The Preliminary Appropriateness of Applying Lean Thinking to Educational Management

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Abstract: Since the 1950s, in order to address the significant waste generated by a large number of production methods, Toyota has initially implemented lean production methods. Afterwards, the lean production method was summarized as lean thinking. However, there have long been problems in educational management caused by a large number of training methods. Therefore, in order to address the drawbacks of these methods, educational management calls for the introduction of lean thinking. The principle and practical path of lean thinking are that value can only be determined by the end customer, value flow analysis, value flow, customer demand driven production, and achieving perfection at every step. This can achieve functions such as reducing waste, widespread application, and meeting diverse customer needs in principle. Due to the fact that the education industry and industry have both experienced single and batch production methods, lean thinking can not only help industrial production, but also contribute to the high-quality development of the education industry.

Keywords: Lean Thinking, Educational Management, Manufacturing Management

1. Lean Thinking

Lean thinking is a key principle summarized from the lean production method, aimed at providing action guidelines for managers on how to transition from batch production to lean production. Lean thinking comes from addressing the drawbacks of mass production methods. The principles of lean thinking revolve around value, value stream analysis, value flow, customer needs, and perfection.

1.1. The Connotation of Lean Thinking

1.1.1. Lean Production

Lean thinking originates from lean production, so when mentioning lean thinking, it is necessary to first clarify the concept of lean production. The term "Lean Production" was first proposed by James P. Womack, Daniel T. Jones, and Daniel Roos in 1990 in the book "The Machine That Changed the World". The Chinese translation of "lean" is "lean meat", which means "no waste of essence". Therefore, in Chinese, "Lean Production" means "striving for excellence". Lean production refers to the production methods adopted by Toyota in managing factories, automotive design, collaborative support, handling user relationships, and managing lean enterprises.

1.1.2. Lean Thinking

In many literatures, when it comes to "lean", only lean production is mentioned. Lean thinking and lean production are different [1]. As James P. Womack and Daniel T. Jones wrote in the preface of Lean Thinking in 1996: "The Machine that Changes the World." We provide benchmark data for Toyota and introduce a good way of organizing and managing rich relationships with customers, supply chain, product development, and production operations, which was first introduced by Toyota in Japan after World War II. We call this production method lean production because it can achieve more and more output with fewer inputs [2]. Lean thinking is a key principle summarized from the lean production method, aimed at providing action guidelines for managers on how to transition from batch production to lean production.

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1.2. The Source of Lean Thinking

Lean thinking comes from addressing the drawbacks of mass production methods. The development of production methods can be divided into three stages, namely single piece production, mass production, and lean production. The mass production method of the automotive industry originated from Ford's production of the T-shaped car in 1908. Ford referred to its production method as the "mass production method". The mass production method solves the shortcomings of the single piece production method, such as high skill requirements for workers, lack of professional equipment, low production efficiency, and high manufacturing and maintenance costs. The mass production method reduced the average work cycle of Ford employees from 514 minutes in 1908 to 1.9 minutes in 1913 [3]. The mass production method helped Ford determine its dominant position in the global automotive industry. But mass production methods also have many drawbacks. Japanese engineer Hidevoshi Toyoda visited and studied at the Luchi factory of Ford in the spring of 1950. Although the Luchi factory was the largest in the world at the time, Hideyoshi Toyoda still confidently believed that "there is still room for improvement at the Luchi factory [4]."[The production method of the Luchi factory was not suitable for Toyota in Japan. Toyoda Hideyoshi has made a series of improvements to eliminate waste in response to the drawbacks of the large-scale production method at the Luki factory, which can result in various types of waste. James P. Womack, Daniel T. Jones, and Daniel Ruth referred to Toyota's improved production method as lean production. In 1996, they summarized the key principles of lean production, which became lean thinking.

1.3. Principles of Lean Thinking

In order to help enterprises clearly understand how to use lean thinking to guide production, James P. Womack and Daniel T. Jones summarized five principles of lean thinking in their book "Lean Thinking" in 1996, helping enterprises truly learn how to use lean thinking to guide practice. As table 1, the principles of lean thinking include 5 points [5].

