of society as a whole in a digital way. In this definition, the digital approach is the key, relying on digital technology. Military research institutes urgently need to use data/AI as their core capabilities. In the process of digital transformation, timely introduce new technologies such as the internet of things and block chain, build a new cloud-based and service-based architecture system, and deeply integrate new technologies with management operations to create new competitive advantages for military research institutes.

The realization path of digital transformation consists of three steps, business cloud, data integration, and application innovation.

Among them, the cloud is the carrying environment, which fully supports the resource architecture, data architecture and application architecture of enterprise operations, and has changed the traditional enterprise architecture. At the same time, the cloud is also the foundation of other digital technologies such as big data, the Internet of Things, and artificial intelligence. The promotion of "business to the cloud" is an important way for digital transformation. Through the business to the cloud, the upstream and downstream of the enterprise can be connected and the entire industrial chain can be connected. Making the end-to-end process of customers and suppliers more comprehensive, accelerating the promotion of business model innovation, efficient and flexible management, and achieving cost reduction and efficiency enhancement.

The Internet of Things is a key technology for enterprises to realize the digital empowerment of equipment and materials. Enterprises use the cloud to send and receive data. Trillions of new devices are connected to the network and generate massive amounts of data. The data is growing exponentially. The integration provides a data foundation for big data analysis and artificial intelligence. At present, the evolution of the Internet of Things is developing from "things-to-things connection" to ubiquitous perception, cognitive computing, and predictive analysis. Industry and innovation continue to merge, innovate and develop, and promote the transformation of traditional business to intelligent, digital, and networked, and reshape the role of enterprise development models in the digital transformation of various industries has been highlighted, and the industrial Internet of Things platform is becoming the focus of attention in the conversion of new and old kinetic energy.
With the rapid development of cloud and the Internet of Things, and the realization of data interconnection, enterprise big data has become the core asset of enterprises. Big data runs through the industry chain and is the subject of future development. We must pay attention to data planning, data governance, and in-depth data mining and utilization to accelerate the digital transformation of enterprises. At present, big data still faces many challenges. Data management lacks standards and specifications, and the integration process of business development/R&D construction is slow. To realize all-round intelligence, enterprises need to strengthen basic capabilities in algorithms, models, and data. Making good use of various tools. Business model innovations based on big data have been seen everywhere. In the future, all companies that are undergoing digital transformation will need to build big data storage, processing and analysis platforms. Companies that establish big data platforms first will gain a clear lead in intelligence.

Big data and artificial intelligence complement each other and promote each other. Artificial intelligence was born in the context of big data, which greatly improves the quality and speed of data collection, and promotes the development of the big data industry. Big data provides a breeding ground for the development of artificial intelligence, is the foundation of artificial intelligence, and promotes the development of artificial intelligence. The application of artificial intelligence in the field of enterprise services is mainly the enhancement and landing of application innovation, which promotes the development of intelligent products, and realizes enterprise intelligent management, multi-dimensional analysis, and visual operation. The combination of "AI+Big Data+Cloud Computing" will drive the re-innovation of enterprise operating models, promote enterprises to become intelligent, and add new momentum to the digital transformation of smart enterprises.

III. Integrated Research and Development Platform Basic Theory

The integrated R&D platform is a set of systems engineering-based platforms. It takes large systems as the research object and carries out design, development, management and control according to a certain purpose, so as to achieve the integration of various sub-systems and achieve the best technology, methods, methods and methods for the overall effect process. In the system integration, the factors and roles of people participating in system activities should be taken into consideration at the same time. At present, system integration has become a core profession encouraged by the state.

The Hall three-dimensional management framework for product R&D advocated by system engineering is used

as the theoretical basis for the construction of integrated R&D platform. It is called hard system methodology in system engineering. The three dimensions are time dimension, logic dimension, and knowledge dimension. However, the three-dimensional framework of lean R&D does not consider the law of operation of technical systems in society. Therefore, soft system methodology appears in modern systems engineering Physics-Affair-Human Methodology (WSR). The three-dimensional framework of lean R&D only decomposes and describes the physical dimensions of WSR.

The methodology of WSR is exactly the same as that of social technology. The physics, affair, and human theory of WSR correspond to the technology, process, and people of social technology, respectively. From the perspective of social technology, the three-dimensional framework of lean R&D only describes its technical dimensions.

Social technology believes that the development of a social technology system usually starts with technology. When technology reaches a certain level and needs to be applied socially, it is necessary to establish and improve the talent system and process system, and then form a strategic system, and finally constitute a complete and a stable social technology system.

