

An integrated core competence evaluation framework for portfolio management in the oil industry

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Abstract

The proponents of resource-based theory argue that efficient management of core competence portfolio provide sustainable competitive advantages. However, literature provide little evidence about (i) how to identify core competence specifically for a company operating in the oil sector; (ii) how to identify tangible and intangible resources related to the core competence of the company, and (iii) how to manage company's competence portfolio more efficiently by forging network alliances with collaborating firms. Drawing upon resource based theory this paper presents a core competence evaluation framework for managing competence portfolio of an oil company. The paper introduces a network typology to illustrate how to form different types of strategic alliance relations with partnering firm to manage and grow the competence portfolio. The framework is tested using a case study approach involving face-to-face structured interview with twenty-five divisional managers of a large oil company in the Middle East. We identified *purchasing, refining and sales and marketing* as the strong candidates to be the core competence of the company. However, despite of company's core business of refining oil, the core competence was identified to be its *R&D* and *Performance Management* (PM) capabilities. We further provide a procedure to determine different kinds of physical, intellectual and cultural resource making a dominant impact on company's competence portfolio. In addition, we provide a comprehensive set of guidelines how to develop core competence further by forging a partnership alliance choosing an appropriate *network* topology. The paper make many contributions in the field of strategic management and core competence evaluation in oil sector. The guidelines provide can assist the practitioners to devise appropriate network relationship with the partnering companies in order to outsource, divest, protect and/or develop their core competence portfolio.

Keywords: Competence portfolio; resource-based view; resource-asset-capability; core competence; network topology, collective learning.

1. Introduction

To succeed in today's knowledge economy, companies need to fully understand their competence portfolio (Parry *et al.*, 2010; Derwik and Hellström, 2017; Korytkowski, 2017). The notion of core competencies forms an important aspect of the resource-based view of the firm (Gupta *et al.*, 2018; Mejri *et al.*, 2018; Penrose, 2000; Schumpeter, 2013), which was pointed out as early as 1950's by scholars (e.g., Penrose, 1959), however, has been advocated by Prahalad and Hamel (1990) as a way of rethinking corporate business portfolio for achieving competitive advantage. By leveraging unique resources and capabilities, companies can utilize their strengths to gain sustainable competitive advantage (King and Zeithaml, 2001; Lei, Hitt, and Bettis, 1996). Core competencies, considered the crown jewels of a company (Hafeez *et al.*, 2002a,b&c), should be carefully nurtured and developed, as the core competencies' strength can determine companies' future business directions (Chursin and Tyulin, 2018; Porter, 1986; Yang, 2015). Hence, the analysis of core competencies becomes imperative as the results can be used to help a company make more informed strategic management decisions regarding capability development, outsourcing, focusing, or diversification, in relation to new products, services, or markets (Amiri *et al.*, 2009; Meyer, 1991; Newbert, 2007; Shee, 2006; Urciuoli *et al.*, 2014).

However, although the concepts of resource-based view of the firm (Barney, 1991) and core competence (Prahalad and Hamel, 1990; Snchez, 1995) as firm strategy to gain competitive advantage have been discussed for many decades, there are limited studies that illustrate how to manage a core competence portfolio in an integrated fashion (Derwik and Hellström, 2017; Mahdi *et al.*, 2018). In addition, our literature review suggests that it is very difficult to distinguish between resources, capabilities and competences. Phrases like firm resources, knowledge, capabilities, strategic assets, and core competencies have been used arbitrarily, loosely, and interchangeable (Hall, 1989; Löfstedt, 2001; Nanda, 1996). This has caused confusion particularly to those firms, which are embarking on business planning based on core competence theory (Hamel, 1994). Also, earlier research has primarily focused on core competence identification in the context of manufacturing companies (see for example, Hafeez *et al.*, 2002ab; 2007a&b). There is a need to address the question

of core competence portfolio management in the process industry such as oil and gas and pharmaceuticals as the key capability resources and their context of tangibility may be profoundly different, especially while defining the key resources and capabilities matrix (Legenvre and Gualandris, 2018).

In order to address the above issues and to create a more general classification of core competencies, so that they can be managed in a more integrated and systematic fashion, this study builds and extends on Hafeez *et al.*'s (2002a&b and 2007a&b) framework to provide not only definitions of the salient characteristics of the key concepts, but also to develop a structured method to evaluate core competence of a company belonging to the process industry. Specifically, this paper has three novel aims. First, it presents a core competence evaluation framework (CCEF) using concepts of assets, resource, and capabilities and their desired attributes in the context of process industry. The framework is subsequently tested by conducting face-to-face structured interviews with the management of a large oil company. Second, to provide a procedure to close the loop. That is how to track down the tangible and intangible that make up these core competencies. This would allow the management of a company to invest further in those resources that are responsible for providing sustainable competitive advantage for the company. Third, it introduces a strategic alliance typology and illustrates how to protect and further develop the competence, and how to manage non-core areas of the business in a strategic way.

The world's oil industry can be considered as the single largest revenue sector compared to all other sectors. In many ways the expansion and contraction of the world economy is directly related to the consumption of energy, for which oil is the single largest resource. Expectations for global economic growth remain unchanged at 3.3 percent for 2015, in line with growth in 2014 (OPEC Report, 2015). Global oil demand is seen growing at 1.18 mb/d in 2015, higher than in the previous year's growth of 0.96 mb/d and unchanged from last month's report. Total oil consumption is expected to pick up pace in 2nd half of 2015, leading to a total oil demand of 92.50 mb/d for 2015 (OPEC Report, 2015). Recent reports suggest that global oil demand will continue to grow annually by 1.2% on average, and estimated to reach 105 mb/d (Lukoil, 2013). The management of an oil

company portfolio is complex considering the complexity of the market and capital size and revenue involved. Many strategic management decisions in terms of exploring, partnering, and outsourcing are relatively more sophisticated technically, as well as capital intensive compared to other industrial sectors. The management of the oil companies, therefore, have a huge challenge to undertake key strategic decisions that are efficient in terms of value and time. We see no example in the literature where the oil sector has been an area of investigation for core competence identification and management.

