Knowledge Utilisation in Chinese Medium Sized Manufacturing Firms – An Exploration under the Backcloth of Quality Improvement

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Abstract
Purpose – This paper reports findings of up-to-date insights to fill the knowledge gap of lack of theoretical and practical understandings of how knowledge is utilized in medium-sized enterprises (MEs) for ensuring their performance excellence, healthy survival and growth, particularly using the contextual background of quality improvement as the standing point to concretize the research content and research participants’ mind-set for data collection.

Design/methodology/approach – The empirical data were attained by conducting firstly an multiple-case study and thereafter a structured interview. Insights were obtained through analysing the collected data as well as triangulating the findings with the contention from the extant literature where available.

Findings – A set of approaches for effective quality improvement knowledge (QIK) utilization in MEs have been identified and attested as well as prioritised for a clear guidance on their application by practical businesses.

Originality/value – As a pioneering study on the particularly focused issue, namely a current knowledge gap – QIK utilization in MEs, theoretically the research contributes to the enrichment of the current KM and QI literature with a primary focus on knowledge utilization in MEs. Practically its findings provide insightful guidance to practice on the approaches of QIK utilization.

Keywords Knowledge utilization, Medium-sized enterprises, China

1. Introduction
The importance of small and medium sized enterprises (SMEs) to national and global economy has been evidenced extensively (e.g., Kuratko, et al., 2001; Brink and Madsen, 2015). SMEs’ pivotal contribution is reflected in various aspects, including that at the strategic level they drive and ensure the growth, stability of the economic systems and the well-being of the general public, and that at operational level they provide goods and services to customers, contribute to national taxation and secure employment locally, nationally and often internationally.
The huge number of small sized enterprises (SEs) and medium sized enterprises (MEs) actively operating in different business sectors have also in their own right manifested their critical role in economic systems (Brink and Madsen, 2015; Šatanová, et al., 2015). Research has evidenced as well that in the current national and global economies, MEs function as one of the major forces playing a cornerstone role in driving the economic recovery and growth (Coltorti, et al., 2013; Massaro, et al., 2016). Therefore, the MEs’ healthy survival and continuous growth are of salient importance not only to themselves but also to the various stakeholders in the contemporary economic systems (Brink and Madsen, 2015; Kumar, et al., 2016; Massaro, et al., 2016).

Within MEs and other type organisations, quality as one of the important strategic factors is a fundamental operations capability underpinning and maintaining businesses’ competitiveness in marketplace (Lorentz, et al., 2016). Many MEs have endeavoured in implementing various quality improvement (QI) approaches and techniques/technologies (Kumar, et al., 2016; Lee, 2004; Kuratko, et al., 2001) for enhancing their performance and ensuring/improving their products’ ability to fulfil the designed functionality and meet the customers’ requirements. Meanwhile, the large amount knowledge of aforementioned QI processes, techniques/technologies, approaches, etc. comprising the body of QI knowledge (QIK), which exists/is being created externally and internally to the individual MEs and can be used for achieving their operations excellence. However, the extant research on KM in SME sector in general focuses on SMEs as a whole without differentiation, alongside the phenomenon that KM research mainly concentrates on large enterprises (LEs) (Durst and Edvardsson, 2012; Massaro, et al., 2016). Namely, alongside SEs, MEs as a particular type organization barely receive any research attention (Durst and Edvardsson, 2012; Tortorella, et al., 2015; Yasir and Majid, 2017).

One needs to notice that since there is a heterogeneity between SEs, MEs and LEs (Brink and Madsen, 2015; Shrafat, 2018; Taura and Radicic, 2019), the means of utilizing the QIK tend to be different between different sized enterprises, namely the approaches used by LEs very possibly cannot be directly or effectively followed by MEs, the same phenomenon also applies to SEs in view of the possibility of applying their means of knowledge utilization in MEs. This contention has been resonated by Pett, et al. (2012) in their research revealing that there is a clear difference on learning/knowledge related aspects between SEs and MEs. This finding has been further attested by the very recent research from Klepić, et al. (2020) and Tamulevičienė and Androniceanu (2020), arguing the significant difference between SEs and MEs in many aspects of operations and the necessity for further investigation. Therefore there
is a clear need to study the particularities of the relevant issues in SEs and MEs through separated research focusing on them respectively. For a manageable scale, the empirical investigation of the research reported by this paper focuses on MEs. Meanwhile, as contended by research, the utilisation of knowledge is the most critical one among the facets of KM in business operations, since it directly adds value to businesses (Edvardsson, 2009), nonetheless there is a lack of research on its concrete approaches (Yasir and Majid, 2017; Massaro, et al., 2016; Durst and Edvardsson, 2012).

The aforementioned circumstances as a whole present a knowledge gap of the understanding of knowledge utilization approaches in MEs particularly herein apropos of QI. This research concentrates on this issue and its findings fill the gap, contributing to the current KM and QI literature by providing ME centred insights with a primary focus on the utilization approaches of KM alongside QI as the general contextual backcloth; meanwhile they also provide insightful guidance to practice of QIK utilization in MEs and are also referential to other type enterprises.

The industrial specialty of MEs focused by the research is manufacturing sector, on account of that it is a crucial cornerstone to economic development (Colotla, et al., 2018; Lorenz, et al., 2016; Pitelis and Antonakis, 2003), and that research findings from manufacturing MEs can also be referential to the businesses within and beyond the sector (Wang, et al., 2020).

In the rest of the paper, the background literature review is presented in next section covering the concrete aspects of the research, followed by the introduction of methodology directing the research activities, thereafter is the summarised findings and analysis, and then the paper finalises with concluding remarks and future research.

2. Literature background of the research

2.1 Defining MEs in this research

MEs are defined differently in different countries and sometimes even for different industrial sectors in the same country (Loecher, 2000). Within this research, in view of the close alignment between EU (Loecher, 2000) and UK definitions, and with a consideration of that the two case MEs at the first stage research are related to UK/EU, as well as that a planned follow-up larger scale project to compare between British/European and Chinese MEs, the definition from Companies Act (2006) of UK has been adopted in term of employee numbers; henceforth, in this paper, MEs refer to firms with a size of between 50 to 250 employees.

2.2 KM in MEs
As a fundamental strategic as well as operational approach, KM ensures all types of businesses to successfully compete, survive and profit (Pino, et al., 2019; Bojica, et al. 2017).