Lean R&D belongs to a typical socio-technical system and abides by the technological, management and economic laws of socio-technical science. Therefore, in addition to technical aspects including R&D management, design simulation, knowledge engineering, and quality management, lean R&D needs to include strategy, talent, organization, process, standards, specifications, tool software, basic IT, and design from the socio-technical dimension. Methods, etc. The information platform is the carrier of the system, and these dimensions will run on the platform.

Therefore, the construction of a lean R&D system is not only the purchase of R&D methods, tools and technologies, nor is it not only the construction of a lean R&D information platform, but also a choice of strategy, organizational changes, processes, and the construction of standards and norms system.

The construction of the R&D platform not only covers all majors in the technical field, and comprehensively improves the professional R&D capabilities, but also extracts the common parts between them for centralized construction and comprehensive integration. In this way, on the one hand, it can integrate existing guarantee resources, save capital investment, reduce repeated investment, and support future project research and development. On the other hand, it can realize cross-professional and cross-field information/resource sharing, achieve the purpose of large-scale system research and development, and improve the level of scientific research in the professional field.

IV. Building a Research and Development Platform Guided by the System Engineering Method

4.1 System engineering method working process

With the development of science and technology in military reformed in the new era, the system has put forward higher requirements in terms of technical level, quality and cost. This requires a research unit specializing in product system engineering research, development and integration. Further, to enhance the experience of successfully developed large-scale complex systems by using system engineering methods and processes and learn from effective management methods (such as life cycle management, project management, etc.) in foreign specific practices, and implement the system in the development process. Engineering method process repeated analysis, synthesis, testing and evaluation, refinement, continuous iteration, transforming user needs into feasible technical solutions. To achieve the goal of improving work efficiency, reducing the development cycle, rationally utilizing resources, lowering development costs, meeting performance requirements, and ensuring product quality. Figure 1 shows the working process of the system engineering method.

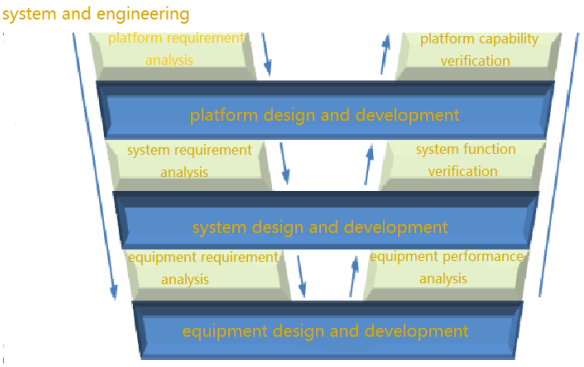

Fig 1: Working process of the system engineering method

4.2 Development-oriented, building and supporting the development of the system life cycle research and development platform

The architecture of the integrated R&D platform should conform to relevant international and domestic standards, achieve advanced framework, and have good openness, which is easy to expand according to demand. Therefore, the composition of the R&D platform should adopt an advanced hierarchical structure. The bottom layer is the basic layer of the entire R&D platform, providing basic site facilities, secure network and universal server system for remote interconnection. the middle layer is the common layer of the R&D platform, providing integrated public life for the life cycle development of the upper professional applications. The scientific research means and environment. The upper level is the professional layer of the R&D platform. These professional sub-platforms focus on the characteristics of the professional field, and use the infrastructure and public R&D platform to form support for the whole process of R&D, closely surrounding the product task requirements and facing professional development.

This hierarchical system framework has a clear structure, reasonable functional layout, and easy resource sharing. It can improve the sincerity of the R&D platform and make the system more flexible and adapt to the rolling development of the future.

After the platform is completed, it should be able to form a systematic, professional-oriented technical support capability to support future product projects and special research. Basic research is easy to achieve resource sharing. System development platform to support the full life cycle of research and development, support for demonstration, design, development, integration, testing, evaluation, security and other life cycle can carry out technical research, test, verification, joint test, simulation training and other functions. Figure 2 shows the new integrated R&D life cycle.

