External knowledge absorption in Chinese SMEs
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3 External Knowledge Absorption in SMEs

This chapter[5] addresses RQ 1: How do SMEs absorb external knowledge? We will explore the underlying routines and practices in the knowledge-absorbing processes of SMEs. Section 3.1 of this chapter introduces the knowledge-absorbing processes, and Section 3.2 divides RQ 1 into three sub-RQs. Then, Section 3.3 describes how the study is conducted by introducing the research method, the data collection, and the analysis processes. Following that, Section 3.4 provides answers to each of the sub-RQs and combines them with discussions. Section 3.5 concludes the chapter with a summary.

3.1 External Knowledge-Absorbing Processes

Knowledge has become the critical factor of the societal development on which modern economies are based. It is widely recognized that knowledge is of utmost importance in building up organizational competitive advantages (cf. Davenport and Prusak 1998, McEvily and Chakravarthy 2002, Andersson *et al.* 2009, Antonelli and Fassio 2016). Scholars in the innovation network streams suggest that firms should "seek to create value and extract value from the network" (Dhanaraj and Parkhe 2006, p. 659). Chesbrough (2003) advocates that companies should purposively use inflows and outflows of knowledge and resources to facilitate internal innovation and expand the markets for external utilization of innovation. Knowledge management (KM) researchers have devoted efforts to enhance our understanding of how organizations identify and leverage collective knowledge to increase innovativeness and responsiveness for competition (cf. Gupta and Sharma 2004, Girard 2015).

To be able to benefit from external resources and knowledge, Cohen and Levinthal (1990) argue that organizations need to develop absorptive capacity (AC) to quickly recognize the value of new external knowledge, assimilate it, and utilize it to create commercial value. Since its origination, the concept of AC has attracted much attention

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from scholars. Many authors have devoted efforts to developing the concept and apply it to the analysis of different phenomena in various fields. Most of the studies consider AC as a concept consisting of different processes regarding how to deal with external knowledge.

In the conceptualization by Cohen and Levinthal (1990), AC consists of three essential processes: (1) external knowledge recognition (EKR), (2) external knowledge assimilation (EKA), and (3) external knowledge utilization (EKU). In contrast, some authors see AC as including four processes (e.g., Mowery and Oxley 1995, Veugelers 1997, Mangematin and Nesta 1999, Zahra and George 2002) that includes (1) knowledge acquisition, (2) knowledge assimilation, (3) knowledge transformation, and (4) knowledge exploitation. As the two most cited conceptualizations, the three-process and the four-process are also related in our thesis. They have been compared in Subsection 2.2.1 in our literature review (see, in particular, table 2.1).

Nevertheless, some authors are cautious about the four-dimensional conceptualization of AC and its measurement. For example, Todorova and Durisin (2007) reject the idea that transformation follows assimilation. Instead, they see the transformation as an alternative to assimilation, which takes place only when the new knowledge does not fit with existing cognitive structures. After close inspection of these arguments, we decided to return to the original definition of AC by Cohen and Levinthal (1990) by treating the concept as containing three processes.

3.2 Partitioning the Research Question

Though existing studies on AC have divided AC into different processes (see e.g., Cohen and Levinthal 1990, Zahra and George 2002), the description of these processes is not specific. While specific sources and outcomes of organizational AC have been uncovered in the literature (see Section 2.2), we still know little about what organizations do when absorbing new knowledge in the identified processes of AC.

We consider AC as including three different processes: EKR (see Definition 1.7), EKA (see Definition 1.8), and EKU (see Definition 1.9). Hence, the investigation of RQ 1 regarding how SMEs absorb external knowledge is partitioned into three sub-RQs accordingly (see Figure 3.1).
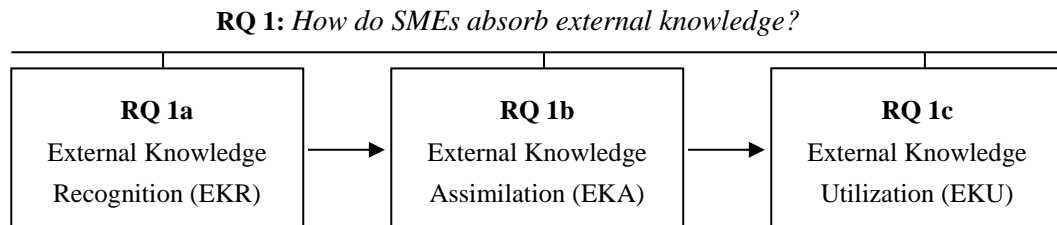
RQ 1: *How do SMEs absorb external knowledge?*

RQ 1a External Knowledge Recognition (EKR)	→	**RQ 1b** External Knowledge Assimilation (EKA)	→	**RQ 1c** External Knowledge Utilization (EKU)

Figure 3.1 Partitioning Research Question 1

The three sub-RQs are formulated as follows.