Several contributions are made to existing literature. First, the framework presented here is a comprehensive portfolio management framework that involves both, the identification of core competence, as well as management of the core competence portfolio. Second, this is the first example where the oil sector has been a focus of attention for managing core competence portfolio. Specifically, we test the framework using data collected from a major oil refinery to identify competence and core competences for the company. We demonstrate how operational characteristics such as *collectiveness* or *learning* ability among various capabilities are evolved into unique competencies of the case company. We argue how strategic flexibility in terms *routine reorganisations* and *resource redeployment* manifest itself to become core competence for the organisation.

Finally, we have employed Laudon and Laudon (1995) basic organisation structure to appraise four network typologies, namely, *operational network*, *knowledge network*, *tactical network*, and *strategic network*. We illustrate how the case company may be able to sustain, nurture, and further develop its core competences and operational excellence by exploiting primary features of these networks in terms of enabling mechanism, type of synergy, points of commitments, knowledge sharing, trust, and cultural influences. Examples are given for various strategic alliances or collaborative relationships that suit to each network type, viz. supply chain management, project based joint-venture, outsourcing using ad hoc pool arrangement, and full-blown joint ventures or consortia bonds.

2. Literature Review

The topic of how core capability can be developed and how it impacts on company performance has been the subject of many research studies (Österlund, 1999). Researchers have stressed on the importance of developing core capability frameworks that are conceptually and empirically applicable by practitioners in contexts extending beyond mere core competence identification (Ljungquist, 2007). Previously, scholars (Heaslip et al., 2018; Gudanowska et al., 2018; Lazarova and Tarique, 2005) have analysed the development of knowledge competencies and knowledge reverse diffusion involved with repatriation of experts back to the company. Hafeez *et al.* (2002b & 2007b) have employed Analytic Hierarchy Process (AHP) to develop a core competence evaluation model and have illustrated how strategic alliances can be formed for the non-core activities of a firm using Lorange and Ross (1992) strategic alliance framework for managing outsourcing of non-core activities. Based on Hafeez *et al.*'s (2002) framework, Kim and Kim (2013) have employed AHP analysis to identify core competence strengths in Korean water pump market to resolve country's water purification problem. Lin and Wu (2014) have explored the role of dynamic capabilities in evaluating firm performance. Their results show that firm dynamic capabilities are able to mediate the firm's valuable, rare, inimitable, and non-substitutable (VRIN) resources to improve performance. On the contrary, non-VRIN resources have an insignificant mediating effect.

Iles *et al.* (2010) identify ways of competence development through human capital management. For them, the important characteristic of a *social capital* perspective is the kind of network and relationships that exists therein. For example, Lampel and Bhalla (2011) have discussed different ways of developing network configurations and the impact of this through offshoring. Their findings suggest that where offshoring renders firms' operational flexibility and cost efficiencies, it also presents challenges in terms of strategic alignment of the core values and processes for the company. Beugelsdijk and Jindra (2018) and Mudamde and Swift (2011) explore ways of leveraging competencies in multinational enterprises (MNEs) using local companies' innovation network. They

argue that MNEs can access to multiple sources of knowledge residing in diverse geographical locations through community of practice (Hafeez and Alghatas, 2006) that allow access to technological expertise and social networks for knowledge sharing (Hafeez and Abdelneguid, 2003; Hafeez and Alghatas, 2007).

Chand and Kaou (2012) and Khan and Lew (2018) have analysed the key determinants of partner selection for a strategic alliance in a multi-country context. They concluded that alignment of nationality and culture were the key determinants of developing the alliance. Li and Lee (2014) have evaluated the impact of knowledge transfer to develop capability of a subsidiary in the network using multiple sources, one from the parent company and other from using a peer company. They conclude that this speeds up the knowledge transfer and capability building process in comparison to using only one source. The study also points out that a focal subsidiary's entrepreneurial culture is a key element in determining the success of knowledge transfer process within its MNC network. More recently, Hong and Snell (2015) have discussed the knowledge development through co-opetition in the supply chain. They have discussed the case of knowledge co-creation in between foreign subsidiary and its local supplier. Pollitte *et al.* (2015) have explored how knowledge acquisition and knowledge exploitation process can occur in between multiple partners to establish and exploit sustainable competitive advantage. Scott-Kennel and Giroud (2015) investigate the contribution of network knowledge and strategic orientation to firm-specific advantages (FSAs). They found significant and positive relationships between different types of FSAs and knowledge of the focal unit, knowledge of the internal corporate and external business networks, strategic orientation and firm performance. More recently, Salamat et al., (2018) provide a fuzzy possibilistic Analytic Hierachy Process (AHP) based approach for partner selection while considering developing strategic alliances. This approach can not only handle inconsitent data, but also allow for mitigating different kinds of risks associated while formulating a strategic alliance. However, this approach focus on finding an efficient way for partner selection and do not look into valuating the core competence and its associated tangible and intangible assets.

Our review indicates that the literature remains fragmented, perhaps due to the multi-faceted and multidisciplinary nature of core competence concepts.. A key framework driving the development of our more integrated approach to core competencies portfolio management is Barney (1986), who identified the conditions for a resource to offer sustained competitive advantage as value, rarity, inimitability, and non-substitutability. In a practitioner-orientated article, Grant (1991) recognised that for a profit-generating sustainable capability to emerge, it must be durable, non-transparent (inimitable), non-transferable (immobile), nonreplicable, and appropriable. These factors are incorporated into the study's framework. They are not independent, but interrelate and inter-correlate since the value of a resource will decline if it becomes less scarce; a resource is less valuable and less scarce if it is easily imitable (Day, 1994). On the whole, the main motivation for our framework can be summarised by Amit and Schoemaker (2012), who argue that a firm achieves rent not because it has better resources, rather its ability to make better use of the resources. This study offers an integrated and more systematic approach at first to identify core competence of a company in oil sector and then provide a framework to manage its core competence portfolio.