	Manufacturing Management	
Value	Value can only be determined by the end customer	
Value stream	Analyze the value stream	
Flow	Let value flow	
Pull	Using customer needs to drive production	
Perfect	Strive for perfection in every step	

Table 1: The principles of lean thinking in the manufacturing management

1.3.1. Value can only be determined by the end customer

In production practice, value is created by producers, so producers often mistakenly believe that value is determined by the producers themselves [6]. When faced with customers questioning the value of a product, producers often feel that they will gain customer recognition by lowering prices or explaining the value of the product to customers. This idea is arrogant and not inferior. Although engineers are well aware of the difficulty of product design and manufacturing, and highly educated engineers themselves possess rich professional knowledge and abilities, the value of a product can only be determined by the customer [7].

1.3.2. Analysed the value stream

Value stream refers to the activities that a product undergoes in three processes: problem-solving, information management, and material transformation. The process of problem solving refers to the process from conceptual conception, scheme design, and process design to production [8]. The process of information management refers to the process of information management from obtaining customer demand information, making design and manufacturing task plans, to delivering products to customers. Analyzing the value stream clearly reveals the three ways in which it operates. The first mode of activity is to identify the activity that produces value, and the second mode of activity is to choose to produce value not explicitly. However, under the existing technical conditions, this activity cannot be canceled; we call it the first type of waste. The other category is activities that do not produce value and can be eliminated, which we call the second type of waste.

1.3.3. Let value flow

In life, we always believe that it is more efficient to complete the first task in bulk before moving on to the next task. But in fact, that's not the case. We should let value flow. In Henry Ford's factory, Ford

creatively invented assembly lines, greatly improving production efficiency. Ford utilized the principle of allowing value to flow. In the past, organizations always placed too much emphasis on whether departmental work was done well, while lean thinking required us to emphasize the "process" of creating value. Only by valuing the flow of value can an organization truly increase its profitability. In the actual operation of an organization, the value flow chart can be drawn first, and then the process of value flow can be analyzed to identify the waste in each process, remove type 2 waste, and reduce type 1 waste.

1.3.4. Drive production with customer demand

In previous manufacturing production, enterprises were unable to achieve demand driven production. The main reason is that the enterprise has not identified the value stream. When enterprises continue to manufacture and produce in bulk, their value does not flow well. Enterprises that do not have value flowing will generate a large amount of inventory at every step of production, and it will take a lot of time from the beginning of production to the goods entering the hands of customers [9]. Due to the operation of enterprises in mass production, they are unable to produce according to customer needs in a timely manner, so they always push their own products to customers. If value can flow quickly and without waste, enterprises can adjust production in a timely manner according to user needs, truly adapting to the multi-level, personalized, and multi quantity needs of customers. Therefore, enterprises need to use customer needs to drive production in order to achieve value creation.

1.3.5. Try to achieve perfection in every step

If a company can achieve the first four points, then achieving perfection in every step is not a difficult task. Firstly, if a company can accurately identify the value stream, it will discover waste in every process. Secondly, if enterprises can allow value to flow, then various wastes in the value flow process can be eliminated. Thirdly, if a company can use customer demand to drive its production, on the one hand, it can produce truly valuable products, and on the other hand, it can allow value to flow quickly and without waste. Meanwhile, this can also increase employee motivation. The traditional management method of "carrot and stick" is no longer able to meet the needs of social development. Value flow and demand driving can increase employee motivation, as employees can receive timely feedback. When employees see customer satisfaction with their work, they will affirm the effectiveness of their work and even meet their own needs to realize their life value.

1.4. The Significance of Lean Thinking

In response to the drawbacks of mass production methods, lean thinking can solve problems that cannot be solved by mass production methods and optimize traditional production methods. As table2, the optimization of mass production methods is reflected in three aspects.

	lean thinking in manufacturing management	
Waste	Reduce waste	
Applicable scope	Lean thinking has a wide range of applications	
Requirement	Lean thinking is applicable to meeting the diverse needs of	
satisfaction	users	

Table 2: The significance of lean thinking in manufacturing management

1.4.1. Reduce waste

If a company adopts a production method that embodies lean thinking and changes the original batch production method to a value flow and demand driven production method, the labor productivity of the company will double. The error rate of products delivered to users, the scrap rate in the production process, and work-related accidents will all decrease by more than half, and the inventory occupied in the production process will be greatly reduced. Therefore, the lean production method that embodies the concept of "perfection" will greatly reduce waste [10].

