

# TECHNICAL DESIGN METHODS FOR SPATIAL DATA PRODUCTION

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## ABSTRACT:

Technical design is a crucial part of project implementation and main basis for organizing production. With the development of surveying and mapping technology and its system, spatial data show more new features such as digitalisation of survey products, systemization of production, and networking of management and so on. By this, objectively it's required that technical design method for spatial data production also should be changed. In this article, the authors bring forward the general mode of technical design, they emphasize characters and changes of technical design for spatial data production, and summarise the design method.

## 1. INTRODUCTION

The technical design is a crucial part of project implementation and main basis for organizing the production. Therefore the quality of technical design is very significant to the quality of project and product. With the development of surveying and mapping technology and its system, spatial data show more main features such as digitalisation of surveying and mapping products, systemization of production, and networking of management. Correspondingly the technical design methods for spatial data production also bound to change. In this paper, the authors discuss the technical design patterns, characteristics and methods of spatial data production.

repeated technical evaluation. Its technical design pattern can be sum up as follows:

**2.1.1 Identify the technical design objectives:** First of all, try to understand the existing technical resources and configuration including of technical personnel's level and hardware and software configuration based on the project's demand, find out the difference between project's demand and actual technical status. By this way, "problem space" can be lined out. This "problem space" is the goal of technical design. According to this goal, try to understand the technical resources configuration capability including technical personnel and hardware equipment and software status, then estimate if the technical goal can be achieved.

**2.1.2 Search the available technical measures:** After identifying the technical design goal, the next step is to search all possible available technical measures in order to realize this technical goal. Proceed from identifying the difference between the goal and the realistic technical status, make an heuristic search relying on the heuristic knowledge such as background theory and experience so as to search the measures to eliminate difference. Then demonstrate the possibility and feasibility of these measures until to find out a suitable means. This is the key process to form technical design.

**2.1.3 Programming the technical design:** The process to make technical measure search based on designer's experience and background knowledge is the thinking process to form the technical design. Coordinate such thinking process to form a reasonable and expressive mode, this is the programming the technical design.

**2.1.4 Evaluating the technical design:** After the technical design formed, it should be evaluated. Its evaluation can be divided into two sorts. One is self-evaluation. That is to make an objective evaluation internally before implementing the production. The related technical personnel can evaluate it in different aspects such as the rationality and availability of technical design, the reliability of the used data, and feasibility

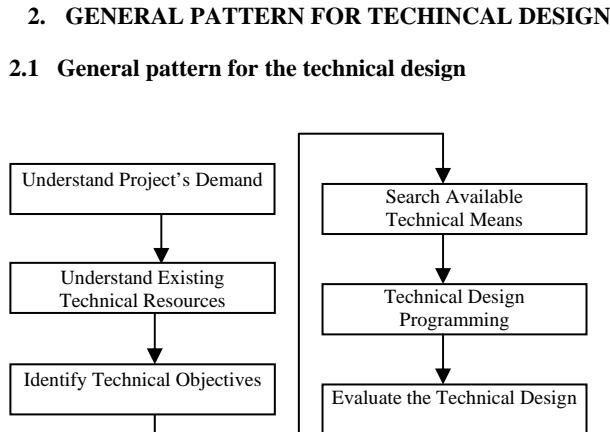


Figure 1. Technical Design Pattern

Technical design is an operation process to search the available means to realize the technical objectives. It's a process that makes certain technical goal based on the project's demand, and designs the proposal according to the technical objectives, then evaluates the technical proposal so as to enter production test. In the process, there are several major areas including the technical objectives identification, the proposal designing, and the

of its technical method from different angles. This is an effective design evaluation method. The other is the user's evaluation. Make a production test to the finished products according to the technical design, then provide sample data for the user to test and check if it can meet the demands of different system. This is the key part of the technical design evaluation.

### **3. THE CHARACTERISTICS OF THE TECHNICAL DESIGN FOR SPATIAL DATA PRODUCTION**

With the development of surveying and mapping technology and computer and network technique, the survey domain has had a profound change. The traditional production manner has been replaced by the digital manner. The spatial data production presents new traits such as result digitalisation, production systematisation, operation flow processing, management networking. These features objectively require its technical design to be changed accordingly. Reflected in the following aspects:

#### **3.1 The change of the project's demand**

In project's demand, the users increase the demand to the data of survey products. Besides the traditional paper drawings, the digital products should also be delivered to meet the demand of the client's system.

#### **3.2 The change of the technical goal**

As a result of digitalisation and systematisation of the production, it must make overall consideration to determine the technical goals. It is necessary to meet the production demands, but also to consider the demands of GIS and data application. And the digitalisation demands become the main theme to determine the technical goal.

#### **3.3 The change of the technical proposal**

As a result of networking management, it makes the phase of the technical design programming different in comparison with the traditional one. Spatial data production objectively requests:

**3.3.1 The standard specification is Digitized:** As the computers have become main operation tool today, the traditional technical standards and specifications will be replaced by the digital standard documents that adapt the computer operation. Therefore, the technical design should be delivered standard and normalized digital document, for example, the project data layer and symbol plan, data classification code program, uniform legend file, uniform line style library accorded with the specifications request, uniform font library.

**3.3.2 The technical design can operationalize:** Transform the design thought into the format of data files. Express the design thought through operationalized data files is the objective requirement of spatial data production. It's also the objective requirement normalizing spatial data operation manner, ensuring data uniformed highly, as well as promoting the data quality. The template files used in the operation reflects the operationalization of the technical design for spatial data production.

