

# 科技型企业决策行为 递进机理研究

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## 摘 要

随着时代的发展,知识作为内在于经济的核心要素已经得到广泛的共识。以知识为基础,高新技术得以快速发展和广泛渗透,而科技型企业也应运而生并蓬勃发展起来。科技型企业作为致力于高科技产品的开发与生产经营,并富于高知识、高技能和高创新能力的企业组织,具有企业智力聚集特性明显、产品技术含量高、企业竞争优势基于技术持续创新等基本特点,而创新是当今时代的最强音和主旋律。进入 21 世纪以来,与以往不一样的根本特征就在于今天我们依赖技术创新、知识创新来实现经济与社会的持续发展。不过,由于科技发明、科技投入、科技转化项目越来越多,其中暴露出来的与企业经营有关的各种问题也越来越多,由创新所带来的高风险、多异变等问题也已成为全世界普遍关注的大事。

在激烈的市场竞争中,不断地有企业在诞生,也不断地有企业在消亡,还有数以万计的企业为了持久的发展而在努力地拼搏。在这一过程中,决定企业命运的是企业对自我行为的把握。不同的时间、地点与情势,企业所面临的问题不同,相关的影响因素及其影响程度也不同,并且随着企业行为的递进,企业与内外环境发生互动,情

势不断演变,反而又为企业进一步行为的选择提出了新的挑战。这样的状况不断延续,更需要我们实时地对企业行为进行研究与把握。因此,随着时间的推移和情景的变迁,针对企业行为尤其是企业决策行为的研究,就成为一个永远不老的课题。

本研究力求揭示科技型企业若干决策过程中的影响因素、影响力度和影响制动关系,以预测某一决策选择所带来的结果及其变异程度;同时要揭示随行为结果变动而引发的决策行为递进关系,进而揭示行为走向某一新的情势中,影响力量的消长和新生变化,并在此基础上推测未来的行为变化。从而从实质上刻画企业决策行为依势而动的递进过程,为企业决策提供进一步的理论支持和应用基础平台。

在这一研究思想的指导之下,本书在国内外相关研究状况分析评述的基础上,将经济学、管理学、心理学、行为学和决策理论等相关理论的思想结合起来,综合分析刻画具体的决策情势和决策行为。同时从技术上采用定性与定量相结合的方法,在理论分析的基础上,运用系统论、控制论、决策理论和预测学等方面提供的量化技术,介入分析中,将可量化的部分进行了比较详细的处理。然后,采用系统动力学提供的 Vensim 模拟技术软件,进行了仿真模拟分析。在具体分析中,采取由概念创新入手,先分析一般的共性,再分析具体个性,最终进行详细量化处理的方式,同时把量化的分析尽量建立在定性分析认知的基础上,提出了一些有益的思想。

科技型企业决策行为的演进离不开对决策情势的研

判,因此本书首先对科技型企业决策情势的形态进行了分析,提出了决策情势的四维时空结构,分析了科技型企业面对的主要决策问题,并基于新产品开发进行了决策情势的分析。情势是指某一事件中,针对被作用的对象主体,相关各影响因子的作用关系状况及其交互作用而涌现的演化趋向。对于决策情势,本研究意欲突出决策者所要面对的决策对象,目的是关注其未来的发展途径及可能的后果。

决策情势整体所呈现出来的是一个复杂的结构柔变的多棱体,“结构柔变”反映了作用系统内在结构的演化特性。决策情势的柔变结构可以在四维时空结构空间中得以表征,而沿时间维的情势变化隐含在系统柔变结构的演化和决策对象动态运动轨迹中,呈现在我们面前的是一种非线性的递进演化趋向和行为演进过程,同时也伴随着柔变的时空多棱体的结构演化。

企业决策问题是指问题的解决具有多择性,且解决的效果对企业的生存与发展产生重要影响的一系列问题。问题的划分虽然各有侧重,但是实际上各个问题之间有着复杂的层叠与交融关系,每个问题与其他问题均有着广泛的联系,不能严格的割裂开来。由于科技型企业的基本特性就在于以智力为基础的持续创新,而持续创新的价值实现要在市场上完成,所以,解决问题的关键点是新产品的开发决策问题,由此所伴随的是相关的资本运作决策问题、生产运作决策问题和市场运作决策问题。因而本书分析的重点就是基于企业新产品开发而进行的决策情势与递进过程研究。