1.4.2. Lean thinking has a wide range of applications

Although lean thinking originated in the manufacturing industry, its concepts of defining value, identifying value streams, allowing value to flow, demand driven production, and perfection also apply to other industries. Meanwhile, lean thinking will provide new growth points for traditional industries. The traditional view holds that technology and education play an important driving role in production, but new technologies may not perfectly adapt to all fields. For example, 95% of all industries are not easily affected by new technologies. Lean thinking will be the best growth point for these industries.

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Taking traditional manufacturing as an example, the mechanical industry has been developing for over 100 years since the Second Industrial Revolution, and the industry has gradually matured. The impact of new technologies on traditional manufacturing is slow, and the new management methods innovated by lean thinking undoubtedly have a significant impact on the efficiency of traditional manufacturing.

1.4.3. Lean thinking is applicable to meeting the diverse needs of users

Traditional production methods are difficult to meet the rapidly changing and personalized needs of users [11]. Firstly, traditional production methods do not accurately recognize the definition of value. The traditional production method believes that value is determined by professional technicians, but in reality, value can only be defined by users [12-13]. Only products that meet user needs are valuable products. No matter how skilled the technical engineer is, how rich the knowledge is, or how much the technical content of the product increases, as long as the user does not recognize the product, the product is worthless. Secondly, traditional production methods have a large amount of inventory. A large amount of inventory makes it impossible for enterprises to handle the backlog of inventory when user demand changes, so they have to continue producing products according to the original inventory production methods, value does not flow quickly and without waste. When value does not flow well, the entire production cycle becomes very long [13]. When user needs change, enterprises cannot immediately change their original production methods.

2. The Preliminary Appropriateness of Lean Thinking in Educational Management

Lean thinking was mainly used in the manufacturing industry in the past, which can solve the problem of a large amount of waste in the mass production mode of the manufacturing industry. Whether lean thinking can be applied to the field of educational management still needs to be demonstrated. Below is an analysis of the appropriateness of lean thinking in educational management from several aspects.

At present, the education management approach based on cultivating a large number of talents calls for lean thinking. As shown in Table 3, both manufacturing and education have gone through a process from individual, batch to personalize. The origin of lean thinking began with addressing the drawbacks of mass production methods. So why doesn't education management need lean thinking to address the drawbacks of mass talent cultivation in education? The production mode at the beginning of the manufacturing industry is individual production mode the organizational approach for the beginning of education is individual teaching. The manufacturing industry has adopted a large number of production methods to address the drawbacks of individual production methods Education has adopted a classroom teaching organization to address the drawbacks of individual teaching. The lean production method in the manufacturing industry has been around for 70 years, starting from Toyota in Japan in 1950 and spreading to the 1980s. Education management still adopts a large number of training methods. Education management calls for the introduction and application of lean thinking.

Development stage	Manufacturing Industry	Education
Single	Single piece production method	Individual education
	(early 20th century)	(——1860s)
Batch production	Mass production methods	Mass cultivation methods
	(Early 20th century—1950s))	(1860s—present)
Lean thinking	lean production	2
	(1950s—present)	2

 Table 3: The development stage of manufacturing industry and education

3. Conclusions

Lean thinking originates from lean production, which was the first efficient management method adopted by Toyota in Japan. Lean thinking is a key principle summarized from lean production methods, aiming to provide action guidance for managers on how to transition from batch production to lean production. Lean thinking originates from addressing the shortcomings of large-scale production methods. The principle and practical path of lean thinking is that value can only be determined by the end customer, value stream analysis, and value flow, customer demand driving production, and achieving perfection at every step. Lean thinking can reduce waste, be widely applied, and meet the

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diverse needs of users.

The development of production methods can be divided into three stages, namely single piece production, batch production, and lean production. Both manufacturing and education industries have gone through a process from individualization, mass production to personalization. The initial production mode of the manufacturing industry was individual production mode. The organizational method for starting education is individual teaching. The manufacturing industry has adopted a large number of production methods to address the shortcomings of individual production methods Education adopts classroom teaching organization to address the shortcomings of individual teaching. The mass production method solves the shortcomings of the single piece production method, which requires high worker skills, lacks professional equipment, has low production efficiency, and high manufacturing and maintenance costs. However, there is still a significant amount of waste. The lean production method in the manufacturing industry has existed for 70 years, from Toyota in Japan in 1950 to the 1980s. Education management still adopts a large number of training methods. Education management calls for the introduction and application of lean thinking.

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