Heretofore, KM has been researched extensively, nevertheless the research largely concentrated on LEs or SMEs as a whole, and produced generalized insights without a focused consideration of MEs, resulting to the dearth of understanding of MEs’ KM (Coetzer, et al., 2012; Tortorella, et al., 2015). Apropos of the differences of MEs’ organizational structure, capabilities and business practices to other type businesses, as well as the resource constraints facing them (Durst and Edvardsson, 2012; Shrafat, 2018), the approaches for MEs’ KM inherently have their peculiarity and dissimilarity from that of LEs and SEs (Wang, et al., 2020). However, as aforementioned, the understanding of them is not readily in place. The lack of exploration on pivotal elements of KM in MEs (Shrafat, 2018; Serenko, 2013; Durst and Edvardsson, 2012) not only illustrates the unthorough theoretical understanding of MEs’ KM, but also entails that the practitioners in this segment cannot have relevant theoretical guidance in their business operations decision making (Booker, et al., 2008), which is very crucial for business success (Oliva and Kotabe, 2018). A situation as such merits further extensive investigation (Wang, et al., 2020; Durst and Edvardsson, 2012; Massaro, et al., 2016). Nevertheless, to make the investigation more concentrated, for a concrete standing point to attain in-depth insights and also with a further consideration of QI’s pivotal importance to business success, this research does not examine KM as a whole entity and in a full range of MEs; instead, it focuses on QI knowledge (QIK) utilisation and in manufacturing MEs, with rationales further elaborated in next section.

2.3 Knowledge utilisation, quality improvement (QI), case organization type and region focused by this research

Knowledge utilisation concerns with the formats and procedures for the application of the appropriate knowledge within an organization for creating value to customers and generating revenue for the organization itself, as well as ensuring high level of operations performance to satisfy both the internal and external stakeholders. As evidenced by the existing research literature, knowledge utilisation is much inadequately explored in MEs as a separate contextual setting (Durst and Edvardsson, 2012; Massaro, et al., 2016). There is an absence of a holistic KM mechanism in many MEs in directing knowledge utilization (Centobelli, et al., 2018). Consequently more and further research is much needed in order to enhance the theoretical understanding of the associated issues and to provide guidance to real world MEs in their KM practices (Wang, et al., 2020; Durst and Edvardsson, 2012; Massaro, et al., 2016).
QI as a crucial functional process with its related activities contributes strategically in securing a company’s competitiveness (Nobel, 1995; Lee, 2004). Meanwhile, different from other types of knowledge, QIK focuses on quality – a core competitive factor of a business, with a particular attribute of integrating both strategic and operational dimensions of continuous improvement (Kuratko, et al., 2001; Šatanová, et al., 2015; Lee, 2004). The utilisation of QIK can ensure MEs to attain improved capability and enhanced competitive advantage. While in reality, MEs are not a scaled down version of LEs (Durst and Edvardsson, 2012) and also not a larger version of SEs, they have differences of organisational structure and management practices to that of LEs (Durst and Edvardsson, 2012; Brink and Madsen, 2015) and SEs. Consequently, the detail KM contents/procedures obtained from the research on LEs and SMEs as a whole may need to be acclimated to operationalise the QIK utilisation in the business context of MEs. Hence a research centring MEs’ knowledge utilisation with QI as a general backdrop will contribute valuably to the KM literature and guide MEs’ KM practice effectively. And currently, the coverage of research on MEs’ KM among different countries is unbalanced; China, as a representative fast developing country and a newly emerging market as well as a globally driving force for economic development, has been largely neglected from research focus (Massaro, et al., 2016). Apropos of all the above-mentioned, it is considerably meaningful and critically necessary to obtain further and more insights of the issues relevant to ME KM in China.

Meanwhile, within Chinese SME sector, manufacturing MEs yield the biggest contribution towards the total sectoral business revenue (Liu, 2008; Ning, 2018). Therefore in this research, manufacturing case companies are selected with the aim to obtain insightful understandings, which could be referential to KM in more and other type businesses as well (Wang, et al., 2020).

2.4 Questions to be explored by the research

Based on the learning and inspiration from the aforementioned extant literature (e.g., Pino, et al., 2019; Durst and Edvardsson, 2012; Massaro, et al., 2016), as well as further scrutiny by a focus group of experts, the detailed research question content is concretised as below.

What are the various approaches used for utilizing QI knowledge in MEs?

The question also highlights the background context of this research – QI, namely with knowledge utilization as the primarily targeted aspect, alongside QI as a critical backdrop.
3. Research methodology followed by the research

The research is completed through three stages depicted by Figure 1 and further elaborated afterwards.

Figure 1. Research stages and comprising elements and their logical relationship

The research question was preliminarily derived from literature review following an approach of deductive content analysis (Elo and Kyngäs, 2008), and then its relevance has been further examined and ensured by a focus group. This research investigates the unknown aspect of QIK utilisation, correspondingly a case study strategy has been adopted to obtain, consolidate and finalise the first two stages’ findings (Voss, et al., 2002; Yin, 2018) before their further attestation by interview with more respondents from manufacturing MEs locating in different industrial segments and regions. The first stage mainly focused on collecting and analysing data from two case MEs. At this stage, the data were firstly collected through a combination of semi-structured interview and focus group methods (participants comprised by case companies’ employees categorised into four types), and then they were analysed through summarisation, comparison and triangulation to consolidate the findings. Afterwards, at the
second stage, focus group sessions were organised in additional four case companies to further examine and attest the findings from the first stage. Finally, at the third stage, structured interviews have been conducted with 40 respondents from MEs with various specialties in the manufacturing sector to triangulate and finalise the findings.

In the whole research process, for data collection, all the participants preferred note taking of their discourses, hence this method had been followed to document the data. The interview transcription after each individual session was a further check and summarisation of the noted points by the authors (afterwards, the interview summary was sent to the respective interviewee for further examination of accuracy and inclusiveness before data analysis process). This way is less time consuming than transcribing data from oral recoding, therefore ensures a higher processing efficiency. While the summarised consensual viewpoints from the respective focus groups have been further confirmed by the group members at the end of each session.

A particular attribute to highlight is that in data analysis, no software package has been used to assist the process, all work has been conducted by the authors manually through firstly tabulation – an often used method by content analysis (Elo and Kyngäs, 2008), and then comparison, triangulation and synthesis (e.g., Costa et al., 2016). Although less efficient, this approach provides more opportunities for distilling subtle and detail connotations from the participants’ discourses, avoids the drawbacks from analysis conducted by software (St John and Johnson, 2000).

Following the mentality of inductive approach for content analysis (Elo and Kyngäs, 2008), the narrations (data) with same meaning (wording might be different) were consolidated into summarised expressions (as the answers to the research question, they are basically the applied approaches for QIK utilisation) for convenience/effectiveness of understanding and presentation, the research question was coded as Qku representing the overarching research clou and meanwhile these answers to it were assigned with numerated extension respectively to Qku, as demonstrated in Table 3 and detailed in Appendix 1. Details of the procedure of data analysis are included in Appendix 2.