本书基于新产品开发对决策情势分析模型所进行的研究,首先分析了科技型企业的产品特性、市场情势对局中的参与人行为特性;其次基于相关认识,就市场情势关系与演化倾向进行表征,并研究了一个市场情势分析算例。其中,科技型企业的产品特性包括:(1)依功能效应区隔产品群;(2)价格定位基于价值认知;(3)竞品贴身跟随,功能趋于集成;(4)多方动态博弈,价格递降演化;(5)基于产品而多方竞合。而情势对局中的参与人除了我们所选定的基准对象——企业 $A$ 以外,还有用户、敏感竞合人、非随身策略人和替代竞争人。由于博弈人除企业 $A$ 以外,均是一个群体类且边界具有随机的不确定性,其群体策略常常表现为一个随机组合策略。所谓随机组合策略,是指该策略是其博弈人策略空间中各个纯策略的线性组合,而策略权值是纯策略发生的关联概率。在这里,群体策略的特点是:同群博弈人由于其认知和需求的不同,可能在其策略空间中选择不同的纯策略,同时,在决策信息不完备的情况下,其选择的异化变动效应也会显现出来。

在一个具体的时期,企业 $A$ 通过分析可以给自己的产品定位的是成本和价格,但是,产品的品质没有一个确定的定位,这就是说,虽然产品是企业制造的,但产品能否卖得出去由市场说了算。在客户认知与辨别能力的影响下,产品的购买过程是企业与客户的博弈过程。

企业产品概型是指企业产品所蕴涵的成本、价格、质量等特质形态的统一体。在某一时段,市场上竞品的特质类型究竟是哪几种,事先是不能必然确定的。从市场

的角度看,具有某种特质的产品是依概率出现的。因而企业产品面临的竞争情势具有不确定性,“概型”的概念反映了竞品特质的这种不确定性。

在对决策情势分析的基础上,本书对科技型企业决策行为递进进程进行了研究,并分析了决策行为递进进程的一般表述、动力学表述,然后基于新产品开发进行了相关分析。决策递进是指决策行为人在已往决策的实施过程中,进行决策追踪,并根据环境和条件的变化,因势判别事物发展的可能趋向,实时作出符合决策行为人体内需求的再决策,依次递进所形成的动态序决策过程。决策行为递进具有以下特征:(1)决策递进行为随时因势而动,并保持着决策对象系统的内外关联变动;(2)在演化基础上进行能动的取向与推动;(3)系统思考,多角度分析;(4)循环递进,螺旋式上升;(5)建立在学习的基础上;(6)借助先进的分析评估手段;(7)承认决策的基础平台和路径依赖;(8)力求反映事物的原貌;(9)展现决策的理性。

系统动力学建模的基础源自于其内在的思想与功能。系统动力学的基本思想是系统的行为源自于系统自身内部的结构。而系统的特性恰恰就在于其内在的有机联系。系统动力学的模型模拟是一种结构——功能模拟,并力求揭示复杂系统结构、功能与行为之间的互动演进关系,实现了系统思想的交融与共生。

进化博弈论是近年来博弈论的新发展。进化博弈理论在处理有限理性参与人决策问题时,由于状态信息的不确定性,常常假定参与人遵循某种比贝叶斯法则更简



单的行为规则,这种行为规则只告诉如何采取行动及如何根据经验来改变行为选择。这样博弈参与人就可以计算自己选择不同策略所得的支付,但该支付不是一个期望支付。在本书中,分析设计了一个随博弈策略变动而支付转移的机制。

非线性反馈环表现为极性的权变性,随着事物的演进,常常依势对因果链的极性进行调整,使得作用关系能变动变化,从而出现事物的起伏变化。判择变量所在的回路是一个非线性反馈环。判择变量作为一个嵌入变量,把其他分析方法与系统动力学模拟方法结合起来,既体现时点状态的研判选择,又实现状态的动态递进。本书中市场反应与价格控制作为判择变量,把系统动力学分析方法与决策情势分析方法以及博弈分析方法等有机结合起来。

在本书中,主要有如下三个创新点:

(1)提出了决策情势的概念,把人们面向决策问题的情况分析提升到情势分析,这样,除了人们日常所强调的影响因素及其关系分析以外,刻意突出了在关系机理的作用之下所涌现出来的决策对象的受动趋向分析。在此基础上,提出复杂的情势作用机理具有可测性,而某一决策时点处的决策情势呈现复杂的空间结构并依时推进而出现动态递进的时空结构,进而对时空结构作了一般性的描述与解析。

(2)提出客户、敏感竞合人、非随身策略人和替代竞争人的划分,并指出他们与企业的关系都是竞合关系,他们都是企业的市场博弈人,而市场上博弈人出现的状态

是随机的。基于市场博弈人随机出现规则,本书建立了随机市场情势分析模型,进而给出了随策略变化而博弈支付随动的作用演化机制,也就初步改观了进化博弈下由于行为人有限理性而带来的博弈支付表征主观给定化的现状。

(3)提出决策行为递进的概念,并基于系统力学表征分析方法,初步描绘了决策行为递进进程,同时也引入了判择变量,然后基于判择变量所表征的伴生结构,初步实现了系统动力学方法与情势关联分析法的内嵌与联接。

## ABSTRACT

As times elapses, it is known that knowledge is working as kernel of economy. Based on knowledge, high and new technologies develop quickly and infiltrate widely. At the same time, the enterprise of science and technology emerges and flourishes. The enterprise of science and technology, which bends oneself to the exploitation of high-tech product and management, and is rich in high knowledge, high technology and highly innovative ability, has some basic characteristics such as obvious corporate intelligence collectiveness, high-technology-content product and competitive advantage of enterprise based sustainable innovation of technology. The innovation is the ictus and theme nowadays. From the 21th century, we realize sustainable development of economy and society depending on technology innovation, knowledge innovation, this is the basic characteristic different from past. But then, various problems about enterprise management arise more and more because of increasing S&T inventions, investments in S&T, projects of S&T conversion. Some questions have been paid attention to all over the world, for example high risks and multiple alterations caused

by innovation.

In violent market competition, enterprises come forth and die out persistently, and there are ten thousands of corporations trying their best to develop permanently. In above process, the factor which can decide the destiny of an enterprise is the enterprise's self-control over its behaviors. If time, place and circumstance are different, an enterprise will face different questions, and correlative effect factors and their effect levels are different too. In addition, with the progress of enterprise's behaviors, the enterprise interacts with inter and outer environment, then circumstance will evolve continually; this will give enterprise new challenges to choose next action. This status is continual and need us to study and control enterprise's behaviors real-timely. Thereby the study about enterprise's behaviors, especially for enterprise's decision behaviors, becomes a perpetual question for discussion.

The book tries to open out the factor, level of influence and the restrictive relationship among them in the course of some decisions of enterprise of science and technology in order to forecast the result and degree of variation brought by the choosing a decision. At the same time this book reveals the progressive relationship of decision behaviors according to the change of the behaviors' result. Then it will show ebb and flow of effect force and new change while behaviors are going into a new circumstance, and will guess the change of behaviors in future. The book depicts the progressive process of enterprise's

decision behavior which corresponds with change of circumstance, and it provides business decision with theory support and basic application platform.

Guided by upper thought, the book integrates the ideas of economics, management science, psychics, behavior and decision theory, synthetically analyses and depicts the decision circumstance and decision behavior on the basis of the analysis and comment about relational study status at home and abroad. The quantifiable part is disposed more in detail adopting stability and quantitative analysis theory and using quantitative technology supported by system theory, cybernetics, decision theory and using quantitative technology supported by system theory, cybernetics, decision theory and theory of forecasting, then this book does some simulation analyses with the software——Vensim made by system dynamics. In the process of analysis, the book begins with innovation, firstly analyzes the universality, secondly analyzes the individuality, finally does the detailed treatment, simultaneously tries its best to build quantitative analysis of stability analysis and brings up some good ideas.

Decision behavior's development of enterprise of science and technology depends on the study and choice, so the book analyzes the form of enterprise of science and technology decision circumstance, raises four-dimension-time-space structure of decision circumstance, analyses the decision circumstance based on development of new product and main decision problems faced by enterprise of science and technology. Circumstance

means the status of interactive relationship among relational ineffective factors and the evolutionary tendency of interaction for affected entity in a matter. For decision circumstance, the book wants to make decision object maker must face obvious in order to keep eyes on evolutionary path in future and possible result.