3. Towards a Core Competence Evaluation Framework (CCEF)

3.1 Strategic Value and Characteristics of Firm Resources

Wernerfelt (1984) defines resources as 'anything, which could be thought of as a strength or weakness of a given firm'. Barney (1991) suggest that firm resources 'include all assets, capabilities, organisational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness'. David-West et al. (2018) and Nanda (1996) advocated that, 'resources are the fixed, firm-specific input factors of production'. These definitions differ from Amit and Schoemaker (2012) who defined resources as 'transferable input factors of production'. Proponents of the resource-based view often define resources as the assets, knowledge, capabilities, and organisational processes that enable the firm to conceive and

implement strategic decisions. However, more recently a consistent view is emerging that resources may be tangible or intangible (Porter and Kramer, 2019). Intangible resources are identical to Itami's (1987) invisible assets 'information based resources' such as consumer trust, corporate culture, and management skill (Itami, 1987). We believe soft skills and knowledge is an essential ingredient of intellectual resource. Also, in today's global economy, a firm needs not to own or control a tangible or intangible resource; rather, having access to a resource through some arrangement is enough to impart value to the customer and the parent organisation.

Based on our review, we define resources as the individual assets of the firm, for example, items of capital equipment, employee skills, patents, and brand names. In particular, we classify assets into three categories, namely, physical, cultural, and intellectual. *Physical resources* include plant and equipment, production technology, financial endowments, location advantages, and raw materials. *Cultural resources* include the training, abilities, and experience possessed by organisation members (Milner et al., 2018). *Intellectual resources* include the firm image or reputation, internal systems for research, planning, and motivation, and the processes or routines that support these systems (Hafeez *et al.*, 2002a&b&c). Table 1 shows definitions and examples of firm resources.

Insert Table 1 about here

3.2 Firm Capabilities

Resources and capabilities are closely related terms – where resource is a fixed asset, capability is the potential input from the resource stock to the production function. Grant (1991: 114) defines capability as 'the capacity for a team of resources to perform some task

or activity'. Capabilities are what the firm can do; they are the result of resources working together to achieve productive tasks. For each business function, capabilities may be formed by the *integration* of multiple activities (processes) or developed just from single (discrete) activity (Klein and Hiscocks, 1994). The examples of discrete capabilities may include those dealing with individual activities or specialised tasks such as polishing surface of components or dealing at the checkout counters. These capabilities are relatively simple, however, large in number. While such capabilities may be indispensable to a business operation, on their own they have limited value to the firm. Many authors have pointed out that such a capability is unlikely to qualify as a core competence (Brem and Elsner, 2018; Goddard, 1997; Henderson and Cockburn, 1994; Teece *et al.*, 1997). Comparing with discrete capabilities, integrated capabilities are few in number, and are more dexterous and valuable owing to synergy by the combining various discrete capabilities. While capabilities depend on the integration and application of the firm's human, cultural, and tangible resources (Hasan, 2018), it is through the application of capabilities that the firm also creates and augments its resource base (Kwak *et al.*, 2018). In summary, there are the current and potential applications of resources. Table 2 gives some examples of functional or operational capabilities.

Insert Table 2 about here

3.3 Firm Competence and Functional Integration

Generally, if more activities are involved, the capability is likely to be more complex. Since the integration is a characteristic of extensive communications and interactions among discrete capabilities, the integrated capabilities are also known as *collective learning* (Alnawafleh *et al.*, 2018; Kogut and Zander, 1992; O'Donnell *et al.*, 2018; Riley *et al.*, 2018; Teece *et al.*, 1997). An integrated capability because of its richer context may provide more

flexible business options to a firm. Since integrated capabilities are relatively more complex, it is much harder for outsiders to understand and comprehend the capabilities. Literature recognises two characteristics associated with competence, namely, *collectiveness* and *uniqueness*. As mentioned earlier, like capability, a competence should be an integrated rather than discrete capability. It is the *collectiveness* nature that makes competence very valuable in strategic decision-making (Collis, 1994; Prahalad and Hamel, 1990; Stalk *et al.*, 1992; Tampoe, 1994; Hafeez *et al.*, 2007a). Also, competences themselves are ‘isolating mechanism’ (Doz, 1997; Heikkilä *et al.*, 2018). They have some barriers preventing the firm’s competitors to imitate. Since these competencies cannot be quickly and evenly distributed across all competing firms, the competitive advantage is thus expected to sustain for a long time (Bharadwa *et al.*, 1993; Dierickx and Cool, 1989; Hall, 1994; Maury, 2018). Based on our review, we define competence as a valuable capability, which is highly *collective* within the firm and *unique* in competition. A brief explanation of the term’s *collectiveness* and *uniqueness* is given in the following.

Collectiveness (or integration) of capabilities. We use three attributes to represent the *collectiveness* characteristic of competencies, namely, across-product, across-function, and across-business (Barney, 1991; Leonard-Barton, 1992; Hafeez *et al.*, 2002a&b&c; Tian *et al.*, 2018).

Across-product. Competences should not be some *isolated*, special purposed capabilities but the platform of multiple lines of products (Klein and Hiscocks, 1994). They should have the ability to deliver various product families and services and hence add value to the firm by integrating diverse assets and skills (Kogut and Zander, 1992). An example of this approach is Canon, whose product development capability involves a meshing of three

technologies: microelectronics, optics, and precision engineering. Canon's stream of new products has involved the integration of these technologies.

Across-function. Competencies should be formed through integrated efforts from multiple teams or groups within a whole business function. A competence may be described as the artillery of capability networks of a function. Its existence is critical to the excellence of functional operation. For example, Sony's design capability of small motors is formed through joint efforts of its technical researchers and product developing engineers and its existence makes the company's R&D function distinctive among competing firms.

Across-business. Very often, a competence is an indispensable element of the business process that cuts horizontally across the functional areas of the firm. It can be seen as part of the identity of the firm. In fact, Prahalad and Hamel's 'core competence concept' has particularly emphasised the importance of a cross-business competencies to a multi-business corporation (Prahalad and Hamel, 1990). Many authors believe that such capabilities are extremely useful for the firm to seek better integration options among Strategic Business Units (SBUs) (Amit and Schoemaker, 2012; Goddard, 1997; Klein and Hiscocks, 1994; Rumelt, 1994; Hafeez et al., 2010).

Insert Table 3 about here

Uniqueness. A unique capability could become an 'isolating mechanism' which is able to prevent competitors erode the competitive edge created by the capability (Klein *et al.*, 1998). To render *unique*, a capability should show at least one of the three attributes namely, rare in the marketplace, less imitable by competitors, and difficult to be substituted (Barney, 1991; Hamel, 1994; Klein *et al.*, 1998).