RQ 1a: *How do SMEs recognize external knowledge?*

RQ 1b: *How do SMEs assimilate external knowledge?*

RQ 1c: *How do SMEs utilize external knowledge?*

As illustrated in Figure 3.1, we treat the three AC processes as three sequential activities for easier understanding. However, some authors have suggested that different AC processes may be interrelated and iterative (e.g., Todorova and Durisin 2007, Camisón and Forés 2010). There is still a knowledge gap in how different AC processes emerge, *interact*, and evolve. By looking into the three AC processes, this chapter may shed some light on the potentially interactive and iterative relationship between the three AC processes.

3.3 Research Design

In the section, we describe how the research is designed and conducted. Subsection 3.3.1 describes the overall methodology, i.e., the interview design. The data collection processes and an overview of the interviewees are provided in Subsection 3.3.2. Subsection 3.3.3 describes the data analysis process.

3.3.1 Research Method

The investigation aims to generate insights into how companies progress through the AC process and what they do in each phase. The investigation is designed to be exploratory and tentative. So, we adopted a qualitative research approach and used the in-depth semi-structured interview as the primary data collection method. Interviews are particularly useful for getting the story behind the participants' experiences so that we can obtain in-depth information around the topic (cf. McNamara 1999, Hollway and Jefferson 2000, Kallio *et al.* 2016).

We prepared a *general interview guide* to ensure that the same general areas of information are collected from each interviewee. The guide contains a list of questions centered on (1) how external knowledge is absorbed in the firms and (2) what will be their perceived challenges in the processes. All the questions are intended to be open-ended to allow us both to focus on the relatively new, complex topic and keep the possibility of developing new theoretical insights. In order to obtain possible uncovered but meaningful information, the interviewees were asked to express their opinions and add topics that they believe are relevant but not included in the interview guide.

In advance of the actual interviews, three pilot interviews by phone were conducted with three potential interviewees. These pilot interviews were meant to check whether the questions can be easily interpreted. After the three pilot interviews, the questions were adjusted according to their feedbacks. For example, the initially designed questions asked the interviewees directly on the three knowledge-absorbing processes. However, the interviewees in the pilot interviews reported difficulties in understanding the three processes and the essence of the questions. One reason is that they considered the phrasing of the questions as too academic and too hard to be understood from an operational perspective. A second reason is probably that the word "assimilate" and "absorb" are almost identical in Chinese (i.e., "吸收") when Cohen and Levinthal's (1990) definition was translated. To make it easier for the interviewees, we changed the phrasing and wording of some of the questions. For instance, we formulated the question

of "How does your company approach those sources for useful knowledge?" instead of directly asking, "How does your company assimilate external knowledge?"

The overall structure of the interview comprises of three parts: (1) introduction of the research purpose, (2) background questions on the interviewees and the firm they work for, and (3) questions on different AC processes in the SMEs and the potential challenges they face. An overview of the structure of the interview can be found in Table 3.1.

Table 3.1: Interview Structure

Interview Structure	Part 1: Introduction	Part 2: Interviewee Backgrounds	Part 3: AC Processes and Challenges
Content	Statements on the purpose of the study	Five questions on the interviewees and the SMEs	11 questions on the AC processes and one on the challenges

The first part of the interview, the introduction, is to provide the interviewees with a broad background of the study and our purposes. We explained the concept of AC with plain words so that the interviewee may understand the concept better and provide more relevant information. The second part, the background questions, is designed to understand the profiles of the interviewees and their companies. They were asked to provide information on the position they hold in the company, the company size, and its core business, etc. After introducing the interview and obtaining the backgrounds of the interviewees and their companies, the third part focuses on how they conduct AC practices in their daily operations and their perceived challenges[6] in the AC processes.

Further detailed information on the interview questions can be found in Appendix 1.

3.3.2 Data Collection

Prior studies indicate that the owner-managers of the SMEs play a crucial role in the growth and performance of the company (cf. Brunetto and Farr‑Wharton 2007, Sarwoko and Frisdiantara 2016). A firm's AC is a joint outcome of the actions and developments by owner-managers and employees in the knowledge environment. Hence, qualified interviewees in our study are those who oversee the daily operations of their companies and have in-depth knowledge of how they absorb external knowledge.

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[6] The findings of the perceived challenges are discussed in chapter 4.

Most of the interviewees in our sample are the principal founders or owners of SMEs. They usually hold an executive position, such as the Chief Executive Officer (CEO) or Chief Technology Officer (CTO) of the SMEs. All the interviewees take part in the all-around operation of the companies and are supposed to have in-depth knowledge of how external knowledge is absorbed in their firms.

We conducted sixteen interviews with owner-managers of SMEs from August 12th to September 9th in 2016 in three different cities of China: Beijing, Shanghai, and Shenzhen. The sample of the interviewees was selected from the author's alumni networks of Peking University and Xiamen University in China. Thirteen of them are network friends and acquaintances of the author. The other three are referred to and connected by the members of the two alumni networks indirectly.