Decision circumstance manifests itself to be a complex polygon with flexible structure, and flexible structure reflects evolutionary characteristics of internal structure in system. Flexible structure of decision circumstance may be represented in the space of four-dimension-time-space structure, and the change of circumstance along with time dimension is implied in evolution of flexible structure of system and dynamic track of decision object, manifests itself to be a nonlinear progressive evolutionary tendency and evolutionary process of behavior to us and goes with structure evolution of flexible space polygon.

Decision problems of enterprise refer to a series of problems whose resolution has multiple selectivity, and the effect of resolution will affect the survival and development of enterprise. Although problem's partition is emphasized differently, in fact there are complicated cascading and blending relation and broad contact among problems, and these problems can't distinguish strictly. The basic characteristic of enterprise of science and technology is sustainable innovation based on intelligence, and the value of sustainable innovation must be implemented in market. so the key of resolving problem is the decision problem of new product development. This is companied by the problems of

capital operation, production and market operation. So this book analyzes the decision circumstance and progressive process on the basis of new product development mainly.

The book studies the analysis model of decision circumstance on the basis of new product development. It analyzes the characteristics of enterprise of science and technology's product, and analyzes the behavior characteristics of players in market circumstance game in the first place. In the second place, it represents the market circumstance relation and evolutionary tendency and studies an analysis case of market circumstance. Thereinto, the product characteristics of enterprise of science and technology include: (1) product group differentiated by function effect. (2) price orientation based on value perception. (3) competitive product moves one by one, and the function are integrated to it. (4) multiple dynamic game theory, the decreasing evolution of price. (5) multiple coincidence on the basis of product. The players in circumstance game include user, sensitive co-opetition individual, non-follower, and substitutable competitive individual besides the fiducial object we choose——enterprise A. Because game theory player is a colony group besides enterprise A, and its boundary has stochastic uncertainty, its group decision looks like a stochastic combined decision. The stochastic combined decision is a linear combination of pure strategy in the space of decision of game theory player, and the weighted value of decision is the affiliated firing probability of pure strategy. The characteristic of group decision

is that group game theory player may choose different pure strategy because of different cognition and requirement, and at the same time the dissimilation effect of choice will show up in the case of imperfect information.

In a specific period, enterprise A can determine products' cost and price through analysis, but can not locate products' quality. That is, although the products are made by the enterprise, it is the market that determines whether the products can be sold out. Under the influence of client cognition and discretion, the purchasing of products seems like a game between enterprise and client.

Probability model of enterprise products is the unity of some properties such as cost, price and quality of enterprise products. In certain period, the property type of products in the market is uncertain. In the perspective of market, products with certain property appear in probability. So competition circumstance of enterprise products is uncertain, which is represented by the concept of "probability model".

On the basis of analysis of decision circumstance, this book studies the progressive process of decision behavior of enterprises of science and technology and analyzes general expression and dynamic expression of the progressive process of decision behavior, then discusses the development of new products. Decision progress implies that decision maker traces the execution of former decisions, judges possible developing tendency of the matter according to the change of circumstances and condi-



tions and makes new decisions correspondence with decision-maker's requirement, which forms a series of progressive and dynamic procedures. Decision behavior progress has the characteristics as follows: (1) Decision progress behavior changing according to circumstance and keeping association & change of system. (2) Making choice and impulse on the basis of evolution. (3) Systemic thinking and multi-dimensional analyzing. (4) Circular progress and spiral rising. (5) Making decisions on the basis of learning. (6) Using advanced analyzing and evaluating method. (7) Admitting the basic platform and path-dependence of the decision. (8) Trying to reflect the matter's original appearance. (9) Showing the rationality of the decision.

System dynamics model is built on its inherent ideas and functions. The basic idea of system dynamics is: system behavior originates from its inner structure. The feature of system is just showed by inner relationship of its components. As a kind of structure-function simulation, system dynamics modeling aims at revealing mutual evolution relationship of a complex system's structure, function and behavior to realize the blend and co-existence of system ideas.

Evolved game theory is the new development of game theory in recent years. Because there is uncertain information of states in the process of finite rational participant making decision, evolved game theory usually assumes that the participant follows some simpler rules than Bayes rule, which only tells how to take action and how to change choice of behavior depending