Rareness. If one or more key capabilities are rare in the competition, a firm can base its value creating strategy upon these capabilities to sustain competitive advantage. Being *rare* doesn't necessarily mean that a specific capability is only held by one competing firm. Generally speaking, rareness is very often attributed to the following two factors (Barney, 1991; Dierickx and Cool, 1989; Reed and Defillippi, 1990):

- i) *Path Dependency* (i.e. the firm-specific experience). For example, House of Fraser's high quality retailing results from the operating experience of its long history.
- ii) *Asset Mass Deterrence* (i.e. the ability to accumulate necessary assets in time). For example, BT's selling capability is largely depending upon its dominant dealer networks in the UK.

Inimitability. Inimitability is the degree to which a firm's resources or capabilities cannot be duplicated or copied by its competitors (Ambrosius, 2018; Lippman and Rumelt, 1982). If a resource or capability is difficult to be imitated, then it is likely to have an extra value with regard to the competition. The more imitable a resource or capability is, the more likely it would maintain its superiority and hence value. For example, Sky's football coverage of the Premiership, which began in 1992, changed the face of football coverage worldwide, and entirely changed the rules of market competition among the rivals.

Non-substitutability. Substitution is also a serious threat to the value of a capability (Saranga et al., 2018). As Dierickx and Cool (1989) pointed out that the existence of substitutes means that the capability no longer is able to create distinctive value to the customers. For example, Coca Cola cannot rely on its fizzy drink technology to remain competitive, as all its rivals have an access to very similar technology. In the vacuum cleaner market, Dyson challenged the dominant position of Hoover and the like only by introducing a high quality revolutionary product, that is, vacuum cleaners with no bag. Substitution may

happen in various ways, such as, material change, technological development, process revolution, and methodology improvement (Doz, 1997). Table 4 summarises the attributes of uniqueness by giving some examples.

Insert Table 4 about here

3.4 Core Competences and Strategic Flexibility

Many authors have pointed out that ‘being unique in competition’ is not sufficient for core competencies to keep their strategic values in the dynamic environment. This is because an inflexible *core competence* may quickly turn into tomorrow's *core rigidity* (Leonard-Barton, 1992; Taba, 2018; Teece *et al.*, 1997; Hafeez *et al.*, 2007a). Some other scholars also suggest that a core competence may be ‘a competence, which is highly flexible in terms of creating new strategic options for future business in a dynamic environment’ (Klein *et al.*, 1998). We agree that in order to identify core competence, the criteria should include some dynamic attributes. We thus define strategic flexibility as *the capacity of the capability to create new strategic options to respond to new demands in a dynamic competitive environment*. The strategic flexibility may include two attributes: resource re-deployment and routine re-organisation. A description of these terms is given below.

Capability re-deployment. It is understood that if a company can manage to redeploy its capability, new strategic options may be created. For instance, Honda's experience in Formula One Racing has benefited its road production cars by the introduction of Formula One cars technology. The impact of the asset flexibility on competence may be examined from the following three aspects (Amit and Schoemaker, 2012; Dierickx and Cool, 1989; Sanchez, 1995; Hafeez *et al.*, 2002a):

- i) *Range of alternative uses*: The resource re-deployment ability of a competence may be established if the underlined resources are deployed in a range of alternative uses.
- ii) *Switching costs and difficulty*: The lower the associated costs and complexity the assets can be switched for alternative applications, the more flexible the competence will be.
- iii) *Opportunity cost of delay*: The faster one or more of the assets can respond to business opportunity, the more flexible the competence would be.

Routines re-organisation. As pointed out earlier, capabilities in essence are the organisational routines, which present solutions to a particular problem. While a routine may be valuable to a firm for a specific period of time, it may also ‘create an organisational inertia which limit's the organisation's ability to fully comprehend new signals from the environment and act upon them expediently’ (Doz, 1997; Leonard-Barton, 1992; Hafeez et al., 2002b). A valuable routine should be able to re-organise itself from time to time to exploit business opportunities. For example, Canon's product development competence is formed by a set of informal and less rigid routines. Where necessary, the company set-up a taskforce brings together employees across the organisation to develop new products. Since the taskforce combine skills and knowledge within the company, and the development activities are managed and interacted flexibly, canon is able to deliver innovative and high quality products, such as cameras, image systems, and copiers, to customers (Klein and Hiscocks, 1994; Stalk *et al.*, 1992). Table 5 summarises the attributes of strategic flexibility by giving some examples.

 Insert Table 5 about here

3.5 An Architecture for Core Competence in the Oil Industry

Based on the comprehensive review presented, and using the concepts of firm resource, capability, and competence, we propose a core competence evaluation architecture as illustrated in Figure 1 (Source: Hafeez et al., 2002a&b&c). The tangible and intangible resources are the inputs to form capabilities of a firm. While all of the capabilities are useful to the firm's business, some capabilities play relatively more *valuable* role in realising the business objectives. These are key capabilities of the firm. Note that only those key capabilities, which are relatively *unique* in competition and highly *collective* in business operation, are likely to become competence. As explained earlier, the difference between competence and core competence is that the latter is relatively *strategically flexible* or dynamic by nature. In the subsequent sections, we test this framework by providing a detailed analysis, before developing a validated typology.

Insert Figure 1 about here

4. Methodology

4.1 Identifying Competence for an Oil Company

The case company investigated is regarded as one of the most efficient oil refineries in the world. The main output of the refinery comprise different grade of petrol with different lead compositions, and is distributed throughout the Europe. The refinery was commissioned in around 1960's and since went through a series of improvement programs to increase its daily oil throughput by 75 percent, and its coke production twice as much. The company has always been on the lookout for the most advanced technology and innovative techniques. This is to ensure its ability to meet the increased requirement for low lead petrol as dictated

by many environmental sustainability agendas throughout the Europe. Over the years all these investments have helped the refinery to maintain its enviable position.