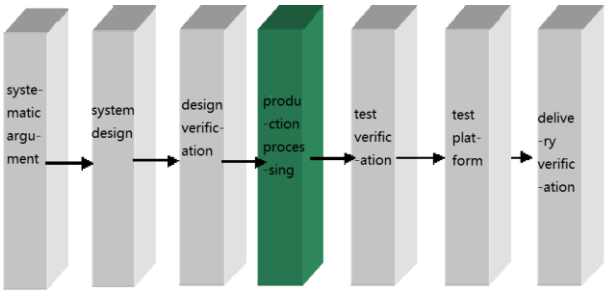

Fig 2: New integrated R&D life cycle

V. Overall Architecture of Digital Integrated R&D Platform

The essence of digital transformation is business reshaping, and its primary task is to connect data in all business systems, use software tools and software technology to empower businesses, and thus obtain innovative capabilities. At the same time, the development of any enterprise is inseparable from the coordination of multiple departments. Only when the R&D and design, production and construction, operation management, marketing and other departments are seamlessly connected can the enterprise be able to maximize production and transaction efficiency. The essence of personalized customization is to rely on the digital integrated R&D platform to realize the automatic flow of data between various departments, and effectively improve the enterprise's R&D cycle, production efficiency and product quality.

5.1 General ideas

Based on the development and innovation of system engineering theory, and on the coverage and expansion support of business structure, multi-disciplinary R&D tools are integrated into different levels and categories to form a flexible and expandable integrated R&D platform for resource sharing and professional collaboration. It forms three-tier architecture with professional layer coordinated operation, support of common layer entities, and effective protection of the basic layer.

5.2 Frame structure

According to the overall idea of R&D platform construction, the integrated R&D platform adopts a hierarchical structure, as shown in the following figure 3.

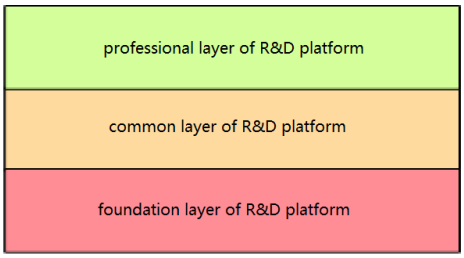

Fig3: R&D platform hierarchy

The composition of each layer of the entire R&D platform can be represented by the following figure 4. That is, the professional layer is composed of a plurality of professional R&D sub-platforms, and the common layer is composed of a common integrated supporting environment and a plurality of common sub-platforms. The basic layer mainly includes a site facility, an off-site security interconnection network, and a server system.

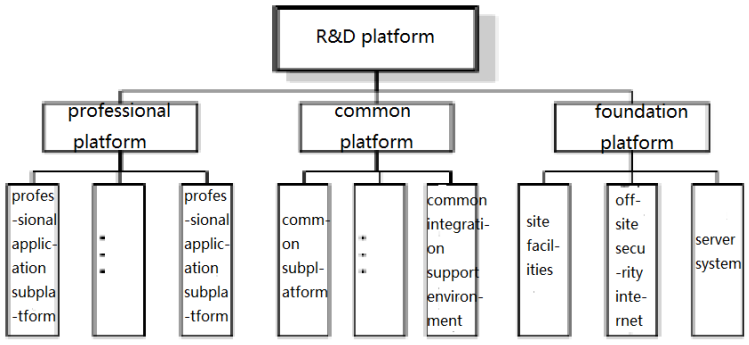

Fig 4: The structure of the R&D platform

5.2.1 R&D platform professional layer
The professional level of the R&D platform is for professional applications, mainly for laboratories, R&D

environment and professional debugging labs for various projects. The construction of the professional layer of the R&D platform is mainly through new construction or supplemental reconstruction, making full use of existing resources, integrating various professional sharing, general resources, and perfecting scientific research methods to achieve the goal of establishing a common professional R&D system that does not depend on specific products. The professional R&D platform is based on the public R&D platform. Professional application personnel provide public software tools, resources and supporting environment through the public R&D platform, with the special software tools, environment and resources provided by the professional R&D platform, to study their professional work.

5.2.2 R&D platform common layer

The main layer of the R&D platform is to extract the common parts (design, simulation, testing and testing tools and environment) of the upper professional research and development platforms for centralized construction and integrated integration, which is the whole life cycle of the upper professional applications. Develop and provide integrated public research methods and environment. In this way, it can integrate existing resources to guarantee resources, save capital investment, avoid redundant construction, and support the research and development of future projects. On the other hand, it can realize cross-professional and cross-disciplinary information/resource sharing, to achieve the purpose of large-scale system research and development and improve the level of scientific research in various professional fields. The common layer of the R&D platform is mainly composed of five parts, system design public platform, co-simulation public platform, system test public platform, comprehensive test environment, and public integrated support environment. With the construction and development of the upper professional R&D platform, the platform puts forward more requirements to continuously supplement the common layer of the R&D platform.

