PART I

The Nature of Knowledge and Entrepreneurship

1 *Soft Knowledge and Entrepreneurship*

How big is the gap between an outstanding enterprise and a mediocre enterprise? It is less than 5%! I deeply believe the percentage is even smaller. This might seem a little sensationalist, but it is not. Remember that the genetic distance between humans and apes is less than 2% and the genetic distance between humans and most mammals is less than 5%. However, it is precisely this small gap that puts humans as the rulers of the earth, and not the other mammals.[1]

From this perspective, it is this small gap that leads to the success of some enterprises and to the failure of others. But what exactly causes this gap? I believe the most important cause is entrepreneurship. Entrepreneurship is crucial to success and without it many enterprises will definitely fail.

To understand this point, we must discuss the essence of knowledge.

Hard Knowledge and Soft Knowledge

During the 1930s Socialist Calculation Debate, F.A. Hayek described the essence of knowledge. He separated knowledge into two simple categories: scientific knowledge and practical knowledge (Hayek, 1937, 1945). We can simply refer to them as "hard knowledge" and "soft knowledge."[2] Hard knowledge refers to knowledge that can be disseminated using language, text, numbers, diagrams, formulas, and other ways. This type of knowledge is objective, anyone can obtain it, and it can be used intensively. Newtonian mechanics and Einstein's

[1] The shared genetic material of humans, chimps, and mammals actually refers neither to the number of chromosomes nor to the number of whole genes, but to the number of DNA "letters" (technically, base pairs) that match each other within the respective human, chimp, and mammal genes. See Dawkins (2009), chapter 10, p. 151.

[2] I prefer hard versus soft knowledge rather than scientific versus practical knowledge because not all hard knowledge is scientific and soft knowledge is more than practical knowledge.

theory of relativity are examples of hard knowledge. Soft knowledge refers to knowledge that cannot be disseminated using language, text, numbers, diagrams, formulas, and other ways. Know-how and intuition, for example, are subjective and personal. They can only be understood without words. This is the meaning of Laocius' saying: "The Dao that can be trodden is not the enduring and unchanging Dao. The name that can be named is not the enduring and unchanging name."

Michael Polanyi differentiated between tacit knowledge and explicit knowledge (Polanyi, 1958, 1959). *Tacit knowledge*, as opposed to formal, codified, or explicit knowledge, can be defined as skills, ideas, and experiences that are possessed by people but are not codified and may not necessarily be easily expressed. Explicit knowledge is know-what, and tacit knowledge is know-how. Scientific knowledge is explicit knowledge, but practical knowledge is primarily tacit knowledge. This means the person knows which actions to take but cannot tell which factors or parts constitute what he is doing or know if they are real or fake.[3]

The basic feature of soft knowledge is that it cannot be effectively transferred and copied but it is extremely important for decision making. It is especially important for creative decision making. Hayek told us people often forget that scientific knowledge is not the only knowledge relevant for decision making:

> a little reflection will show that there is beyond question a body of very important but unorganized knowledge which cannot possibly be called scientific in the sense of knowledge of general rules: the knowledge of the particular circumstances of time and place … The shipper who earns his living from using otherwise empty or half-filled journeys of tramp-steamers, or the estate agent whose whole knowledge is almost exclusively one of temporary opportunities, or the arbitrageur who gains from local differences of commodity prices – are all performing eminently useful functions based on special knowledge of circumstances of the fleeting moment not known to others. (Hayek, 1948[1980], p. 80)

Polanyi even believed that tacit knowledge is the "dominance principle" of all knowledge. Even the most formal and scientific

[3] For a detailed discussion of the differences between two types of knowledge related to economics, see Soto, de (2010). Collins (2010) develops a common conceptual language to bridge the concept's disparate domains by explaining explicit knowledge and classifying tacit knowledge (including relational tacit knowledge, somatic tacit knowledge, and social tacit knowledge).

knowledge follows a certain conscious or creative behavior, without exception, and embodies completely tacit knowledge (Polanyi, 1959, pp. 24–25). For example, Newton's universal gravitation and Einstein's theory of relativity are both hard knowledge, but why did other people not discover them? Newton and Einstein had tacit knowledge that others did not. We do not know how Newton discovered universal gravitation or how Einstein discovered the theory of relativity, and they themselves had no way of clearly explaining it to us.