The case study involved conducting face-to-face structured interview with twenty five divisional managers. The structured interviews involved going through a questionnaire related to the core competence evaluation framework as described by Hafeez et al. (2002a&c). A four stage core competence evaluation procedure was adopted as identified by Hafeez et al. (2002 a&c). For stage 1, we conducted interviews in two rounds. In the first round each divisional managers were asked to identify 10 key capabilities of the firm accordingly to their importance of 'value' to the company strategic operation and prioritised them (by assigning them 1 to 10 ranking). This data from 25 participating managers were collated in a spreadsheet by assigning different ranking to the identified key capabilities. Subsequently, these capabilities were ranked using a normalisation method to identify five key capabilities that scored higher in the ranking. We also conducted a subsequent exercise in which the participants were asked to identify contribution of physical assets, intellectual assets and cultural assets that make up these key capabilities. Each interview lasted in the between 1 to 2.3 hours. The data was recorded directly onto a spreadsheet model to reduce the analysis time.

Following Hafeez et al. 2007 and Hafeez and Essmael 2007, a more in depth analysis was undertaken by utilising a structured questionnaire. At stage 2 at first each participant was asked to rank each of these five functional capabilities against the 'collectiveness' attributes of 'across product, 'across-functions' and 'across business-unit'. At stage 3, respondents were asked to provide a ranking to these functions against the 'uniqueness' of 'rareness', 'inimitability', and 'non-substitutability'. The excel spreadsheet analysis of the combined response provided the 'competence' functions of the organisation. At stage 4, respondents

were asked to rank a reduced selection of ‘competence’ function to undergo the test of strategic flexibility and sustainability, again by collecting and collating responses in the spreadsheet model against the attributes of ‘resource–redeployment’ and ‘routine-reorganisation’.

As will be seen, for the purpose of this research, we have introduced a new stage 5 that concerns mapping the various strengths of the competence and core competence candidates against a Network typology in order to protect or augment these competencies further through developing partnerships and/or other collaborative relationship with other organisations.

The next section describes the implementation of this methodology in our case company.

5. Results Analysis and Discussion

5.1 Assets Contribution

As described in methodology, at stage 1 two sets of structured interviews were undertaken with each of the twenty-five divisional managers, participated in this study. These interviews concerned to identify and rank 10 key capabilities of the company that they believe are most ‘valuable’ to the company. Overall 30 capabilities were identified, and the ranking process identified the five key functional capabilities of the company, namely, *purchasing, refining, sales and marketing, R&D, and performance management (PM)*, that were deemed most ‘valuable’ for company. These are identified in Table 6.

One aspect of the analysis is to assess the key contribution of the three identified assets namely, *physical, intellectual, and cultural*, which make up the individual capability of the company. The average results are given in Table 6. Results show that *refining* comes out

to be the top *physical asset* scoring **49** percent. A refinery, such as the case company, has vast amounts of pumps, motors, and turbines. The raw materials, tools, and other physical assets are what make the refinery function. Grant (1991) states that ‘firm resources are the primary source of profit for the firm’, and this seems to be true for this case company. R&D scored **58** percent, as the top *intellectual asset*. R&D is about knowledge and expertise, and therefore, identified primarily as an intellectual asset. According to Grant (1991), ‘resources firstly provide the basic direction for a firm’s strategy’. From our discussion with the management it became apparent that over a number of years the case company has been heavily relying on its *R&D* competence to seek future directions. Finally, with the *cultural asset* category, *performance management* secured a top position with 58 percent contribution. From subsequent discussion, it was clear that the management understood performance management as the belief, values, and attitudes, and they are successful in conveying this message throughout the company.

Insert Table 6 about here

5.2 Uniqueness of Assets

Our analysis revealed that the physical assets ranked slightly higher on *rareness* scale (Table 7). An example of the physical assets is the location of the refinery, as it is situated directly on the major road and rail networks as well as served very well by the sea. However, it is the cultural assets that scored high on *rareness* and *non-substitutability*. Actually, the cultural assets are ranked top for all three attributes of uniqueness. This suggests that the

company appreciate relatively highly of its cultural assets compared with physical and intellectual assets as a contributory factors in imparting its business operations.

Insert Table 7 about here

5.3 Collectiveness of Capabilities

As can be seen from the total score in Table 8, the key capabilities that are regarded as being relatively integrated are *refining*, *performance management* and *purchasing*. These capabilities seems central to the company's main operation, and interact with all of its key business functions and departments. R&D scored relatively higher than the sales and marketing. Perhaps due to stable demand, sales and marketing is deemed not to be making much impact on the business operations. However, we feel that the company can be benefited by integrating sales and marketing especially with purchasing and refining (production).

Insert Table 8 about here

5.4 Uniqueness of Capabilities

Table 9 gives scores for the three uniqueness attributes for each key capability. The table shows that *refining*, *performance management*, and *R&D*, are regarded by the company as being relatively unique key capabilities. With regards to *refining*, the uniqueness may be

translated in terms of its *physical* assets, as well as *intellectual* assets as identified in Table 6. Specifically, plant location and investment in new technology gave company a *rare* position in the competition. With regards to *R&D*, specialist skill and knowledge about the refining process and understanding the chemistry to translate its main output into by-products, depends a lot on its intellectual assets. Also, *performance management*, as identified earlier, borrows much from the cultural assets of the company. It is also interesting to note that the main output of the company – *refining* – scoring higher than *performance management* and *R&D*. Note that two of these capabilities (*refining* and *performance management*) are also regarded as highly collective and, therefore become a prime candidate to be considered as a core competence.

Insert Table 9 about here

5.5 Core Competence for Company A

Scores for the strategic flexibility constructs, namely, resource re-deployment and routine re-organisation are provided in Table 10. It is interesting to note that *R&D* and *performance management* score relatively higher on the strategic flexibility indices. One apparent reason is that these two activities borrow a lot from the intellectual and cultural assets of the organisation. Compare with the physical assets, these non-tangible assets are relatively easy to adapt or mould into a new situation compared with *refining*, where its rigid plant structure restricts the main operation to a narrowly confined option for product range or diversification.

Insert Table 10 about here

The tabular results are represented in a graphically form in a two dimensional matrix (Hafeez et al., 2002a&b&c), as shown in Figure 2. The pictorial format illustrates that where R&D and performance management fall into core competence category, refining, purchasing, and sales and marketing are not falling far behind on the strategic flexibility measures. These results were verified by the management of the company, who agree with the assessment, quoting that these result are in-line with the company's overall view about the company as their mission statement refers to 'flexibility and innovation are the hallmarks of the refinery'.