Choosing the alumni networks as the main sources of the research subjects may bring a selection bias to the research as some of the interviewees share similar educational backgrounds, and most of them held a bachelor's or master's degree from the two universities. Such shared characteristics among them may reduce the representativeness of our research findings by under-representing the SMEs of which the owner-managers did not receive higher education. Existing studies have shown that a manager's educational background may influence how they make decisions (e.g., Gröschl and Barrows 2003, Bhagat *et al.* 2010, Loi *et al.* 2019). For instance, a manager with a master's or doctoral degree may already have some connections with universities and research institutes. Those managers are also more familiar with the operations of potential academic partners. Such previous knowledge of and familiarity with academic institutes may stimulate them to be more willing to contact academic partners for external knowledge than the managers who did not attend higher education.

However, selecting samples from the alumni networks allows us to have more open and in-depth communication with the interviewees because of the trust and confidence having been built up by the previous interactions in the networks. The interviewees are

more willing to reveal their thoughts to someone they already know and trust (cf. Hiller and DiLuzio 2004, Jacob and Furgerson 2012, Alshenqeeti 2014).

Ten of the 16 interviewees work in technology-based SMEs from different industries, such as software and IT service. The other six work in SMEs that do not focus on technology but use technology in their core business, such as e-commerce and online education. The SMEs in our sample are relatively small in size. Most of them have less than 100 employees, and five of them employ fewer than ten employees. The age of the firms ranges from less than one year to about ten years.

Table 3.2 shows a cursory profile of the interviewees. A more detailed description can be seen in Appendix 2.

Table 3.2: Profile of the Interviewees

Contents	Gender		Firms size			Industry		Firm Location		
Categories	Female	Male	Micro	Small	Medium	Tech-based	Tech-user	Beijing	Shanghai	Shenzhen
Frequencies	1	15	5	10	1	10	6	7	2	7

All the interviews were conducted informally. The interviews mostly took place at the interviewees' offices or in coffee shops to suit their convenience. The questions were asked and answered in Chinese. All the interviews were recorded in audio format with the permission of the interviewees. We also took notes of the critical points of what the interviewees answered during the interview processes. Twelve interviews were transcribed into text by professional audio-to-text transcription-service agents, and the texts were then translated from Chinese to English for analysis. The remaining four interviews were not transcribed due to poor audio quality. The text of the notes of these four interviews is analyzed together with the text of the twelve interviews.

3.3.3 Data Analysis

All the audio recordings, transcriptions, and text notes were reviewed and analyzed with professional qualitative data analysis software MAXQDA. As the interview is semi-structured, part of the text from each interview has a pre-defined structure following the RQs. They are treated as categories used to group the analysis units in the content analysis. Accordingly, the analysis of this study contains pre-defined categories

as EKR, EKA, and EKU. The semi-structured nature of the interview also allows the interviewees to express their understanding of the theme next to giving answers to the predefined questions.

Our data analysis approach follows the instructions by Graneheim and Lundman (2004) on how to use content analysis in nursing research. We first read and coded the interview texts by providing a label or code to the words or sentences which we consider to have a meaning that is relevant to the sub-RQs. All the codes were then assigned to one of the pre-defined categories. Though we used frequency counts of each code, the final codes from which we formulated the answer were not determined by the frequency of the counts. Many codes formulated in the first round have been re-coded and integrated into new higher-level codes that constitute the research findings. Codes within each category are compared and reviewed to decide their relevance and significance to the RQs. The codes that are considered to be directly relevant to the answers are kept as part of the answers. Some others were reorganized and integrated into new codes to formulate the answers. The remaining codes that were considered irrelevant were excluded and deleted. Potential links and some common patterns that emerged from the codes of different categories are generalized as themes and discussed in the finding sections.

We tried to adopt measures to minimize the subjectivity in the study. For example, in order to improve the validity of the coding scheme, two researchers coded the same three interview texts independently in the first round. The two code systems were then compared and discussed until a certain degree of agreement was reached. The agreed code system was applied as the framework to analyze all the interview text.

Here we add that we used the same approach for answering RQ 2. The findings are described in chapter 4.

3.4 Findings and Discussions

The goal of the qualitative research is to address how Chinese SMEs absorb external knowledge in terms of its (1) recognition, (2) assimilation, and (3) utilization. Accordingly, findings with respect to RQ 1a, RQ 1b, and RQ 1c are presented and discussed as follows. Subsection 3.4.1 provides the answers to RQ 1a. Subsection 3.4.2 describes our findings on RQ 1b. The answers to RQ 1c are expressed in Subsection 3.4.3.

3.4.1 External Knowledge Recognition Criteria

Cohen and Levinthal (1990) define AC as organizational learning processes in which knowledge recognition is the first sub-process before knowledge assimilation and utilization. They formulate knowledge recognition as a process of recognizing the value of new information. So, we view EKR as an evaluation process. This chapter is focused on examining what specific *EKR criteria* (see Definition 3.1) SMEs often use to make the evaluation.