Soft Knowledge Is Crucial for Entrepreneurial Decision Making

What is the difference between entrepreneurs and managers? Stated simply, the knowledge they base their decisions on is different. Entrepreneurial decision making primarily depends on soft knowledge whereas managerial decision making primarily depends on hard knowledge. Discussions of decision making in economics and most management studies are based on hard-knowledge decision making: "select among alternative" means to achieve given goals. Here, these goals and means can be clearly described, even quantifiable. This is far from real entrepreneurial decision making. True entrepreneurial decision making is not about selecting given means to satisfy given objectives. Instead, it is about actively and creatively seeking new goals and means. Entrepreneurship depends to a large extent on the ability to perceive and judge new goals and new means. In other words, managers use tools but entrepreneurs create tools. Managers achieve goals but entrepreneurs define goals.

From the perspective of decision making, if means and goals are given and similar, then with the same data all rational people will make the same choices. On students' tests and homework, there is only one standard answer for each question. If your answer is different from other students' answers, then either you are wrong, or they are. However, when making entrepreneurial decisions, even with the same data and hard knowledge, different entrepreneurs will make totally different choices. You cannot say *ex ante* who is right and who is wrong. The majority might be wrong.

Why? Because entrepreneurial decision making not only depends on data and hard knowledge, but also on soft knowledge. An individual's imagination, perception, and judgment related to market prospects, technological prospects, and resource availability are soft knowledge.

Judgment is not calculative. Entrepreneurial decision making is similar to a scientist's discovery but is different from so-called scientific decision making!

It is impossible to understand entrepreneurship without understanding the importance of soft knowledge. Hayek even believed it was the contempt for practical knowledge that, to a large extent, caused people to favor production over commerce:

> It is a curious fact that this sort of knowledge should today be generally regarded with a kind of contempt and that anyone who by such knowledge gains an advantage over somebody better equipped with theoretical or technical knowledge is thought to have acted almost disreputably. To gain an advantage from better knowledge of facilities of communication or transport is sometimes regarded as almost dishonest, although it is quite as important that society make use of the best opportunities in this respect as in using the latest scientific discoveries. (Hayek, 1948[1980], p. 81)

Israel Kirzner defined entrepreneurial knowledge as the "highest order of knowledge" – the ultimate knowledge needed to harness available information already possessed. "The kind of 'knowledge' required for entrepreneurship is 'knowing where to look for knowledge' rather than knowledge of substantive market information" (Kirzner, 1973, p. 68). He called it "alertness."

Entrepreneurship transcends data. Even though hard knowledge and data are very useful to entrepreneurs – both are certainly needed for entrepreneurial decision making – but that data can be obtained by anyone. True entrepreneurship certainly transcends this knowable data. Decisions made solely based on data are only scientific decision making, not entrepreneurial decision making. Entrepreneurs must see behind the knowledge and data, the things average people do not see. Also, different entrepreneurs will see the things very differently.

Traditional economics believes the primary function of the market is scarce resource allocation. Assuming that resources, technologies, and preferences are all given, then the next step is to select means according to objectives. Actually, the most important function of the market is not resource allocation, but instead is changing resources – creating new technologies, new products, and new forms of organization – to change the usefulness of resources or even obtain entirely new resources. These changes are what we call innovation. Social progress, to a large degree, is brought about by innovative entrepreneurs. This

type of innovation cannot be provided by data. In terms of innovation, the help that data can provide is extremely limited.

The computer industry is an example. After International Business Machines (IBM) introduced the first computer for commercial use in 1954, computers progressed from large-scale computers, microcomputers, personal computers, laptops, and tablets to smart phones. These were disruptive innovations, but few of the new disruptors came from the original dominant producer.[4] IBM dominated large-scale computers but missed the microcomputer market. None of the microcomputer companies developed into the primary manufacturers of personal computers. Laptops were dominated by Japanese firms such as Sony, Sharp, and Toshiba. Why? Obviously, data was not a reason. The early companies did not have less data than the latecomers or focus less on customers' needs. Instead, the reason was that they judged incorrectly! Incorrect judgment is unrelated to the amount of data.