Insert Figure 2 about here

Nevertheless, the results of the above assessment should not be taken up blindly, considering dispensing with the main operation of the company, that is oil production or refining. Outsourcing this operation would move the company entirely into a virtual business, which would not be sustainable. However, the analysis should draw management attention how some element of flexibility may be introduced within the refining function for the future sustainability of the business.

In the subsequent section, we introduce Laudon and Laudon's (1995) organisation structure to appraise four network typologies, namely, *operational network*, *knowledge network*, *tactical network*, and *strategic network*. We define primary features of these networks and illustrate how the case company may be able to sustain, nurture, and further develop its core competences and operational excellence by exploiting collaborative opportunities offered by these structures.

6. A Typology of the Network Structures

In order to remain competitive and adaptive to the fast changing global market, many organisations have adopted the newer organisational forms (Drucker, 1988; Jarvenpaa and Ives, 1994). Network organisations have been hailed as the new competition (Newbert, 2007), the 3rd organisational form (Best, 1990), and organisational form for the information age (Li *et al.*, 2016; Lipnack and Stamps, 1997). These efforts are a reflection of organisations' desire to move away from the Fordist model of vertical integration to introduce more adaptability and flexibility in operations to suit new demand of knowledge economy. Sub-contracting has been used increasingly as a way to mitigate investment failure by large organisations (Mouritsen, 1999). During 1990's this led to the trend of extravagant outsourcing in order to reduce cost and increase operational efficiency of the value chains (Chan *et al.*, 1997).

However, despite frequent citations in the literature, a general framework to describe the anatomy of network organisations is yet to appear (Cravens *et al.*, 1996; Nassimbeni, 1998). Existing models are either too complicated, or too superficial to provide management with appropriate rationale when seeking for a collaborative relationship. Despite of its formal boundaries, we find Laudon and Laudon's (1995) model describing vertical coordination mechanisms particularly helpful in this regard. With this model, the top management plans the firm's strategy; middle management supervise and co-ordinate business activities in order to achieve the desired strategy (Hafeez et al; 2006); knowledge and data worker use expertise to design products, processes and services (Hafeez and Abdelmeguid, 2003); and production and service workers deal with day-to-day production and service activities (Hafeez and Arawi, 2013; Shafiq et al., 2017). All these functions cut across various business functions within the company (see Figure 3).

While entering into some kind of external relationships, organisations needs to be aware of a complex set of interdependencies, each of which demands a different nature of co-ordination efforts. This particularly applies when the relationship remains separated at the geographical, cultural, legal, or even organisational level. Mintzberg (1998) points out four main kinds of interdependence: *Interdependencies in workflow, interdependencies in processes, interdependencies of scale, and social interdependencies*. Mintzberg (1983) also suggest that the differences in the nature of the inter-

dependencies are translated into the main co-ordination mechanism such as, *direct supervision*, *standardisation of input/output, processes and skills*, and *mutual adjustment*. Using authors' (Laudon and Laudon, 1995; Mintzberg, 1983) concepts, we propose four different network typologies, as illustrated in Figure 3 and explained briefly in the following subsections.

Insert Figure 3 about here

6.1 Operational Network

The operational network allows creating operational synergies between two organisations (Jarillo, 1988; Schonsleben, 2000) while focusing on the material flow (Hafeez et al; 2010). In its most simplistic form, this network constitutes a kind of short-term supply relations. Traditionally, such collaboration may be developed by the *staff* servicing the purchase departments of the two organisations. Usually, these relationships would not go beyond keeping a formal contact at the departmental level. Therefore, it provides very limited scope to build trust and knowledge sharing opportunities. Here organisation acts as a client (or contractor) to receive (or supply) raw material, semi-finished goods, or even the finished product and/or service. Operational network can be benefited by moving into supply chain management or partnership sourcing kind of relationships (Al-Qatawneh and Hafeez, 2015; Keoy et al; 2007; Hafeez, et al; 2010). This would allow longer term involvement between the partner organisations and offer opportunities for improving operational performance.

6.2 Knowledge Network

The main strength of the knowledge network is to facilitate knowledge sharing opportunities (Inkpen, 1996) at the intra or inter-organisation or functional levels (for example, between marketing, R&D, distribution functions, etc.). Therefore, forming such

networks would facilitate skill and expertise flow amongst the partnering organisations.

There are examples that joint ventures type arrangements have become a popular mode for sharing resources. This network allows an opportunity to learn, often by acquiring the alliance partner's skills and capabilities (Inkpen, 1996; Hafeez and Alghatas, 2007a; Hafeez and Aburawi, 2013). Therefore, the main enablers involved in this collaborative relationship are the *knowledge workers*. This type would most benefit the 'knowledge intensive' companies such as consulting companies as well as public sector organisations such as National Health Service (NHS) in the UK (Hussain and Hafeez, 2008a&b).

6.3 Tactical Network

With this form, the middle management is usually the key enablers to develop collaboration (Drucker, 1988; Jarvenpaa and Ives, 1994), if any. The main impetus here is to achieve synergies amongst network participants by focusing on the outputs only (Hafeez et al; 2006a&b). Non-core activities, such as, cleaning, catering, and facilities management, are out-sourced to the network participants to minimise the cost and the hassles of managing these. Therefore, the relationships are usually at arm's length, hardly allowing for any exchange of expertise. Middle management usually assumes the responsibility of managing these contracts, whereas, top management assumes only an advisory role.

6.4 Strategic Network

For us, the strategic network (Jarillo, 1988) would suit the most to exploit competence synergies among the participating organisations. Here an organisation can detect rapid changes in the social and industrial climate, and try to meet new challenges by quickly developing new products and/or services using the competences of the partnering organisation. Such strategic network would demand high level of trust and flow of expertise and knowledge. The close cooperation would

demand high level of intra-departmental and inter-organisational communications cutting across the vertical as well horizontal levels of the network. In terms of various modes of formal entry, consortia bonds type strategic alliance arrangements have become increasingly popular because they are often an efficient way of handling environmental uncertainty at a foreign location (Beamish and Banks, 1987; Hafeez et al., 2010). A number of financial sector and pharmaceutical sector alliances are the best example, where collaborations started as a strategic network.