Definition 3.1: External Knowledge Recognition Criteria

> *External knowledge recognition (EKR) Criteria* are defined in our study as principles or standards by which external knowledge is judged in order to decide its value.

The intangibility nature of knowledge makes its evaluation complicated (cf. Xu *et al.* 2014). The valuation of knowledge is often biased and subjective (cf. Menon and Pfeffer 2003). Most interviewed SMEs use qualitative benefit-cost analysis to evaluate external knowledge before making decisions on whether to absorb external knowledge and how to do it.

As one of the interviewees stated: *"However, that solution does not fit us because its costs is too high……It is all about what resources you could afford and whether the resources you look for match the needs"* (coded as "financial costs" that later merged into the higher-level code "expected costs").

A second interviewee mentioned: *"If we want to develop some similar functions to their API, we have to spend half a year, one year…You can manage to develop it yourself if you want. But it takes a lot of time costs…After two months, the product which requires the function is already obsolete"* (first coded as "time costs" then merged into the higher-level code "expected costs").

The interviews indicate that SMEs in China often consider three *criteria* when valuing specific potential knowledge or technology. They are discussed below as: (A) the potential of external knowledge to meet internal needs, (B) expected costs associated with knowledge-absorbing processes, and (C) accessibility of the knowledge sources. The first criterion represents perceived benefits, and the other two perceived costs. The most valuable knowledge item is the one that is accessible and can meet internal needs at affordable costs.

A: Potential of the External Knowledge to Meet Internal Needs

SMEs emphasize the strategic value of the knowledge needed. Therefore, they consider whether it has the potential to meet internal needs as the most critical criterion to recognize its value. Firms are willing to invest more money (or efforts) to obtain knowledge that is expected to deliver strategic value. Knowledge could be defined as an entity to attain specific goals. Comparing its potential performance and functionality with other knowledge candidates is an important means to determine its value (cf. Reich 1995, Bontis 2001, Xu and Bernard 2010, Andrey *et al.* 2020). At the very beginning of the knowledge absorbing process, SMEs mainly consider what technology or knowledge can help solve their problems or bring extra value. This initial stage of knowledge evaluation is highly ambiguous and subjective, particularly when the knowledge involved is implicit. The evaluation process often depends on the experience and accumulated knowledge of the owner-managers or internal experts. When asked about what methods or processes they use to make the evaluation, most of the interviewees replied that they do not have explicit or defined processes.

B: Expected Costs for the Knowledge Absorption

In the decision-making process of valuing external knowledge, the management team of the SMEs is highly cost-sensitive. They look at time and money. The perceived value of potential external knowledge is negatively impacted by the expected costs in the knowledge-absorbing processes. The higher the estimated financial costs and time costs associated with external knowledge absorption, the lower its perceived value, and the lower the probability that it will be chosen. The SMEs aim to value and foresee how much cost it will incur in the knowledge absorption process, particularly the costs in the assimilation and utilization phases.

Financial costs and time costs are the most apparent costs. Not surprisingly, these costs are among what SMEs concern mostly. When the external knowledge is seen as too costly, firms will choose not to absorb it by either finding a less costly option or turning to internal R&D. The reason is straightforward. Extra financial resources will allow a firm more room to maneuver. For SMEs, speed is important. Therefore, it is essential to keep in mind that, in a highly dynamic environment, fierce competition forces companies to deliver fast. Hence, SMEs emphasize strongly how fast specific knowledge can be absorbed and how much time it costs to deliver what they need. When SMEs have several potential solution candidates and need to compare them, time is a crucial aspect to consider. How much time it may take to absorb the intended knowledge has to do with the nature of the knowledge and how they would like to absorb it (cf. Haldin-Herrgard 2000, Buckley *et al.* 2009, Sousa and Rocha 2019). In the fast-paced, high-tech industry, a timely absorption of new knowledge is more critical to a firm's success than in traditional industries (cf. Narasimhan *et al.* 2006, Alblas and Notten 2020).

C: Accessibility of the Knowledge Sources

SMEs in our interviews also stress the accessibility of external knowledge when evaluating it. Strong and broad strategic partnerships are often built on organizational social resources, such as reputation, status, internal resources, and expertise (cf. Eisenhardt and Schoonhoven 1996, Jamali *et al.* 2011, Mtega and Ngoepe 2019). While

big firms could take advantage of knowledge sources in the network such as universities, research centers, and R&D alliances, SMEs often find it hard to build official relations with significant institutions and get access to their knowledge pools (cf. Purcell and McGrath 2013, Cuervo-Cazurra and Rui 2017). Even though some knowledge or technology seems valuable, SMEs must consider whether and to what extent they can access it for assimilation and utilization. SMEs often report that they know what they need and where to find it, but they cannot get access to it because the knowledge might be protected by intellectual property laws, or the knowledge owner is not willing to share it.