3.1 Case study strategy, interview and focus group

As contended by researchers (e.g., Yin, 2018; Voss, et al., 2002), case study can effectively ensure the exploration on emerging issues in a focused context, and to clarify vague viewpoints or unclear understandings to refine or enrich the existing theories. Case study as a research strategy has been frequently applied in investigating the contemporary issues (Vlachos, 2015). More extensive application of case study in research in the management related fields has also
been advocated (Childe, 2016). The focus of this research – QIK utilisation, falls into the remit where case study strategy can investigate effectively.

Within the three stages of empirical data collection, the methods of semi-structured/structured interview and focus group are implemented. The structured interview in this research was applied in an adapted manner (e.g., Wang, et al., 2020) by including a few open-ended questions for acquiring additional relevant information. These research methods have been often used in the same or similar types of research and been proven very effective in obtaining comprehensive data (e.g., Pino, et al., 2019; Wee and Chua, 2013; Coyte, et al., 2012). Based on the interviews and focus group sessions, insights on QIK utilisation are attained through examining, summarising and consolidating the viewpoints from research participants (Tam and Gray, 2016; Rittenhofer, 2015) following the data analysis protocol in Appendix 2.

3.2 Research process at the first stage

At the first stage, to collect empirical data from the two case companies, a snowball approach has been followed in selecting the interviewees, namely a next interviewee is recommended by the previous research participant, to avoid researchers’ potential bias affecting data objectivity and hence improve the research findings’ reliability (Tam and Gray, 2016). The interviewees all come from the areas either directly or closely involved in QI; and according to their roles in the organizations, they were categorised into four groups: managers, functional staff, production foremen and production line operators. The diversity of participants’ composition as such complies with the replication logic of case study research (Yin, 2018) – collection of data from multiple levels/perspectives can ensure an effective triangulation of viewpoints for a comprehensive coverage, and thus to obtain more insightful understandings. Within each participant category, supported by the case companies, the number of interviewees is not restricted. This ensured data saturation – information repetition appears without new points (Tam and Gray, 2016).

The duration of each interview session varied from around 30 to 45 minutes, due to the type of interview as well as the differences of the respondents’ characteristics, e.g., their job roles, their communication skills, and that from the researchers’ side – the amount of further probing on viewpoints during the interview processes. The saturation of data appeared after either 3 or 4 interviews in all the category groups, this is rather early and might be a reflection of the alignment of mind-sets among the employees within the same categories.
In addition to the research question, a set of general background internal and external factors (GBIEFs) advocated by researchers and deemed by the authors as influential to QIK utilisation, have also been examined. They are: (1) What is the respondent’s view on the current situation of the national economic development (with a consideration of SMEs)? Whether do they think/how does this economic situation affect the ME’s QIK management? The heavy influence of external macro-economic environment on business processes and activities, has been contended by the existing research (Sitharam and Hoque, 2016; Choochote, 2012); (2) What specific industrial segment their business belongs to (as indicated by their products)? Whether do they think/how does their industrial specialty affect their QIK management? The conditions of a company’s industrial segment can either positively or negatively affect the efficiency and effectiveness of KM, therefore to explore this issue is of critical meaningfulness (Cerchione, et al., 2015); (3) What information and communication technologies (ICTs) have been implemented in the company’s business processes? Whether do they think/how do ICTs influence their QIK management? ICTs’ direct impact on KM performance has been argued by researchers (Cerchione, et al., 2015; Choochote, 2012).

Meanwhile, during interview in Case company A, a new factor was raised by majority managers and all functional staff, namely, the status of business operating condition (in-growth/in-profit or in-decline/in-deficit); and the importance of this factor is supported by three different interviewee groups in Case B – all managers, vast majority of the functional staff and production foremen, hence this factor has also been enquired as (4) What is the current operating condition of their company? Whether/how does the operating condition impact their QIK management?

The interviews were conducted following the interview protocol (Appendix 2) to ensure the content and format standardisation. A total number of 9 managers, 11 functional staff, 10 production foremen and 13 production line operators participated at this stage research. Table 1 provides the general information of the interviewees from the two case MEs. The interviewees joined in the research on a voluntary base with active attitude. Their response to the research question was noted simultaneously by two authors following the mentioned protocol. The approach of using two researchers to take notes of the information at the same time and then triangulate that after-session, enhanced the completeness and accuracy of the attained viewpoints.
Table 1. The interviewees’ general profile at the first stage research

<table>
<thead>
<tr>
<th>Interviewee category</th>
<th>Number of participants</th>
<th>Case A</th>
<th>Case B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td></td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Functional staff</td>
<td></td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Production foreman</td>
<td></td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Production line operator</td>
<td></td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

The after-interview-session examination on the summarised notes’ content by the respective interviewees, revealed no further amendment. Then focus group sessions were organized with the same respondents (interviewees) from the individual category groups respectively, to obtain consensual or potential contradictory viewpoints or further insights through scrutinising the summarised viewpoints from the interviews. The focus groups were facilitated by two authors and the findings from the focus groups had also been noted by the same two researchers simultaneously to ensure a comprehensive and accurate summarisation of the obtained insights, which were finalised at the end of the sessions.

The outcome of the focus group sessions has no contradictory viewpoint against the summarised interview findings correspondingly to the respective participant groups of the case companies. Based on this confirmation, within and cross-case analyses were conducted.

The detailed discourse of the finding analysis (including the criticality prioritization) is presented in Research findings and analysis section.

3.3 The case companies at the first stage

In accordance with the replication logic (Yin, 2018), the first two stages of this research were designed as a multiple case study. At the first stage, following a convenience sampling strategy, two case companies were selected from two regions with different economic development levels (details seen in Table 2 for case companies A and B), for triangulation of primary insights obtained from them. They are both joint ventures in mechanical manufacturing industry, almost all of their employees are Chinese, including senior/top management. This situation entails that firstly their business operations have integrated with the up-to-date management practices and strategies brought in by the business partners, secondly the organizational culture has been impacted significantly by Chinese mentality. Consequently they can to a large extent represent Chinese manufacturing MEs with high level of management and strategic know-how of
business operations. All these serve as the rationale of them being selected as the first stage cases. The concrete selection criteria include: The case companies 1) should be MEs, 2) are willingly to share their KM practices and strategies, 3) should be in business for at least three years, that gives the organizations sufficient time in forming their inherent pattern of KM practices/strategies, 4) should have been surviving well in the marketplace. Through purposively selecting case companies according to these criteria, a solid foundation can be established for effectively and efficiently collecting the insightful data. The additional rationale of using two cases at this stage is to ensure a manageable scale at the beginning stage, meanwhile the exploration on them also functions as a pilot test on the inclusiveness of the elements to be enquired to secure the coverage of the investigation.