The reason for this is related to uncertainty. What does uncertainty mean? It means the future cannot be predicted based on past data. This is precisely the reason why we need entrepreneurs. If we can use data to predict the future, then we do not need entrepreneurs. We would only need managers, or even just robots. The entrepreneur's prediction of the future is not based on statistical models or calculation. Instead, it is based on imagination, alertness, self-confidence, judgment, and courage. Or, we should say that any decision that can be made with statistical models is not the function of entrepreneurs. Instead, that is the work of daily management. Therefore, it is no wonder entrepreneurial judgment cannot be understood by average people. During the Industrial Revolution, John Wilkinson, a British steel magnate, proposed building ships with iron. People believed he suffered from "Iron Madness" because getting iron to float on water was not in line with the "hard knowledge" of the time. Regardless of what other people said, Wilkinson created an iron boat and floated it on the River Severn. In a letter to friends, he said: "It answers all my expectations and has convinced the unbelievers who were nine hundred ninety-nine in one thousand. It will be only a nine days' wonder, and afterward a Columbus' egg."[5]

[4] See Christensen (1997), Forward. In the book, Christensen provides various detailed case studies to show that many disruptive innovations do not come from previous dominant firms.

[5] For Wilkson's innovative ideas of iron bridges and iron ship, see Mantoux (1964 [1929]), pp. 307–308.

How Did Ice Become a Mass Consumer Product?

Allow me to use a story related to ice to prove this point.[6]

Today, ice is an important consumer product. In Western countries, as soon as you enter a restaurant, the waiter will first bring you a glass of water with ice cubes. In ancient life, however, ice cubes were rare treasures. Usually, only emperors and dignitaries could afford to enjoy them. How did ice cubes become a mass consumer product? It was the creation of Frederic Tudor, an American businessman, in the first half of the nineteenth century.

Tudor was born in 1783 and came from a relatively wealthy Boston family. His father was a lawyer. Tudor's older brother suffered from arthritis, which caused extreme pain every winter. When he was 17, Tudor was asked by his father to accompany his older brother to the Caribbean, hoping the warmer weather would improve his brother's health. The result was counterproductive. The diseases caused by tropical heat and humid climate accelerated the death of his older brother.

Nevertheless, this disastrous journey gave Tudor a radical – even absurd – idea: if he could transport ice from the freezing north to the West Indies, he might be able to make money. Two years after the death of his older brother, Tudor went into business with his younger brother and cousin. They began transporting the worthless ice in the lake near their house to the hot south. In November of 1805, Tudor sent his younger brother to set up an outpost in Martinique. He also bought a brig called *Favorite* for $4,750 and began collecting ice blocks. In February of 1806, they set sail from Boston Harbor, loaded with ice, toward Martinique. After a three-week journey, the ice arrived in Martinique, but the venture proved to be a failure. The younger brother had not found a suitable place to store the ice, so it quickly melted. More trouble came from the residents of Martinique being disinterested in frozen blessings from foreign countries. They did not know what to use ice for. Tudor lost $4,500 in his first attempt, which was a large amount of money at the time.

This bleak situation repeated itself in the following years. Tudor also suffered the disastrous consequences of shipwrecks and customs embargoes. Everyone laughed at him. The *Boston Gazette* reported on his

[6] For the full story of ice becoming a consumer good and its implications, see Johnson (2014), chapter 2.

shipments of ice but told its readers it was "no joke!" In 1813, he was in so much debt that creditors had him thrown in prison. After he was released, he made another attempt. He managed to borrow $2,100 in 1815 and even borrowed $3,000 at 40% interest in 1816. He built a structure to store ice, then modified the design. He continuously improved the way ice was preserved during transportation and storage to reduce the rate of melting, which involved a series of innovations. Using three things that had almost zero cost on the market (ice, wood chips, and an empty boat heading south), Tudor was eventually commercially successful.

Fifteen years after his original hunch, Tudor's ice trade began to make profits. By the 1820s, his icehouses had spread all over the southern United States, filled with chilled water from New England. In the 1830s, his ice merchant ships traveled as far as Rio, Brazil, Madrid, Spain, and even Mumbai, India. By the time of his death in 1864, Tudor had accumulated a large fortune worth more than $200 million today. He was known as the "Ice King of Boston." Of course, later more and more people imitated him, and the ice trade became a new industry with considerable scale.

Ice becoming a mass product changed America's population and political map because the hot and humid south became more bearable. The ice trade also led to the invention of the refrigerator. A doctor in Apalachicola, Florida used ice transported from the north to cool down patients. A hurricane cut off his supply of ice, so he designed a machine that makes ice, thus inventing the refrigerator.