Difficulties in getting access to external knowledge represent unobvious costs that SMEs may have to deal with. When the accessibility of specific knowledge is low, the costs associated with the following absorbing process would be high, which in turn reduces the perceived net value of it.

3.4.2 External Knowledge Assimilation Mechanisms

By looking at both organizational and individual-level activities, our interviews search for different *EKA mechanisms* (see Definition 3.2) that SMEs utilize to assimilate external knowledge.

Definition 3.2: External Knowledge Assimilation Mechanisms

External knowledge assimilation (EKA) mechanisms are different methods that firms utilize to assimilate external knowledge.

We asked the interviewees questions regarding how their firms assimilate external knowledge. Two examples of the many relevant answers we received are as follows.

One answered: *"We determine to enter this market and are preparing by cultivating relevant technical knowledge. Earlier this year, we hired a few new employees with relevant experience on it. Skilled employees are a warrant of satisfying products at customer sites"* (coded as "assimilation through hiring new employees").

The other one replied: *"In the beginning, we try to 'copy' what the big firms produced. It was very common in the past, particularly with many firms in small cities"* (first coded as "copy directly" and then merged into a higher-level code "benchmarking and then learning by doing" and in the end "referring to free sources").

Based on the interviews, we distinguished five *EKA mechanisms*. They include (A) consulting personal networks, (B) purchasing products or services, (C) referring to free sources, (D) recruiting new talents, and (E) collaborating with value-chain partners such as suppliers and customers. We discuss them below.

A: Consulting Personal Networks

The interviews suggest that Chinese SMEs see their personal networks as relevant knowledge sources and frequently consult their personal networks for useful knowledge and problem-solving. Formal classmates, alumni networks, friends, relatives, and former colleagues of owner-managers and internal employees constitute the main body of personal networks. The interaction is based on the reciprocal nature of the personal relationship, which helps SMEs circumvent organizational barriers to gaining knowledge from official channels (cf. Xin and Pearce 1996, Chen and Chen 2004, Burt and Burzynska 2017). The knowledge-sharing activities between personal networks are relatively informal and happen mainly at the individual level.

Personal consulting is a usual practice to transfer knowledge from social networks to SMEs (cf. Huang *et al.* 2011, Azagra-Caro *et al.* 2017). Dialogue, in particular, is a vital process of combining different pieces of knowledge (cf. Hedlund 1994, Kasperek *et al.* 2014, Al Saifi *et al.* 2016). The consulting process may take place at various sites and take different forms. For example, doing business and sharing knowledge during dinners is very common in Chinese business culture. Many SMEs report that they often invite individuals who can provide them useful information to have dinner together. Informal meetings around dining tables help build amicability and avoid communication barriers existing on non-personal occasions. In some cases, SMEs also invite relevant individuals to their workplace to give direct instruction in the knowledge assimilation process.

However, such activities may impair the interests of organizations that the donating individuals work for by leaking their intellectual property they would like to protect.

B: Purchasing Products or Services

When there is a need for external knowledge, SMEs sometimes opt to purchase it in the form of products or services to minimize costs spent in the assimilation process, such as understanding and modifying it. A product or service is purchased as a supply that is used in a system. Knowledge embedded in purchased products and services can be seen as enclosed in a "black box". Firms can utilize it and combine it with existing internal knowledge without fully understanding it. A product or service can also be purchased to study the solutions and understand its inside principles. That is viewed as a different process by this study.

Knowledge assimilation in the form of purchasing products and services is influenced by the extent of how much the products or services can be modularized. Modularity is an attribute of a complex system that emphasizes designing structures based on minimizing interdependence between modules and maximizing interdependence within them. Various modules can be mixed and matched in order to obtain new configurations without loss of the system's functionality and performance (cf. Baldwin and Clark 2006, Eidelwein *et al.* 2018). External knowledge assimilated in the form of products and services connects internal knowledge through pre-designed interfaces. A well-designed interface can significantly reduce or preempt the need to alter internal or external structures in the assimilation process (cf. Langlois 1992, Bennett and Flach 2011, Blandi 2018).

According to the interviews, SMEs that emphasize internal knowledge and internal R&D tend to purchase knowledge in the form of products and services in their non-core business or complementary components of their products. From the knowledge-based view, firms are competing for obtaining and sustaining valuable knowledge. Firms do not need to own full knowledge of every component. In an ideal market, they can buy some components in the form of products or services while focusing on developing

cutting-edge knowledge on the core parts of the final product. By doing so, they may improve their specialization or save time for developing the final product.

C: Referring to Free Sources

It is of great importance for companies to have an open eye for market changes and new technologies and adopt the best practices within and across the industry. Referring to various free sources is a useful process to learn as much new knowledge as possible without any costs. SMEs, especially those with limited official channels, rely heavily on online resources that have free access and open channels without paywalls for external knowledge. In the knowledge assimilation process, there is little interaction between SMEs and the knowledge sources at both the organizational and individual levels. The knowledge in these sources is often free of charge and non-exclusive.