Table 2 summarises the general profile (company names are disguised per the confidential request) of the first stage case MEs. Meanwhile, with a consideration of the information inclusiveness, it also includes the general profile of the additional cases at the second stage.

Table 2. The general profile of the case companies

<table>
<thead>
<tr>
<th>Case company</th>
<th>Size (employee number)</th>
<th>Business focus (specialty industry within manufacturing sector)</th>
<th>Business operating condition</th>
<th>Location (economic development level) *</th>
<th>Years in Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Stage 1)</td>
<td>246</td>
<td>Components manufacturer and supplier in automobile industry</td>
<td>A continuous growth in recent 4 years</td>
<td>Northern region in China (less developed region)</td>
<td>6</td>
</tr>
<tr>
<td>B (Stage 1)</td>
<td>200</td>
<td>Components and sub-assemblies manufacturer and supplier in automobile industry</td>
<td>A slow but stable growth ever since the commencement of business</td>
<td>Middle region in China (developed region)</td>
<td>4</td>
</tr>
<tr>
<td>C (Stage 2)</td>
<td>232</td>
<td>Components manufacturer and supplier in home appliances production industry</td>
<td>A short time period downturn 3 years ago, while business grows in recent years</td>
<td>Middle region in China (developed region)</td>
<td>9</td>
</tr>
<tr>
<td>D (Stage 2)</td>
<td>135</td>
<td>Electronic devices manufacturer and supplier in electronic instrument manufacturing industry</td>
<td>A stable growth in recent 3 years</td>
<td>Northern region in China (less developed region)</td>
<td>5</td>
</tr>
<tr>
<td>E (Stage 2)</td>
<td>93</td>
<td>Plastic toy manufacturer and supplier in toy manufacturing industry</td>
<td>The growth rate has seen a slowdown in recent 3 years, but still survives healthily</td>
<td>Eastern/Costal region in China (developed region)</td>
<td>10</td>
</tr>
<tr>
<td>F (Stage 2)</td>
<td>212</td>
<td>Wood home-furniture manufacturer and supplier in furniture manufacturing industry</td>
<td>A business with stable market demand ever since the commencement of business, with a stable profit level</td>
<td>Southern region in China (developed region)</td>
<td>12</td>
</tr>
</tbody>
</table>

* The regional economic development level is based on Qi (2015) and National data (2018)
3.4 The second stage focus group sessions to attest the first stage findings

Although the first stage two case MEs are in general very much Chinese styled, they are joint ventures; namely they can potentially have some differences to the purely Chinese owned MEs, this might jeopardise the inclusiveness of the findings. To address this concern and also with a consideration of having more cases to obtain broader insights, following the same criteria and process as that for the first stage, four purely Chinese owned manufacturing MEs were selected as additional cases.

Nonetheless, only focus group has been used for data collection in these cases. The focus groups each consist of five to six participants except that one manager group has four people. The data analysis followed the same ways as that for the first stage cases; nevertheless, the points discussed in these focus groups are the prioritised findings as illustrated in Table 3/detailed in Appendix 1.

3.5 The third stage – structured interview attestation on the prioritisation and inclusiveness of the findings

There still is a possibility that the six cases at the previous two stages cannot fully examine and prove the applicability and the prioritisation of the elements of the findings. Hence, the authors carried out a third stage research of structured interviews with forty respondents from different manufacturing MEs, through WeChat or telephone whichever convenient for the interviewees, with the aim to attain more insights from managers (Brettel and Rottenberger, 2013; De Clercq, et al, 2015) in charge of QI related issues in MEs from various manufacturing industrial segments and regions in China. A sample with forty individuals is an upper range of number of interviewees in a research for obtaining sufficient data (Hagaman and Wutich, 2017; Seidman, 2006). There are both close-ended and open-ended questions in the questionnaire for this round interview. The close-ended questions require the interviewees to score the degree of their agreement to each prioritised individual answers to the research question (listed in Research findings and analysis), on a five point scale: 5 - Strongly agree; 4 - Agree; 3 - Unsure; 2 - Disagree; 1 - Strongly disagree. In case of agreement degree below 3 for any answer, the respective interviewee is required to provide his/her prioritisation level corresponding to that element.

The open-ended questions require the interviewees to raise any addition (and their importance level) and/or deletion on the current findings and the reasons for that, as well as the answers to the GBIEF questions. Following the snowball approach, the interviewed managers
were selected from MEs in various manufacturing business segments, including fast moving goods manufacturers, electronic device producers, car component manufacturers, food production companies, etc.; and these MEs locate in different regions in China. Such an approach ensures the triangulation of the insights from multiple informants with diversified backgrounds to enhance the findings’ inclusiveness. Due to the fairly straightforwardness of their conduct process, the structured interview sessions were carried out by the authors separately at a same time period for efficiency. All the interviewees at this round have at least two years’ working experience and in-depth involvement in the field of QI, and have successfully led QI projects with the participation of employees at different hierarchical levels/functions. From these respondents, substantial and comprehensive insights have been obtained on QIK utilisation in practice.

3.6 Validity and reliability

In qualitative research, many people tend not to use the terms of validity and reliability. Herein however the authors “borrowed” them to express their research logic.

The research question is firstly developed from the literature review, and then has been verified and confirmed by a focus group (Wang, et al., 2016) consisting of four experienced professionals in the field. These focus group experts have evaluated the question in view of its appropriateness, importance and necessity to study MEs’ QIK utilization. The evaluation scores are illustrated by Figure 2 on a five point scale (from 5 – highly appropriate/important/necessary, to 1 – inappropriate/unimportant/unnecessary). As demonstrated by the Figure, the scores are at very high value of above 4. The evaluation outcome as such has attested the content validity of the research question and the meaningfulness of the research foci.