7. Managing Competence Portfolio for the Oil Company A

Figure 3 highlights a number of operational excellence strategies using the proposed network typologies. For example, using the operational network typology, Company A may be benefited by opting for partnership sourcing or supply chain type arrangement with its key partners to achieve material flow synergies. This would allow opportunities to further develop *purchasing* competence and *sales and marketing* capability. The business benefits would accrue in terms of cost reduction and improved efficiency. This arrangement would permit low to medium degree of *trust* and *knowledge sharing* opportunities, which are non-existent with current arrangement.

With regards to *refining* competence, Company A must maintain its superiority in terms of its expertise and look for ways to introduce flexibility in its technology. A project based short-term *joint venture* with a cutting edge organisation could allow such an opportunity to get access to some required expertise and technology. This arrangement usually demands a commitment of a higher order from individuals requiring formal and informal interactions. Another avenue for the *knowledge network* exploitation could be for the *R&D* core competence, to test for some new technologies or develop some new product type without giving too much away.

Company A can subcontract some of its non-core functions and non-essential activities using tactical network arrangement that is relatively less demanding to manage compared with the knowledge network. Company A may like to exploit its *performance management* expertise by involving in some long-term joint ventures with spin-out opportunities. Also, R&D work can be

further exploited to check for further avenues of diversification. However, compared to all other network types, this type would be highly demanding requiring relatively more employee and management attention to reap the real benefits.

The results of the analysis were shared with the management of the company who fully approved the core competence identification results. However, in terms of portfolio management, they accepted the theoretical findings and would take this as basis of boardroom discussions.

8. Theoretical Contributions and Managerial Implications

The research presented here address the knowledge gap in terms of how to evaluate core competence for an oil processing industry. By its nature, oil industry is capital and knowledge intensive industry. Oil market is very complex due to fluctuations in oil prices subject to uncertainty in oil demand and geo-political situations. Consequently the investment decisions are highly risky and ramification of any wrong decision is very costly. Under the circumstance, providing a decision making tool and a set of guidelines to assist the management an oil company to cope with such challenges has enormous benefits. This research focuses on managing an oil company portfolio through the lens of resource-based view of the firm as proposed by Barney (1992). In that, the research identify the tangible and intangible resources in the context of process industry, and illustrate ways how these can lead to develop the key capability of the company. Further, the research illustrates how these capabilities can be evaluated across functions, across products and across business units to become a candidate for competence (Hamel and Parahalad, 1991). Under the impression of dynamic capability view (Teece *et al.*, 1997), the researches identify how to evaluate the core competence of the company. One major contribution of the this research is closing the loop by identifying the tangible (physical) and intangible assets (i.e. intellectual and cultural) that make up the core competence. This has much ramification for the management of the company to ensure appropriate investment decisions are made to strengthen these resources, and therefore, protect and nurture the key capabilities to ensure sustainable competitive advantage (Hafeez 2002a &2010).

Similarly, company may decide to use these results to outsource capabilities that are either weak or not valuable to the company's in future business operation.

Most of the previous work describe how to evaluate the key capabilities and core competence for a company (see for example, Hafeez et al., 2002a&b&c; Hafeez and Essmail, 2007, Javaidan et al. 2017). The present work contributes to strategic management theory and practice further by providing a network topology to indicate how competence portfolio can be further strengthen externally by engaging in a collaborative venture. In particular the network topology introduced here provide a comprehensive guidelines for the management of a company by mapping the key enablers of a company business with its core competence. In addition the topology map out how to exploit the key enablers to forge an appropriate collaborative relationship with a partnering company. . For example, in order to further develop the *R&D* core competence for the case company, it requires to have more knowledge and expertise in the refining, therefore a collaborative partnership focus on *knowledge flow* in and out of the organisation, and a meaningful collaboration in between the knowledge and data workers of the two companies. The network topology indicates that high level of knowledge sharing is only possible by building high level of *trust* amongst the collaborative partners .Therefore, a *joint venture* network arrangement is suggested that would ensure the right level of communication and protect the ownership of intellectual property develop through the R&D competence, and this would allow both partners to exploit the benefits from the new venture in appropriate proportions.

The research also extends the present literature in terms of how to manage the core competencies portfolio in an oil company. Here the research contributes in many ways to the strategic management field by merging contemporary views from knowledge management, community of practice, supply chain management, and network organisations. The comprehensive portfolio management tool identified here have major implications for the profession as practicing managers will be able to employ this as an effective portfolio management tool.

9. Future Study and Limitation

Where using case study has its strengths in terms of assessing the suitability of a methodology in a specialist or narrow domain, it poses its limitations in generalising the outcome of the research. In addition, despite undertaking all efforts to collect a representative view of the organisation by averaging the individual responses, the data collection process is prone to subjective bias. Similar to other interview-based research, the subjective bias could arise due to overconfidence of the individuals regarding their own performance or capabilities, or could appear due to game playing behaviour or politics in the organisation. We suggest to utilize AHP-based analysis (Hafeez, et al. 2002b; 2007) to remove any inconsistency in the data and conduct triangulation of the analysis. One of the challenges in this situation would be access to senior management, as this would require at least 4 interviews of one hour duration each from each respondent to collect the required data.

As explained earlier Salamat et al., (2018) provide a fuzzy possibilistic Analytic Hierarchy Process (AHP) based approach for partner selection while considering developing strategic alliances. A future way forward could be to develop a fuzzy possibilistic AHP approach for selection of the network topologies as introduced in this paper. This would allow to reduce the inconsistency in subjective information and would reduce the subjective bias.

Finally, the framework needs to be implemented on a larger size sample to get a consensus if these 3 core competencies identified are a typical representation of the sector.