For instance, in the software industry, there are plenty of open-source websites that provide functional codes for free (cf. Sowe *et al.* 2008, Naidu *et al.* 2017, Marsan *et al.* 2020). By using existing online codes, developers in SMEs can save much time and financial costs when developing new products or solve internal problems. Many interviewed SMEs conduct Competing Product Analysis (CPA) frequently to analyze and learn directly from the product-and-service design of their competitors or even the pioneers within the industry. The knowledge of the products can be found in the advertisement on the websites and in technical documents at exhibitions.

In such learning processes, SMEs mainly depend on internal employees searching free sources for the needed information and then developing new knowledge based on their interpretation. However, referring to free sources is an EKA mechanism that mainly applies to the knowledge that is explicit and easy to be assimilated. Assimilating sophisticated implicit knowledge often requires SMEs to have in-depth interactions with the knowledge sources and to invest more time and money, which are something that SMEs are unable or unwilling to offer.

D: Recruiting New Talents

Many interviewees in our interviews consider hiring external experts as the most effective mechanism for assimilating external knowledge. Human resources have been seen as one of the most crucial resources in companies. Knowledge can take different forms and can be embedded in different types of entities. People are an essential form of knowledge holders (cf. Jain 2011, Davenport 2016, Holford 2019). Organizational competitiveness, to the greatest extent, depends on the skills and knowledge held by their employees (cf. Hamel and Breen 2007, Papa *et al.* 2018). To hire new talents with needed expertise and knowledge is considered the most effective and quickest means to absorb external knowledge by many SMEs owner-managers.

However, costs associated with recruiting new talents may be relatively higher for SMEs than big firms. Some SMEs express that they cannot pay the market-level wage to attract highly skilled employees. It is only an option when the knowledge is in urgent need and necessary financial resources are available. SMEs sometimes choose to hire external expertise temporarily to solve the most critical and urgent problems to save costs, other than to provide them permanent positions inside. For instance, some interviewed SMEs in the software industry often search and hire individual experts with specific technical expertise to work for them only at weekends or in off-work time to solve challenging technical issues. Those external experts either hold a position in other organizations as their main job or work as freelancers in specific technical fields. Their work is compensated according to the nature of the project and the amount of work involved.

E: Collaborating with Value-chain Partners

Owner-managers of SMEs in the interview rarely report collaboration with other big firms, research institutes, or universities for knowledge-absorbing purposes. However, collaborations with value-chain partners such as suppliers and customers occur frequently in SMEs.

When one problem pops up and requires external collaboration, SMEs could quickly get help from their suppliers and customers. One interviewee told us that their suppliers

share R&D facilities, human capital, and other intellectual resources with them. Knowledge-sharing activities among business partners are supported by long-term business interaction and shared interests and goals (cf. Chow and Chan 2008, Lim *et al.* 2017).

Many SMEs have built mature communication channels with their suppliers and customers both at the organizational and individual levels. With organizational level support, both explicit knowledge, such as knowledge in technical documents and implicit knowledge, such as knowledge carried by an internal expert, can be openly shared and transferred. The employees of the two sides interact with each other, and the links built by previous interaction makes them familiar with each other's need and work convention. Such familiarity would facilitate knowledge transfer across value-chain partners (cf. Kotabe *et al.* 2003, Wu 2017).

3.4.3 External Knowledge Utilization Purposes

In existing research, the utilization of external knowledge is the least investigated part of the three AC processes. One reason may stem from the unclear definition of "utilization". Many researchers take the term "utilization" for granted without providing details of what dimensions the concept comprises or what topics it should include. Most previous research defines utilization as a process to "use" or "implement" assimilated knowledge to create value or performance effects. According to the Oxford Dictionary, "implement" means "to make something that has been officially decided to start happening or to be used". The word "utilize" is defined as "to use something, especially for a practical purpose". The word "use" has the meaning that "to do something with a machine, a method, an object, etc. for a particular purpose". So, the words "use," "implement," and "utilize" are often associated with a purpose. Hence, our investigation of how SMEs utilize external knowledge will be focused on what the purposes SMEs may have when utilizing external knowledge. We express these purposes as *EKU purposes* (see Definition 3.3).

Definition 3.3: External Knowledge Utilization Purposes

> *External knowledge utilization (EKU) purposes* are the intentions of utilizing external knowledge instead of internal knowledge in SMEs. The purposes represent what SMEs intend to achieve when utilizing certain external knowledge.

When asked about why they would like to utilize external knowledge, one interviewee mentioned: *"The need for the outside solution is not necessarily crucial because we have the capacity to develop it too. But the outside solution did help us lower the costs and shorten the development time. This is the case that we utilize the final product of others. You just buy it"* (coded as "to reduce costs").

Another interviewee replied: *"We are not a manufacturing firm. We do not do everything ourselves, which is normal for any medical equipment producer"*(coded as "to concentrate on core business").