The focus group has also recommended the necessity and classification criteria to prioritise the knowledge utilisation approaches identified from the research, to ensure better understanding, more insights and more convenient usage of QIK in guiding practice.
As aforementioned, for enhancing the validity of this research, the approach of multiple source evidence (Cepeda and Martin, 2005; Yin, 2018) has been followed, as detailed at below:

The case MEs are selected from different regions with different economic development levels, entailing a possibility of diversity of the employees’ knowledge and skill profiles. Therefore the comparison between the findings from the cases can be effective in consolidating and enriching the understandings and insights through either repetition or contradiction of viewpoints (Yin, 2018; Cepeda and Martin, 2005). Meanwhile, the participants at the first and second research stages are from different functional areas and at different organizational hierarchical levels in management and implementation of QIK; and the interviews continually went on until reaching data saturation (Tam and Gary, 2016), owing to the case companies’ wholehearted support and involvement in the research. After interview data having been collected, the summaries of the individual interviews have been sent to the corresponding interviewees for their examination (O’Connor and Gibson, 2003) on the content for accuracy and inclusiveness, and they were also required to add/delete any points that they deem necessary. The feedback from the participants’ review has confirmed these records’ accuracy and inclusiveness; this has further proved the validity. In the focus group sessions, a consensus among the viewpoints (answers) from the category groups respectively has been attained and confirmed, this constitutes an additional evidence and attestation to the research validity.

At the third stage, the interviewees are managers possessing sufficient knowledge and experience in the field of QIK management and from manufacturing MEs in different industrial segments. All these have secured the research’s construct validity (Yin, 2018). The outcome of no addition/deletion to the content at this round also provides a confirmation on the research validity.
For the additional GBIEF questions, they have been confirmed of their meaningfulness by the research participants during the data collection process; and for majority of them there also exist literature underpinning, as earlier mentioned.

To ensure and evidence the reliability of the research findings, the following two approaches have been implemented: 1) the designed research data collection and analysis protocol (Rose, et al., 2015) (Appendix 2) has been followed carefully during the research conduct; 2) the analysis of the data has been firstly carried out by the authors separately and then the findings were integrated through triangulation synthesis. And a further comparison with available literature has also been made wherever possible. Moreover, the Intra-class Correlation Coefficient (ICC) and Cronbach’s \( \alpha \) have been calculated on the structured interview data, an ICC score of 0.6 and Cronbach’s \( \alpha \) of 0.98 confirm that the interview findings have a good level of reliability (Fleiss, 1986; Wortzel, 1979).

4. Research findings and analysis

4.1 Findings from the first stage

Through the within-case and cross-case analyses, one can notice that there is a certain level of diversity with regard to the viewpoints (answers) among different category groups in the case companies. Nevertheless, the analysis still revealed that there are congruences among the answers of different categories within each case and very often between cases.

As a whole, the analysis on the data from the two case companies affirmed some general phenomena of that: i) There is a high level of congruence of viewpoints between or among manager, functional staff and production foreman category groups. ii) Congruence also can be observed between or among the viewpoints from production foreman, functional staff and production line operator groups. iii) Infrequently can the manager groups and the production line operator groups have agreement on respective viewpoints. Similar phenomenon to this has also been observed by some other researches, although they did not focus solely on MEs (Ouakouak and Ouedraogo, 2019). A situation as such might be caused by the difference of focuses on business operations’ aspects by different people in an organization with different roles and at different hierarchical levels assuming different responsibilities. This circumstance also reflects that with regard to QIK utilization in practice, there is a certain level of broken link between different level employees of MEs, this happens even in the two case companies that indeed illustrated a wholehearted organization-wide commitment towards QIK utilisation. These findings, in line with the contention from the existing research (Yasir and Majid, 2017; Ouakouak and Ouedraogo, 2019; Inkinen, 2016), further highlight the importance of thorough
communication among all hierarchical levels/members of an organization and necessary
trainings to employees on KM, as well as sufficient empowerment for employees to have more
opportunities and access to strategic issues, for a better understanding, alignment and
contribution to QIK management in both operational and strategic dimensions.

The answers to the research question can be prioritised, to obtain further insights leading to
the enrichment of KM theories alongside quality management; they can also serve as practical
guidance to MEs and other relevant organizations for their QIK utilisation. Particularly the
prioritisation can clearly illustrate to the practical businesses the criticality level of the
respective QIK elements for demonstrating their usefulness and meaningfulness. According to
the consensual degree on each answer among the four category participant groups (determined
by the number of category groups agreeing with a certain viewpoint), the answers are
prioritised to five levels:

Level 1: Significantly critical element – the answer’s content has been conveyed
consensually by two or more category groups from both of the two cases respectively;

Level 2: Highly critical element – the answer’s content has received congruence by one
from the four category groups in one case and meanwhile by two or more category groups in
another case;

Level 3: Fairly critical element – the answer’s content has been articulated by one category
group respectively from each of the two cases;

Level 4: Slightly critical element – the answer’s content has been narrated by two or more
category groups within only one case;

Level 5: Possibly uncritical element to be recognised – raised by only one category group
and from only one case.

In MEs’ practical QIK utilisation processes, the first three level elements should have the
higher priority to be considered, due to their cross-case congruence.

The answers’ prioritisation and content are detailed at below and tabulated in Appendix 1.

**Among the QIK utilisation approaches proposed by the ME employees (MEEs):**

1) One has received Level 1 ranking (Qku_2) – Document and standardise the externally
acquired and internally created QIK formally, and print into brochures, use that in training and
then as guidance for employees to cope with daily QI issues. The outcomes and achievements
from the implementation of QIK need to be used to demonstrate its effectiveness, this will
naturally lead to the departments and people in the company to actively apply the knowledge.
These points further endorse the contention from some researchers of the importance of documentation and standardised codification in effective KM (Oliva and Kotabe, 2018; Mohd.Rodzi, et al., 2015). However, the MEEs’ viewpoints partially contradict to the arguments from the other existing literature that the documented knowledge often cannot be readily or directly used for business operations decision making, due to the complexity of some knowledge and the associated documentation (Oluikpe, 2015; Ouakouak and Ouedraogo, 2019). This partial disagreement deserves a future study.

2) One approach was ranked as at Level 3 – (Qku_1) Dedicated department is in charge and delivers the necessary training and leads the implementation of the QIK. Namely, sufficient training sessions need to be organized by a formal unit to disseminate the knowledge quickly and extensively to every employee for QI actions. The importance of training of knowledge for ensuring its effective application has also been evidenced by other research on SMEs (Kumar, et al. 2016; Durst and Edvardsson, 2012). Nevertheless, in view of resource constraints (time, finance, etc.) faced by MEs, provision of sufficient amount of training and with a wide range of coverage casts a big challenge to them. This leads to the need of future research to find solutions with efficacy on how to provide effective training to employees based on the available capacity/capability of MEs.