Among them, the lean R&D platform is a software platform with the R&D process as the hub. The R&D process covers the entire cycle of R&D, design, simulation, testing, and experimentation, and serves the top-level rigid process of project management and quality management and serves personnel by distinguishing The grass-roots flexible process of collaboration and technological innovation integrates knowledge, tools and quality methods in the process. Compared with the traditional serial R&D design process (the whole process of product development is subdivided into multiple links such as demand analysis, structural design, and process design, R&D activities are carried out in sequence among various departments, and after each R&D activity is completed, the next step will be transferred). The construction of a parallel R&D system will greatly improve R&D efficiency and save costs.

The public integrated support environment provides R&D personnel with common resources and integrated application tools for task execution. According to the steps in the work package, R&D personnel call various basic resources through the basic layer of the R&D platform, and form a competence center, a model center, a knowledge center, and a lean process through the microservice framework, basic components, components, and APP development services. Procedure center, data center and other professional field component and tool resource center, support the operation of the professional layer of the R&D platform upwards, use the components, interfaces and basic resources of each layer to build professional application systems to support the development of various businesses. At the same time, develop integrated applications based on public resources and services and applications under new technology conditions in the future, including horizontal integration of various professional fields, vertical integration of system-system-equipment components, and rapid prototyping capabilities from bottom to top, aiming at end-to-end integrate applications, and develop artificial intelligence and trade-off space analysis applications under the conditions of new technologies and trends in the future.

On the basis of the basic layer of the R&D platform, the public integrated support environment carries out system-oriented business-oriented integrated modeling, rapid prototyping, trade-off analysis, machine learning and evolution, and other horizontal, vertical and end-to-end integrated applications, forming a system capability ecology and realizing "Central control" of the capability system. The public application layer upwards provides basic environment, basic functions and other application support for professional applications.

At present, an integrated R&D system based on digitization is being formed. Relying on a series of new technologies and concepts such as model product definitions, fully digital prototypes, digital twins, etc., starting from various actual business needs, it carries out demand mining, function analysis, task decomposition, system design, physical design, simulation deduction, product development, test verification, system integration, system verification and product acceptance and other whole-stage and full-cycle work. By promoting product R&D, design, simulation, testing, service business, etc. to reconstruct full-element, full-process, full-dynamic virtual mirroring in the digital space, to optimize evolution, rapid iteration, and real-time interaction to large systems and giant systems, virtual and reality no longer exist the "twin body" of simple mapping relationship is a unity of interconnection, related transmission and control, and interaction. Decisions after optimization of virtual space can be fed back to real production activities in real time. Real simulation and deduction verification at each stage can obtain more accurate prediction results faster than conventional traditional tests, thereby greatly reducing tedious and lengthy test operations and achieving a substantial increase in research and development efficiency.

5.2.3. R&D platform base layer

The base layer of the R&D platform is the physical basis of the entire platform, emphasizing the concept of physical integration. The foundation layer of the R&D platform is planned on the basis of the infrastructure requirements of the site, network and server on the upper platform, and the comprehensive site construction plan and security network interconnection plan are given to meet the test and office of the upper platform. The need for information interaction and data storage is common in this layer. The basic layer of the R&D platform is mainly composed of two sub-platforms: site construction/construction and remote security interconnection network/server system.

Based on the digital integrated R&D platform, on the one hand, it provides the upper-level platforms with physical infrastructure such as sites, networks, and servers. At the same time, in terms of soft capabilities, with the continuous improvement of digitalization, in addition to basic capabilities such as online monitoring and real-time maintenance, predictive maintenance capabilities have become a new type of capability based on product life cycle services, and are also an important means to enhance corporate profits and competitiveness.

When using the R&D platform, all professional R&D personnel use the sub-platforms of the professional sub-platform and the common layer to carry out the research and development of this professional under the support of the common integrated support environment. An application example is shown in Figure 5.