Based on all the answers in the interviews, we identify five primary *purposes* of utilizing external knowledge in the SMEs: (A) improving existing products or services, (B) solving urgent problems, (C) reducing time costs, (D) reducing financial costs, and (E) concentrating internal resources and expertise in the core business.

A: Improving existing products or services

Most interviewees expressed that the direct purpose of seeking external knowledge is to improve existing products or services. Firms often face challenges in adding new features or functions to their existing products and services or developing next-generation ones. To have new features or functions in the existing products or services may require SMEs to extend their current knowledge bases by adding new knowledge. When internal expertise is insufficient for needed improvement, firms are motivated to seek new knowledge from external sources. This finding is consistent with the conclusions of the previous study that SMEs pursue open innovation primarily for market-related motives such as meeting customer demands or keeping up with competitors (e.g., van de Vrande, Vareska *et al.* 2009, Oduro 2019).

B: Solving Urgent Problems

The interviewees often report that they resort to external sources for new knowledge when severe problems pop up suddenly. New problems expose knowledge gaps existing inside an organization and force decision-makers to seek external knowledge to fill in the gap. Three typical urgent problems are: (1) a customer requiring adding new features to the current products that are unknown or completely new to internal employees, (2) unexpected technical problems in information system due to a sudden growth of customer number, and (3) the unexpected leaving of key employees who are the only ones with the knowledge of the core business. In these scenarios, SMEs experience the difficulty of relying purely on internal human power or resources to solve problems. Hence, they will search for external resources.

C: Reducing Time Costs

Many SMEs in our interviews cited shortening the time in product development and problem-solving as one of the primary purposes of utilizing external knowledge. First or early mover advantages and fierce competition force firms to compete for the fastest development and delivery of new technologies and products. It is particularly the case in an industry with a short product lifecycle. To rely only on internal human resources and the internal knowledge base to develop new technology or problem-solving may take a longer time. Companies may accelerate the development process by utilizing external knowledge.

Absorbing external knowledge provides more optional extras for faster development and delivery. Nonetheless, knowledge absorption processes also take time. It has been found that different means of knowledge assimilation may differ significantly in length (see Fletcher and Prashantham 2011). Firms should choose proper means of knowledge absorption mechanisms according to the peculiar circumstances and time constraints they face. For example, assimilation by purchasing or buying may take much less time than learning by doing. When the time pressure is very high, firms are more likely to buy specific "knowledge" in the form of products or services instead of learning by doing.

D: Reducing Financial Costs

In our interviews, SMEs have been acutely aware of the role of utilizing external knowledge in reducing development costs. Performing R&D internally for new technology and knowledge will incur costs in buying necessary equipment or in training employees. While absorbing new knowledge from others also incur costs. These costs can be significantly lower if proper mechanisms and suppliers are selected. This advantage is even more evident when a firm's business involves many different components, and many providers of these components exist in the market. To trade with external business partners can help improve specialization and reduce costs.

Moreover, firms may purchase needed knowledge from the market as products or services at a lower cost than developing them themselves. For instance, in the software industry, many technology firms have developed software tools in the form of a Plugin. A Plugin is a software component that adds a specific feature to existing software to implement a specific function. Knowledge embedded in Plugins can be utilized immediately after purchasing them. The cost of buying such a Plugin is often much lower than developing it in-house.

E: Concentrating Internal Resources and Expertise in Core Business

In the interviews, owner-managers express that utilizing external knowledge in unnecessary or complementary parts of their product could help them concentrate limited resources and expertise on their core business. This holds in particular for the most value-adding aspects where they have comparative advantages. Products and services are often systems that consist of many components. Firms collaborate with their suppliers and other network partners to deliver final products to end-users. The competitiveness of a firm is based on its relative advantage in building a few components or the ability to combine various parts innovatively. While SMEs face many challenges in competition with big firms, they can improve their competitiveness by focusing on a specific market, customer group, expertise, or technology so that they can specialize and accumulate in-depth knowledge in limited fields (cf. Chesbrough 2010, Koo and Lee

2019). Focusing on too many areas will risk dispersing the limited resources that a firm possesses (cf. Nath *et al.* 2010, McDowell *et al.* 2016).

3.5 Chapter Conclusion

In this chapter, we described our exploratory research on how SMEs absorb knowledge in terms of (1) EKR, (2) EKA, and (3) EKU. We conducted 16 in-depth interviews with owner-managers of Chinese SMEs in three Chinese cities, Beijing, Shanghai, and Shenzhen.

Regarding EKR, this study arrived at the findings that SMEs evaluate potential knowledge with three criteria: (A) the potential of external knowledge to meet internal needs, (B) expected costs involved in the knowledge absorption processes, and (C) accessibility to the knowledge sources. Once the external knowledge is deemed to be valuable, SMEs usually utilize different mechanisms to assimilate it.