After the introduction of the refrigerator, man-made ice gradually replaced natural ice. Ice can maintain freshness, which made long-distance transportation of meat products profitable, which changed the role of Chicago in the United States. This also changed America's political map! (Johnson, 2014, chapter 2.)

The Four Points of Entrepreneurship

I used the above example to explain true entrepreneurship. If I must generalize qualities of entrepreneurship, I would like to emphasize the four points below.

Alertness to Profitable Opportunities

Entrepreneurs can sense opportunities where others do not. Many people traveled from the north to the Caribbean, but only an

entrepreneur like Frederic Tudor recognized that transporting ice could be a profitable opportunity. Israel Kirzner even equated entrepreneurship with alertness: "The entrepreneurial element in the economic behavior of market participants consists ... in their alertness to previously unnoticed changes in circumstances which may make it possible to get far more in exchange for whatever they have to offer than was hitherto possible" (Kirzner, 1973, pp. 15–16).

Imagination of the Future

Imagination is the capability to see something that does not already exist or to think of a possibility that has not been recognized by others. Entrepreneurial innovation always starts with entrepreneurial imagination. The mass market for ice was imagined by Frederic Tudor. Joseph Schumpeter said that innovation is a new combination of production (or of different factors of production).[7] A product or technology is composed of something. A new combination is a type of imagination of the unseen future, not observation of the existing things. George Stephenson imagined a horse cart and a steam engine combined together, leading to the steam locomotive. Augusta Ada Lovelace was the daughter of English poet Lord Byron and is called the "mother of programming." In 1841, she wrote: "What is imagination? It is the combining faculty. It brings together things, facts, ideas, conceptions in new, original, endless, ever-varying combinations ... It is that which penetrates into the unseen worlds around us, the worlds of Science" (Isaacson, 2014, chapter 1, p. 8). When are most people the most "imaginative"? When they are sleeping, which is known as dreaming. To entrepreneurs, imagination is dreaming while awake and they believe that dreams can become reality.[8]

Simplification of Complexity

People often criticize economists for thinking issues are too simple. I believe entrepreneurs view issues as even simpler. Perhaps this is an

[7] Combination is the central concept in Schumpeter's theory of entrepreneurship. Schumpeter uses the term combination in two senses: There are new combinations as well as already existing combinations. New combinations are defined as innovations by Schumpeter. For a valuable discussion, see Becker, Knudsen, and Swedber (ed.) (2011), pp. 22–23. For the original idea of new combinations, see Schumpeter (1934), chapter 2.

[8] I will have more discussion on entrepreneurial imagination in Chapter 2.

important distinction between entrepreneurs and managers. Managers often view issues as more complex, but entrepreneurs view them as simple. A man becomes an entrepreneur precisely because he views issues as simple. A man that views issues as complex cannot possibly become an entrepreneur. Simplification encompasses a lot. It helps you grasp the essence of issues while at the same time giving you the courage to resolve issues. Frederic Tudor had the courage to start his ice business because, at the beginning, he thought he only needed to transport ice from Boston to the West Indies. What is so difficult about that? Why did Mr. Li Shufu dare to found the Geely Motor Company? Because he viewed automobiles in simple terms. He has two famous sayings. The first is: "What's so hard about a car? Isn't it just two motorcycles put together?" The second is: "Isn't a car just a sofa on four wheels?" These were the nature of cars as he understood them at the time. Simplified understanding led him toward automobile manufacturing, and he did not look back. Geely is now the most influential Chinese private-sector automobile manufacturer. I have heard many entrepreneurs say that if they had known how hard it would be, they would not have gone into business! But that is the entrepreneur!

Perseverance and Patience

Things appear simple but actually doing them is not that simple. All great entrepreneurs have experienced failure. Frederic Tudor spent two years in debtors' prison. Henry Ford tried three times and failed the first two. Without strong perseverance and great patience, you cannot become a successful entrepreneur. Probably we shall say that the entrepreneur is a person who pursues success even after failing over and over again, as shown by the case of Tudor. Even two years in jail did not defeat him. Chinese entrepreneur Feng Lun says that "greatness is boiled." Another Chinese entrepreneur, Mr. Duan Yongji, said that being in business means "holding on hard." Their sentiment reflects this characteristic.

Columbus' Egg

As a university professor, I must frankly admit that what school can teach students is mainly hard knowledge, knowledge that can be formalized, not soft knowledge that determines the fate of