**3.3.3 The design thought is programmed:** What the computers are widely used in spatial data production makes the

technical design combining with the technical development. That makes design thought programming become possible and inevitable. Designer's thought not only reflects in the text of documented proposal, but also reflects in procedure document used in the production.

#### **3.4 The change of the technical design evaluation**

The technical design evaluation will be performed by the user's evaluation, namely the production and test sample data are delivered to the users who will test if those data can meet the requirement of the user's system. As a result of GIS development and new requirement to spatial data, this is a main method to evaluate the technical design.

### **4. TECHNICAL DESIGN METHOD OF SPATIAL DATA PRODUCTION**

Spatial data production technical design method is decided by thinking mode of the technical practical application. Its characteristic is "target guidance", here the target is also "technical question". In the technical design, "technical questions" are infinitely varied and different respectively. Generally speaking, it should be reduced to two aspects: a) General "technical question", which is the similar question appeared in past technical design; b) Non-conventional "technical question", which is caused as a result of new technology application or new product appearance. Hereby, the technical design method can be reduced to two kinds, namely general one and non-conventional one.

#### **4.1 General technical design method**

It is an effective method to solve general "technical question" during the production of spatial data. It mainly includes the comprehensive technical design method and the improved one.

**4.1.1 The comprehensive technical design method:** It is a most common design method that is to look for a solution from existing technical norms, method and information. The most major characteristic of comprehensive design is based on the existing technical thought. The massive technical design achievement and the technological means are the important tools of the conventional design. Its design route includes: a) to find the solution from the existing technical design norms and technical design; the existing technical design is formed from the long-term experience accumulation, which is convenient, time-saving, low-cost and reliable. It can be innovated based on the existing norms, may be improved in some way. b) to find thought from front technical information and intelligence data. Here the information and intelligence include the new thought and method both from the domain close interrelated to surveying and mapping technology front and from other technology development outside the survey professional field. As the survey objects are related to other speciality and field. In this way, the designers can surmount the limitation of individual knowledge and experience, make a creationary design. This shows that the so-called the comprehensive technical design method is not to copy verbatim, it needs to innovate and to pioneer from the conventions, consequently to form a new technical design.

**4.1.2 Improved design method:** It refers to make some modification in partial area or reset based on the existing technical design plan but not to change its overall, so as to make it systematized, integrated, consequently bring a new technical

design proposal. This is a most common design method adopted by the technical designers, also one is the easiest to win. It is common and extensively used one.

#### 4.2 Non-conventional technical design method

It is design method to solve the non-conventional “technical question” in spatial data production, namely to solve the problem in the aspects of new technique, new products, new technology. It mainly includes systematic design method, dynamic design method and tentative design method.

**4.2.1 Systematic design method:** With the development of GIS and systematisation of spatial data production, the systematic design method emerges as the times required. It utilizes systemic concept and principle, focuses in various interaction relations among the whole and the part, the part and the part in technical system in order to get a total optimization design plan. It starts from the overall requirement, coordinates the relations between the whole and the part dialectically, thus has provided the basic guarantee for design plan's optimisation. The basic steps of the systematic design are as follows: a) make system's overall goal and the constraints clear; b) decompose system's whole request into specific one of the spatial data production; c) Seek the production method to realizes the spatial data production and to satisfy the system whole request; d) Select the preferred plan in the massive pre-elected plan through the technical appraisal; e) the technical design is programmed. This design method is established on the basis of overall system analysis and synthesis. This design method is one of important modern technology design methods produced along with the modern survey technology development, which is especially fit for complex design object, is the technical design method in which the spatial data production satisfies the requirement of the modern geographical spatial information system.

**4.2.2 Dynamic design method:** It is one modern design method that develops along with computer development. It takes program development as the basis, under the premise not to affect overall technical plan, to adjust certain links in design, thus obtains a partial optimum design plan. Compared with general design method, the characteristics of dynamic design method are extremely obvious. First, dynamic design may run through the whole process of spatial data production implementation, according to the actual production situation, the technical design can be rectified and revised time after time, thus the production efficiency and quality can be improved. Secondly, dynamic design can reduce manpower and material resources consumption, the problem can found and solved promptly. Third, dynamic design may solve complicated or duplicated problem based on research and development by using computer technology, but the general design often is helpless to them.

**4.2.3 Tentative design method:** It refers to carry on original design under the circumstance of no design templet and technical specification. This design is established on the foundation of testing according to new technical principle, then put forward new design proposal so as to meet new requirement. Whether the design is correct or not sometimes must be evaluated through inspecting final product's quality. Therefore, through repeated test by this design method, the quite reasonable and correct technical design plan can be obtained. It is suitable to new production method, new technology, new product and new technique application, and also technical specification method to form new technique and products.

#### 5. CONCLUSION

The technical design plays an important role in the technical research and development of spatial data production. It decides what kind of product will be produced and how to do, and the cost of product production. Therefore, the design itself has the flaw to present “the thought disaster”, this is fundamental, the overall importance problem, it will be no end of trouble for the future. The technical design method for spatial data design is inevitably request from survey system development, and a necessity to accommodate the contemporary survey technological development. Consequently, its design should revolve around the traits of spatial data production, select the suitable design method in accordance to technical goal, to do like this, the production implementation and quality can be instructed and controlled effectively.

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