3) Two approaches have received Level 4 ranking, they are – (i) (Qku_3) Closely cooperate and communicate with relevant functional departments’ staff/quality experts who are in charge of QIK and its implementation, to ensure sufficient and instant support to the operators in applying the QIK. Cooperation and communication between and among functions and employees ensuring effective KM process has also been evidenced in other research (Yasir and Majid, 2017; Oluikpe, 2015; Ibrahim and Heng, 2015). Herein this research, the MEEs in different organizations also mentioned that although cooperation and communication were not prioritised at a very high level, their role in the knowledge utilization cannot be ignored. (ii) (Qku_5) Employees are encouraged to use and create new QIK in their work and report the results of the QIK usage, they are organised using team meeting time to introduce, arrange and examine the implementation activities of the QIK. To encourage employees’ active involvement and engagement in knowledge creation, utilisation as well as associated creative activities is an observed practical phenomenon in businesses (Alrawi et al., 2013; Abdullah et al., 2013; Inkinen, 2016). While, the particular highlighted point from this research is that the case MEs have established a formal mechanism for employees to effectively and efficiently share, learn and utilise the up-to-date QIK in their operations activities and processes, which answered the call for the provision of a platform to facilitate employees’ interaction in KM
process (e.g., Yasir and Majid, 2017). The underlying reason for this approach not being prioritised highly is that since the MEs have already had this mechanism for a relatively long time, MEEs to some extent treat it as a natural routine part of their work life, without a peculiar awareness of it as a means for QIK management.

4) One approach is rated at Level 5 – (Qku_4) Ensure the data used for quality analysis and control collected accurately and timely. The accuracy and timeliness of data for quality and other business operations purposes are emphasized by various researchers continually (e.g., Yasir and Majid, 2017; Mohd.Rodzi, et al., 2015), however in this research, they are raised by only one MEE group in one case company and prioritised at the lowest criticality level. The reason for this is that they are deemed by case MEEs as a kind of common sense, due to that they have already become a taken-for-granted inherent element of their organizational culture.

In general, this research’s findings clearly revealed that the MEs and their employees are aware of the importance of QIK utilisation apropos of the positive impacts of QIK application on business efficacy, product quality/reputation as well as the establishment and enhancement of a positive-thinking and active-learning organizational setting; and they have endeavoured in establishing effective mechanism to ensure QIK utilisation being operationalised in business practice.

Nevertheless, the data also revealed a situation of that no matter for which approach of QIK utilisation, there are always some people not fully aware of them, reflected by that none of the elements (answers) received a full congruence among all the category groups in both case companies. This phenomenon further resonates the aforementioned issue of broken link among employees at different levels and functions, even in organizations with high level of commitment towards KM.

Also interestingly, none of the approaches have been evaluated as at Level 2, it seems that there is no transit level between the most and less critical ones.

**For GBIEF questions**

All the participants from different categories in both case companies view the current economic development in China as very good and supportive to businesses including MEs, particularly as pointed out by some managers and functional staff that China has established a centre supporting SMEs’ growth – China Centre for Promotion of SME Development (Chinasme, 2017). All these factors form a supportive environment for QIK as well as other resources’ effective implementation in MEs. The MEEs do not see any special influence of their industrial specialty on the QIK utilisation, this to some extent is not fully in line with the
argument from some literature regarding the potential differences between its influence on different types of businesses (Massaro, et al., 2016). This circumstance casts a need of future exploration to seek more in-depth insights. Both the two case companies have not implemented ICT system with complicated software packages, they just use some basic elements of ICT, including email system, central database, basic intranet system. The participants all deem these ICT systems function effectively in their QIK management and utilisation processes. For the additional GBIEF of operating conditions’ impact on QIK management, all MEEs noticed the positive support to QIK utilisation from their operating conditions’ current healthy growth. This highlights the mutual relationship between QIK utilisation and the business performance of an organization.

4.2 Findings from the additional case MEs at the second stage

Through the focus group sessions in the additional four case MEs, the identified and prioritised viewpoints from the first stage research have been scrutinised and evaluated further. There are no addition/deletion or change to the answers’ content having been raised. Corresponding to each answer’s criticality evaluation, these focus groups were checked on their agreeing levels to it (from 5 - Strongly agree to 1 - Strongly disagree). If the agreeing level is below 3, the focus group will be required to provide their new rating of the criticality. For those answers receiving a cross-group average agreeing level below 3, the criticality level will be changed to the rounded average of all the ratings (including those sticking to the old ones and those new ratings). This round examination ascertained that no answer’s criticality level needs to be changed, indicating the consistency of the case companies’ understanding and mentality in view of QIK utilization.

Here for inclusiveness of the information, the above-mentioned elements (answers) and the corresponding prioritisation levels identified from the first stage research, as well as attested at the second stage and finalised at the third stage are illustrated in Table 3 (in case of the prioritisation level difference between the previous stages and third stage, the ratings from the third stage will be the decisive score, due to that the third stage rating comes from more respondents from more MEs). As demonstrated by Table 3, the research findings at different stage illustrate no difference on the prioritization levels of the individual elements.
Table 3. The answers and the prioritization levels

<table>
<thead>
<tr>
<th>Theme question</th>
<th>Answer code</th>
<th>First stage focus group evaluation</th>
<th>Second stage focus group evaluation</th>
<th>Third stage agreement degree to the first stage prioritisation</th>
<th>Finalised prioritisation level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qku What are the various approaches used for utilizing QI knowledge in MEs?</td>
<td>Qku_2</td>
<td>Level 1</td>
<td>Level 1</td>
<td>4.10</td>
<td>Level 1</td>
</tr>
<tr>
<td></td>
<td>Qku_1</td>
<td>Level 3</td>
<td>Level 3</td>
<td>4.43</td>
<td>Level 3</td>
</tr>
<tr>
<td></td>
<td>Qku_3</td>
<td>Level 4</td>
<td>Level 4</td>
<td>4.10</td>
<td>Level 4</td>
</tr>
<tr>
<td></td>
<td>Qku_5</td>
<td>Level 4</td>
<td>Level 4</td>
<td>4.13</td>
<td>Level 4</td>
</tr>
<tr>
<td></td>
<td>Qku_4</td>
<td>Level 5</td>
<td>Level 5</td>
<td>3.88</td>
<td>Level 5</td>
</tr>
</tbody>
</table>

Meanwhile, majority of the focus groups (75%) emphasised particularly on another point with regard to the Level 4/5 approaches – albeit they are not recognised by a wider range of people, they might be more appropriate in certain circumstances than the others. Thus they should not be ignored, although they are usually not the first ones to be considered in practical QIK utilisation. This point corroborates to the relevant findings in the first stage.

While for GBIEF questions, the answers at this stage demonstrated a high level of consensus to that from the first stage.