Regarding EKA, our study identified five EKA mechanisms used frequently by SMEs, including (A) consulting personal networks, (B) purchasing products or services, (C) referring to free sources, (D) recruiting new talents, and (E) collaborating with value-chain partners such as suppliers and customers.

Regarding EKU, our findings show that SMEs mainly use external knowledge for the purposes of (A) improving an existing product or service, (B) solving urgent problems that existing internal knowledge cannot solve, (C) reducing internal time costs, (D) reducing internal financial costs, and (E) concentrating internal resources and expertise as much as possible in core business areas.

The findings of this chapter (see Table 3.3) bring our attention to the cost-related issues associated with AC processes. It is shown in our interviews that SMEs are highly cost-sensitive when making decisions regarding absorbing external knowledge, particularly in the EKR and EKU processes. For instance, the expected costs are identified by our study as an important criterion to evaluate potential external knowledge in the EKR phase. Different EKA mechanisms are associated with different costs (see

discussions in Sub-section 3.4.2). Reducing time and financial costs are two of the five primary purposes of EKU in SMEs.

Table 3.3: Summary of the Chapter Findings

Research Questions	Findings	
1. How do SMEs recognize external knowledge?	EKR Criteria	A: Potential of external knowledge to meet internal needs
		B: Expected costs for knowledge absorption
		C: Accessibility to the knowledge sources
2. How do SMEs assimilate knowledge?	EKA Mechanisms	A: Consulting personal networks
		B: Purchasing products or services
		C: Referring to free sources
		D: Recruiting new talents
		E: Collaborating with value-chain partners
3. How is external knowledge utilized in SMEs?	EKU Purposes	A: Improving existing products or services
		B: Solving urgent problems
		C: Reducing time costs
		D: Reducing financial costs
		E: Concentrating internal resources and expertise

The fact that cost issues influence all the three AC processes indicates that different AC processes are related. For instance, an SME that is with limited resources may have to evaluate external knowledge candidates with an emphasis on the potential costs when absorbing them. They are more likely to choose the EKA mechanisms that are more economical, such as referring to free sources or consulting personal networks. The purpose of utilizing external knowledge is more likely to reduce costs. Such a connection between different AC processes suggests that they are interrelated with each other.

Moreover, though different AC processes can be distinguished conceptually and are treated largely as a series of sequential activities, our observation suggests that the three AC processes interact and provide feedback to each other. The whole knowledge-absorbing process is iterative in nature. To be specific, the EKR process entails anticipating the costs involved in the EKA and EKU processes because the EKR and EKU processes may take a big chunk of time and financial costs of the knowledge absorbing process. The evaluation process cannot be complete until the firm assimilates and utilizes the intended knowledge. The EKA and EKU processes provide necessary information on the real value of the intended knowledge to the firm. The EKA and EKU

processes may overlap as the assimilation processes involve utilization. Especially for tacit knowledge, a firm can only fully assimilate it when the knowledge candidates are successfully utilized and its value is realized. Tacit knowledge requires a certain extent of learning by experiencing or learning by doing (cf. Lam 2000, McLeod *et al.* 2006, cf. Agyemang and Boateng 2019). These different AC processes could go back and forth several times until the intended knowledge is appropriately valued, assimilated, and utilized.

Based on the analysis, the interrelated and iterative relationship between the three AC processes can be illustrated in Figure 3.2.
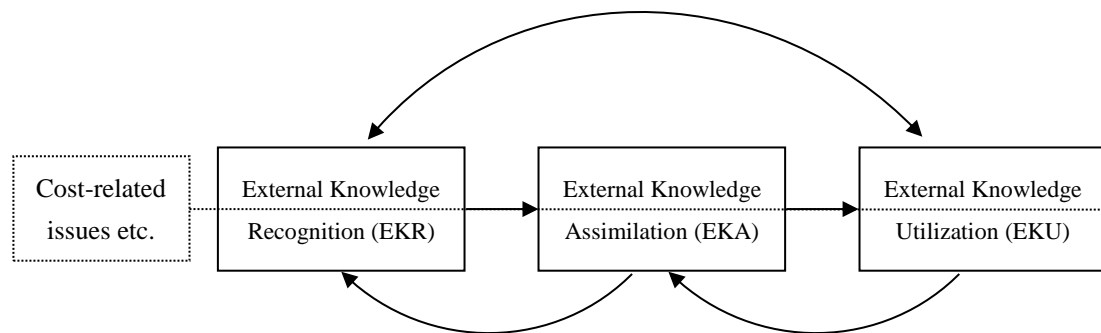
Figure 3.2 Interrelated and Iterative Relationship between AC Processes

The highlighted cost-related issues in the knowledge-absorbing processes of SMEs may reflect the fact that SMEs have to face the challenge of having limited resources. Nevertheless, SMEs may face more challenges in their knowledge-absorbing practices because of their smaller sizes, particularly compared to large firms. Towards this direction, we will investigate what particular challenges SMEs may face in their knowledge-absorbing processes in the next chapter.