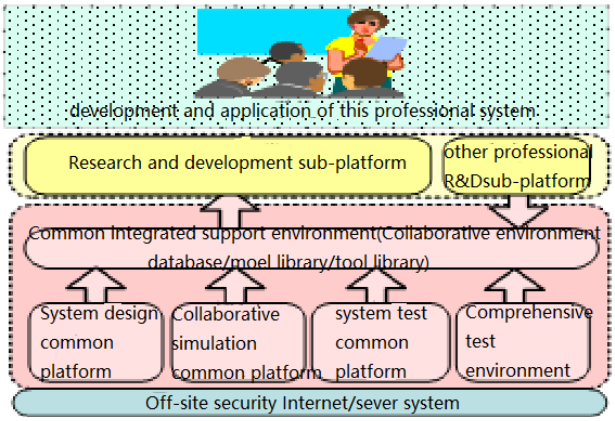

Fig 5: Composition of each layer of the R&D platform

Based on a digital integrated R&D system, a set of lean R&D platforms have been built, covering scientific research process systems, data management systems, quality control systems, knowledge engineering systems, and comprehensive design environment systems; a customer service with real-time perception of customer needs and

real-time data has been constructed The platform, in-depth exploration of the actual needs and potential needs of customers, real-time perception, rapid response, and timely satisfaction. A batch of scientific research knowledge has been accumulated. After the construction of knowledge engineering, more than 1,500 tacit knowledge such as algorithms and experience have been sorted out, and standards, specifications, More than 50,000 pieces of explicit knowledge such as patents, achievements, reports, etc., gradually realized the visualization of intellectual assets, the systemization of knowledge accumulation, the transparency of knowledge sharing, and the fullness of project revenue. A digital R&D platform of "data + model" was constructed, Databases, model libraries, product libraries, and expert libraries for R&D, design, simulation, testing, verification, service and management lay the foundation for the improvement of core R&D capabilities. For core business and systems, the scientific research process of each professional is sorted out and formed hundreds of scientific research process task packages to standardize system development work links, established a research and development model, from the traditional personal document-based workshop-style research and development to a process-based, knowledge-based, tool-based, standardized, and scientific-based research and development model transformation.

VI. Digital Transformation of Military Research Institutes

The digital transformation of military research institutes is the only way for enterprises to upgrade their business, improve efficiency, and enhance competitiveness. It is a systematic and disruptive redefinition of business models, organizational activities, R&D processes, and employee capabilities, that is, integrating their own resources. Based on traditional business, we will check for omissions, pay attention to investment in science and technology, and use digital technology to achieve business innovation and optimize business models. The transformation of the enterprise's infrastructure resources, human resources, data resources, organizational resources, social resources, corporate organizational activities, work processes, business models, cultural innovations, and employee capabilities, etc., to build a unified business service center and realize agile processes and decision-making Paths, supporting rapid changes in business applications and business innovation have laid the foundation.

With the development of complex intelligent products as the core, innovate the technical methods and business models of military research institutes, and build a digital integrated research and development platform that conforms to the national defense construction system.

Military research institutes can achieve a new model of innovation leadership, quality enhancement, and high-quality and healthy development by introducing excellent talents, adopting efficient design methods, using advanced R&D tools, accumulating reliable test data, and building R&D systems.

6.1 Building a digital organization system and strengthen team guarantees

The digital age urgently needs to innovate, combine the current business development and digital new technology, adjust the organizational structure and corporate culture to enhance corporate competitiveness. Strategic transformation, talent first, compound talents who understand business, technology, and data will be the core of the digital transformation of enterprises. In terms of digital talent management, we must first collect effective data, such as organizational climate data, engagement satisfaction data, and talents. Ability potential data, performance data, quantitative data on leadership behavior, industry benchmarking data, etc. Secondly, building an analysis model based on the above data, and forming forward-looking talent management suggestions and scientific talent management decisions by using various data analysis methods such as cross-analysis, regression analysis, and comparative analysis.

6.1.1 Establishing a digital leadership group

Military research institutes need to realize top-down comprehensive digitalization. First, establishing a digital leadership system and set up a digital transformation leadership working group, which is composed of the main leaders of military research institutes, leaders of relevant functional departments and leaders of subordinate

business departments. Among them, military research institutes The main leader serves as the team leader, the leaders of relevant functional departments and the leaders of the subordinate business departments serve as members. They are mainly responsible for the coordination of major issues of digital work and the decision-making of major issues. Responsible for the allocation and guarantee of important resources within each unit. Responsible for coordinating internal and external working relationships with each unit Division of tasks. Responsible for studying and approving digital work plans, inspecting and supervising work progress and important nodes.

6.1.2 Establishing a digital R&D team

The digital R&D team is the backbone of digital transformation, and is responsible for the full-cycle technical work of digital R&D, including research, design, testing, and acceptance, including overall demonstration, overall scheme design, technical index decomposition, and technical path determination. Responsible for organization and development Key technology research, system function research and development, system integration verification and achievement transformation application of digital R&D work. Responsible for regularly organizing and carrying out the technical docking and coordination of digital R&D, researching and solving technical problems in the implementation process. Assisting relevant personnel, financial, and overall management of assets.