4.3 Third stage structured interview attestation on the previous stages’ findings

For the individual elements (answers), all of them have received further confirmation from the interviews on their prioritisation levels determined at the previous stages. For the enquiry on potential elements to be added to/deleted/changed from the current findings, the interview sessions yield no need of any amendment. This is a clear sign of the inclusiveness and meaningfulness of the identified elements. However, longitudinal research in the future is still necessary for exploring any changes on the concrete elements and their criticality levels.

In view of the GBIEF questions, although the interviewees come from MEs with various backgrounds, their answers are also highly consensual to the previous two stages’ findings, with only an exception of that 22.5% of the MEs at this round do not even have IT implemented in their operations functions, thus the interviewees from these companies expressed two general dimensions of viewpoints: majority (67%) of the MEEs believe that with an implementation of ICT system in their operations functions’ processes, the efficacy of the operations can be lifted
to a higher level through its support to knowledge dissemination and utilisation, while the rest MEEs (33%) believe that ICT is not so important to be used in operational processes in the business, the knowledge can be shared through oral and written documentation communication. This aspect illustrates partial contradiction to some existing literature contention (Cerchione, et al., 2015; Choochote, 2012) and deserves future research to understand more of it.

4.4 “Takeaways” based on the research findings
To operationalise the selection process of the QIK utilisation approaches for the convenience of MEs in their KM practice for operations excellence, a framework based on the research findings has been developed as illustrated by Figure 3, for guiding the QIK utilization approaches’ implementation step-wise.

![Figure 3. Framework for selection of QIK utilization approach(es) for implementation](image-url)
To attest this framework’s applicability, the same expert focus group for content validity has conducted the evaluation on its effectiveness and efficiency in helping the decision making for selecting the QIK utilization approaches, following a 5 point scale (from 5 – Very effective/Efficient to 1 – Ineffective/Inefficient).

Table 4 presents the evaluation results, which confirmed the usefulness of the framework.

Table 4. Evaluation on the framework of QIK utilization approach(es) selection

<table>
<thead>
<tr>
<th>Aspects evaluated</th>
<th>Effectiveness</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average score of evaluation</td>
<td>4.75</td>
<td>4.25</td>
</tr>
</tbody>
</table>

5. Concluding remarks and future research

This paper presents an in-depth investigation on a critical component of KM in MEs – QIK utilisation, by focusing on: QIK utilization approaches in MEs. The research findings are obtained through analysing data collected following a multiple perspective approach by including people from different ranks and roles within manufacturing case MEs with various business specialties from different locations, which provide a holistic all-round comprehension of viewpoints. The meaningfulness and applicability of the findings have been examined and confirmed through the stages in the research.

In order to facilitate the understanding and implementation of the elements (the answers to the research question, namely the approaches of QIK utilisation) identified by the research, they have been prioritised into 5 different criticality levels (Table 3 and Appendix 1). The utilisation approaches weighted at and above Level 3 are suggested to be the ones considered at first instance when proceeding with QIK utilisation in practice, although the rest two lower level elements should not be ignored.

To further facilitate the decision making process of MEs in selecting the appropriate QIK utilization approach(es), a framework (Figure 3) has also been developed and can be used to guide the step-wise finalisation of the proper selection of QIK utilization approach(es).

5.1 Implications

Practically in managerial aspect, the findings from this research provide insightful knowledge for understanding the approaches of MEs’ QIK utilisation, as well as provide guidance to real
world business professionals on QIK utilisation activities. Through these means, theoretically conceptualised knowledge entity has been practised into concrete operational activities. By following the framework guiding the QIK approach selection, the management/employees in MEs can decide the appropriate QIK approach(es) to be used effectively and efficiently, to enhance their operations’ performance leading to increased whole organization-wise competitiveness. And all these will naturally link to the prosperity of the business and consequently contribute to the sustainable development of the economy, society and well-being of the general public.

In addition, the research procedure applied by this research can be followed as a guiding framework for MEs in investigating and analysing/resolving problems in the field of KM and others in their business operations. Meanwhile, these approaches of QIK utilisation used by MEs in their operations excellence initiatives can also be referential to other type organisations.

In theoretical aspect, the findings fill the gap of that the current KM research lacks of a focus on MEs, by concentrating on a particular area – QI in MEs as the contextual setting, under the backcloth of that the existing KM research findings are characterised with focus on either LEs or SMEs as a whole. Namely, the new insights on QIK utilization approaches in MEs serve as a supplementary set of knowledge complementing the extant KM literature. Starting from this research’s findings, with more and further focused future research on the same/similar topic direction to this research, a concrete set of theories centring the QIK management particularly in MEs can be established, to clarify the blurred boundary of MEs and SEs in the field of KM with QI as a general backcloth.

5.2 Limitations

Although the diversity of the cases in the case study has been secured, and the number of the structured interviews has reached the upper range of this type research, the sample size is still relatively small, consequently the findings can still lack of certain level of generalisability. Also the case MEs are those operating in Chinese marketplace and in manufacturing industry, albeit there are joint ventures with international attributes of management style and mentality, there is still the possibility that some of the findings from this research cannot be directly applied by MEs in other industries and countries; they need to be cautiously applied and appropriate adaptations might need to be made on the relevant elements if necessary during application.

5.3 Future research
Based on the above mentioned findings and concern of limitations, the following future research activities can be conducted to complement or supplement the insights attained from the current research:

- The case MEs in this research only come from manufacturing industry, the findings based on them might not be applicable on certain aspects in service MEs, hence a further case based research on QIK utilisation in service MEs will clarify this particular issue to a wider spectrum of industrial sectors/segments;

- Investigation can also be made through a survey method to extend the research scale and scope by including larger number of MEs in different industrial sectors and regions/countries, to further attest the applicability of the research findings, as well as the necessity of relevant ICT techniques and the means to use them in operations process for enhancing QIK utilization in MEs;

- A further survey exploration can be carried out by collecting data from a full spectrum of enterprises containing SEs, MEs and LEs, to examine the similarity and difference between/among them in details, particularly between SEs and MEs, corresponding to the focus of QIK utilisation investigated in this research, as well as some further elements such as the in-depth perception of real world businesses on QIK utilisation effects and the drivers/barriers of the utilization between different sized businesses;

- A case study can be conducted focusing on the means to either reduce the complexity of knowledge and the associated documentation or to improve the employees’ capability of understanding knowledge to enhance the QIK utilisation;

- A research centring the approaches to ensure the efficacy and sufficiency of training on QIK utilisation related issues against the limited resource availability, will produce constructive contribution to the business operations performance;

- Corresponding to the above planned research projects, regular longitudinal surveys and case studies can be conducted to seek further insights on the changes of the answers to the research question, as a consequence of circumstances variation due to the elapse of time, to amend or enrich the existing theories and practices of QIK utilization.
References


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Qi, Y. 2015, A Study on Differences of China’s Regional Economic Development Level Based on Cluster Analysis, MATEC Web of Conferences, 22, 05, online at: http://dx.doi.org/10.1051/ matecconf/20152205022.


Appendices

Appendix 1. Codes of the research question and answers as well as their finalised prioritisation level by the third stage research (ordered from the highest level to the lowest)
<table>
<thead>
<tr>
<th>Research question</th>
<th>Answer Code</th>
<th>Answer Content Summary</th>
<th>Finalised critical level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qku</td>
<td>Qku_2</td>
<td>Document and standardise the externally acquired and internally created QIK formally, and print into brochures, used that in training and then as guidance for employees to cope with daily quality improvement issues. The outcomes and achievements from the implementation of QIK need to be used to demonstrate its effectiveness, this will naturally lead to the departments and people in the company to actively apply the knowledge.</td>
<td>Level 1</td>
</tr>
<tr>
<td></td>
<td>Qku_1</td>
<td>Dedicated department is in charge and deliver the necessary training and leads the implementation of the QIK; sufficient training sessions need to be organized to disseminate the knowledge quickly and extensively to every employee for quality improvement actions.</td>
<td>Level 3</td>
</tr>
<tr>
<td></td>
<td>Qku_3</td>
<td>Closely cooperate and communicate with relevant functional departments’ staff/quality experts who are in charge for relevant QIK and its implementation, to ensure sufficient and instant support to the operators in implementation of the QIK.</td>
<td>Level 4</td>
</tr>
<tr>
<td></td>
<td>Qku_4</td>
<td>Employees are encouraged to use and create new QIK in their work and report the results of the QIK usage, they are organised using team meeting time to introduce, arrange and examine the implementation activities of the QIK.</td>
<td>Level 4</td>
</tr>
<tr>
<td></td>
<td>Qku_5</td>
<td>Ensure the data used for quality analysis and control collected accurately and timely</td>
<td>Level 5</td>
</tr>
<tr>
<td>GBIEFs</td>
<td>Questions</td>
<td>Case A respondents’ opinion</td>
<td>Case B respondents’ opinion</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>----------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>(1)</td>
<td>What is the respondents’ view about the current general national economic development situation (mindful of SMEs)? Whether/how does this situation affect their QIK management?</td>
<td>Good macro-economic environment, which is in support to all businesses including MEs – From all category groups, all employees know this clearly from various channels. With a general well developing external economic environment, MEs can have more opportunities to obtain more QIKs from external sources as mentioned by them.</td>
<td>The same as that in Case A.</td>
</tr>
<tr>
<td>(2)</td>
<td>What is the specific industrial segment their business production focuses on (reflected by the products)? Whether/how does this specialty affect their QIK management?</td>
<td>Their business production focus has been answered by all participants, seen in Table 1. They all do not think the QIK management has been affected from their industrial specialty.</td>
<td>The same as Case A.</td>
</tr>
<tr>
<td>(3)</td>
<td>What technologies has their company implemented in the KM process? Whether/how do these technologies affect their QIK management?</td>
<td>Case A has implemented emails system based on intranet, central database and can also use internet if needed. They see technology a strong support to their QIK management.</td>
<td>Case B also has implemented emails system based on intranet, central database, but they do not connect to internet. They also see IT as a good support to their operations performance.</td>
</tr>
<tr>
<td>(4)</td>
<td>What is their company’s current operating condition? Whether/how does it affect their QIK management?</td>
<td>Very good with growing profits. The growth partially comes from the application of some new techniques learnt through QIK identification, this leads to that people pay more attention to QIK.</td>
<td>Good and also profit grows. A good operating conditions have given them more motivation to use any available approaches and means constructive to the business, including QIK identification.</td>
</tr>
</tbody>
</table>
Appendix 2. Data collection and analysis protocol for the research

Field investigation

- The access to case companies is obtained through communicating with the case companies’ CEO/General manager; during the communication, the researchers have assured the confidentiality of data and that the research paper’s content will be based on the data confirmed by the participants;

- Data collection is conducted by carrying out the actions at below:
  - After disclosing aim, background of the research, etc. to the participants in the interview/focus group sessions, obtain the informed consent from them;
  - Obtain permission from the participants for recording or note taking and the agreement on an after-session examination on the summary of the interview content;
  - To all interviewees, a few identical general questions will be asked to obtain the information mainly about: the position, length of working in the case company, the functional areas working in;
  - In Stage 1, - firstly the relevant enquiry questions will be asked for seeking the answers from the interviewees. Probing and follow-up will be conducted when necessary for the respondents to clarify their viewpoints or to seek further understanding on the new aspects inspired by the respondents’ expounding; - after the completion of an interview session, decide with the interviewee a time to communicate on the summary of interview information for further validation of the data accuracy/inclusiveness (including appropriateness) and potential additional comments and insights. The summary is worded in a way to be concise and succinct for the ease of understanding and accurate capsulation of the respondents’ viewpoints; - then in focus group sessions with the same research participants to obtain the finalised consensual viewpoints (on the answers summarised from interview sessions) corresponding to the enquiry questions in each individual category groups in the case companies respectively.
  - The additional four case company’s focus group sessions at the second stage will be carried out following the same procedure/format as that in the first stage two case companies, using the list of prioritised answers from the previous stage research findings.
  - A third stage 40 structured interviews are then conducted through WeChat or telephone, to further examine the previous stages’ findings.
• Data analysis
  
  ❖ At the first stage, after focus group sessions completed, a within-case analysis will be firstly conducted on the findings between the category groups within each case to examine for triangulation and synthesis of the findings within the certain case settings;
  
  ❖ Then a cross-case analysis will be conducted, to triangulate the viewpoints identified between cases for repetition and/or contradiction; afterwards, the summarized elements of the answers to the enquiry question will be prioritized/consolidated for next stage attestation; and whenever possible, comparison will also be made with the existing contentions obtained from the available relevant literature;
  
  ❖ To enhance the insights obtained from the above process, a further examination at second stage based on the data from additional four case companies’ focus group sessions will be made to seek corroboration or contradictory contentions, as well as potential additions/deletions.
  
  ❖ To finalize the conclusions for this research, based on the third stage structured interview data, analysis will be carried out to further attest and concretize the prioritization of the answer elements, as well as enrichment on insights and whether there are still missing points or deletions from the previous stages.