6.1.3 Establishing a digital expert group

Under the leadership of the leading group, a special digital expert group was established, consisting of three-level technical experts, including group-level chief experts discipline leaders, college-level science and technology committee special committees, and subordinate institute-level technical committee members, to fully implement the work deployment of the leadership group, to provide technical support and decision-making control for major issues of digital transformation work in response to digital product demand analysis, planning and demonstration, design, research and development, construction and application. At the same time, it assumes the responsibility of cultivating a talent team for the construction of a digital integrated R&D system for military research institutes, laying a solid foundation for building a national-level team of digital technology experts and management experts, and promoting digital construction and enterprise digital transformation.

6.2 Taking data as the center and establish a data information sharing mechanism

Taking data as the center, designing the overall digital architecture, formulating basic standards for information resource management, and achieving standardization of data management, building a shared data management mechanism, data warehouse and analysis models of different latitudes, and realizing data use Globalization. Through the data resource management platform and business process engine of the data center, realize the visualization of operation management and control, use digital means to mine the value of data, and send the correct data to the correct subject at the correct time and in the correct way to build a complete set. The system of data collection, transmission, analysis and decision-making is particularly important to ensure high-quality data and provide basic data information with high timeliness and high accuracy for scientific research.

6.2.1 Data management standardization

In order to achieve consistent and equal understanding between business development designers and business analysts, ensure the correct interpretation of product requirements, and achieve the most demanded realization, various data management standards have been formulated, mainly including resource information management basic standards and functional system software modeling standards, architecture design modeling standards, technology development standards, integrated application interface standards, etc., to achieve sharing and sharing.

6.2.2 Data usage globalization

Establishing a data sharing management mechanism, link different internal business systems through the enterprise integrated management platform, make all business data definition entries consistent, uniform distribution, global application, and global synchronization, and realize real-time data exchange and real-time sharing of different business systems. At the same time, according to different business characteristics, it aggregates the relevant data

of the whole cycle, builds the data warehouse corresponding to the business and the analysis model of different latitudes, effectively supports the business work of each department, and plays an important role in the strategic decision-making of the management of the military industry institute.

6.2.3 Visualization of operation management and control

In order to realize the unified storage and centralized management of data, in-depth mining of the value of data, enhance the business capabilities of military research institutes, promote high-quality development, explore the construction of data centers for multiple business fields, and carry out data resources, data management and application demand analysis, through the establishment of a unified information portal, the information, processes and data related to the business theme are integrated. Managers can view the process dynamics of corresponding items through different modules of the portal, monitor the process to grasp the running status, and facilitate the timely discovery and resolution of problems, and change the past. The "leg" working mode makes operation management and control more rational and efficient.

6.3 Mining the value of data to ensure high-quality data

High-quality data brings high value. As a core asset, limited management and precise use of data assets are the focus of digital transformation. It is especially important to use digital means to tap the value of data, to send the correct data to the correct subject in the correct way at the correct time, and to build a complete data collection, transmission, analysis and decision-making system. First, collect data, and improve the completeness and accuracy of data collection through the use of smart equipment, terminals and sensors. Secondly, data transmission, the development of communication network technologies such as 5G, 6G, and the Internet of Things provide interconnection and seamless integration for reliable data transmission within the system. Third, analyze data and process, analyze and process perception data with a series of logic, coding and modeling algorithms to form scientific and reasonable valuable data. Fourth, data decision-making uses automatic control devices such as distributed control systems and programmable logic control equipment to "trigger" scientific decisions based on data collection, transmission, analysis, and mining, and execute them accurately.

VII. Conclusion

With the vigorous development of emerging technologies, a new round of industrial revolution is gestating and developing. The use of advanced digital and intelligent technologies to empower military research institutes to transform, and the construction of a digital-based integrated R&D platform architecture will contribute to the long-term sustainable development of military R&D companies. It is of great significance. This article first analyzes the problems encountered in the construction of the integrated R&D platform of the Military Research Institute, introduces the basic theory of data transformation, and conducts in-depth research on the innovation and development of the capability system architecture based on the innovation and development of system engineering theory. A set of digital-oriented integrated R&D platform architecture design methods, including the overall idea of integrated R&D platform architecture design, structural composition, etc., plan the digital integrated R&D platform architecture at the top level to promote the digital integrated R&D system of military research institutes The construction has achieved tangible results.

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