7. Conclusions

This paper develops an integrated core competence identification and portfolio management framework that offers practicing managers guidelines on how to manage the core competence portfolio. This is the first time such framework is tested to identify and manage the competence portfolio of an oil company. We have illustrated here that core competence as a producer of operational excellence and collective learning manifested in across-products, across functions, and across business units. Also, core competence is flexible in terms of resource re-deployment and routine re-organisations to meet the ever-changing market demand. We have illustrated a step-by-step approach to evaluate the core competences using the data from an oil processing company. The results show that in spite of *refining* to be the prime business activity (for an oil company), the core competence turns out to be *performance management* and *R&D*, respectively, belonging to the *cultural* asset and *intellectual* assets categories. Our assessment shows that introducing flexibility in *refining* operation (and technology) may be the key factor for the company to sustain its competitive advantage. However, in order to nurture *performance management* and *R&D* core competences, the management need to invest in the *cultural* asset and *intellectual* asset of the company, respectively. Finally, by introducing four network typologies, we have illustrated how Company A may exploit various collaborative arrangements to enhance its operational excellence by managing its competence portfolio. The framework uses intellectual, cultural, and physical assets as the basic unit of analysis and illustrates how strategic tangible and intangible resources may be employed to manage the competence portfolio of the oil company. We argue that this framework is an integrated tool not only to identify the core competence of the company, but also to manage the competence portfolio by engaging in a range of suitable options for the company to retain and further develop its core competence and to manage its non-core activities in more strategic and efficient way.

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Table 1: Categories of firm resources

Term	Definition	Examples
Intellectual Assets	An intangible or 'invisible' resource	<ul style="list-style-type: none"> - House of Fraser's <i>reputation</i> of quality - Hugo Boss's <i>brand</i> name - Microsoft's <i>customer loyalty</i> - BP's <i>brand</i> name
Physical Assets	A tangible or 'touchable' resource	<ul style="list-style-type: none"> - McDonald restaurant's <i>outlets</i> - Interflora's nation-wide <i>distribution</i> network - Shell's world-wide <i>distribution</i> network
Cultural Assets	A pattern of basic assumptions	<ul style="list-style-type: none"> - Virgins <i>commitment</i> to customer service - Wal-Mart's <i>belief</i> in employees or 'associates'.

Table 2: Some examples of functional/operational capabilities

Functional/Operational Capabilities	Sub Capabilities	Examples
Design	New product design capability	Tetra Pak, Apple Computer;
R&D	Research capability, new product development capability	IBM, 3M, Du Pont, Sony, Canon, Esso
Operations	Efficiency in volume manufacturing,	Nucor; Shell
	Manufacturing flexibility	Texas Instruments
	Quality management	Hewlett-Packard, Toyota, Xerox
	Timely information communication	The Gap, American Airlines
Sales and Distribution	Efficiency and speed of distribution,	Wal-Mart
	Order processing efficiency	LL Bean

Table 3: Examples of the attributes of collectiveness

Collectiveness	Description	Examples
Across-function	The extent to which a capability is an indispensable element of one or more cross-functional processes	Nissan's <i>cost control</i> for its efficient logistics and production processes
Across-product	The extent to which a capability is shared by various products	Canon's <i>optical technology</i> used in image systems, copiers, and cameras
Across-business	The extent to which a capability is an indispensable element of various business units	McDonald's <i>operations management</i> for its world-wide outlet

Table 4: Examples of the attributes of uniqueness

Attribute	Description	Examples
Rareness	The degree to which a particular capability is distinctive in competition	Ferrari's car <i>design</i> capability
Inimitability	The degree to which a particular capability is inimitable by competitors	Sky's Premiership football coverage, Sony's <i>miniaturization</i>
Non-substitutability	The degree to which a particular capability cannot be replaced by other resources or capabilities	Dyson's <i>no bag vacuum</i> cleaners

Table 5: The attributes of strategic flexibility

Attribute	Description	Examples
Resource re-deployment	The ease with which baseline resources of a competence may be re-deployed to develop new capabilities	Honda's Formula One <i>expertise and technology</i> has been re-deployed on their road cars.
Routines re-organization	The ease with which the manifested routines may be re-organized to support future business development	Celltech and 3M's <i>laboratory management</i> competence can readily be re-organized to develop new products.

Table 6: Overall percentage contribution for Company A's assets

Capability	Overall Contribution					
	Physical Assets		Intellectual Assets		Cultural Assets	
	%	Rank	%	Rank	%	Rank
Purchasing	24	3	41	3	35	2
Refining	49	1	30	4	21	4
Sales & Marketing	26	2	49	2	25	3
R&D	22	4	58	1	20	5
Performance Management (PM)	15	5	27	5	58	1

Table 7: Overall scores for the attributes of uniqueness for Company A's assets (all scores out of 4)

Asset	Rareness	Inimitability	Non-substitutability
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	Score	Rank	Score	Rank	Score	Rank
Physical assets	2.6	2	2.4	1	2.4	2
Intellectual asset	2.2	3	2.2	2	2.4	2
Cultural asset	2.8	1	2.4	1	2.8	1

Table 8: Overall scores for the attributes of collectiveness for Company A's key capabilities (individual scores out of 4)

Key Capability	Across-function		Across-product		Across-business		Total (out of 12)
	Score	Rank	Score	Rank	Score	Rank	
Purchasing	2.6	3	2.6	2	2.8	2	8
Refining	2.8	2	3	1	3	1	8.8
Sales & Marketing	2.4	4	2.4	3	2.4	3	7.2
R&D	2.8	2	2.4	3	2.4	3	7.6
Performance Management	3.2	1	2.4	3	2.8	2	8.4

Table 9: Overall scores for the attributes of uniqueness for Company A's key capabilities (individual scores out of 4)

Key Capability	Rareness		Inimitability		Non-substitutability		Total (out of 12)
	Score	Rank	Score	Rank	Score	Rank	
Purchasing	3	3	2.2	4	2.4	5	7.6
Refining	3.8	1	3.4	1	3.6	1	10.8
Sales & Marketing	2.2	4	3	2	3	3	8.2
R&D	3.2	2	2.8	3	3.4	2	9.4
Performance Management	3.8	1	3	2	2.8	4	9.6

Table 10: Overall scores for the attributes of strategic flexibility for Company A's key capabilities (individual scores out of 4)

Key Capability	Resource re-deployment	Routine re-organization	Total
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	Score	Rank	Score	Rank	(out of 8)
Purchasing	2.8	3	2.8	3	5.6
Refining	2.8	3	2.8	3	5.6
Sales & Marketing	2.8	3	2.8	3	5.6
R&D	3.4	1	3	2	6.4
PM	3.2	2	3.2	1	6.4

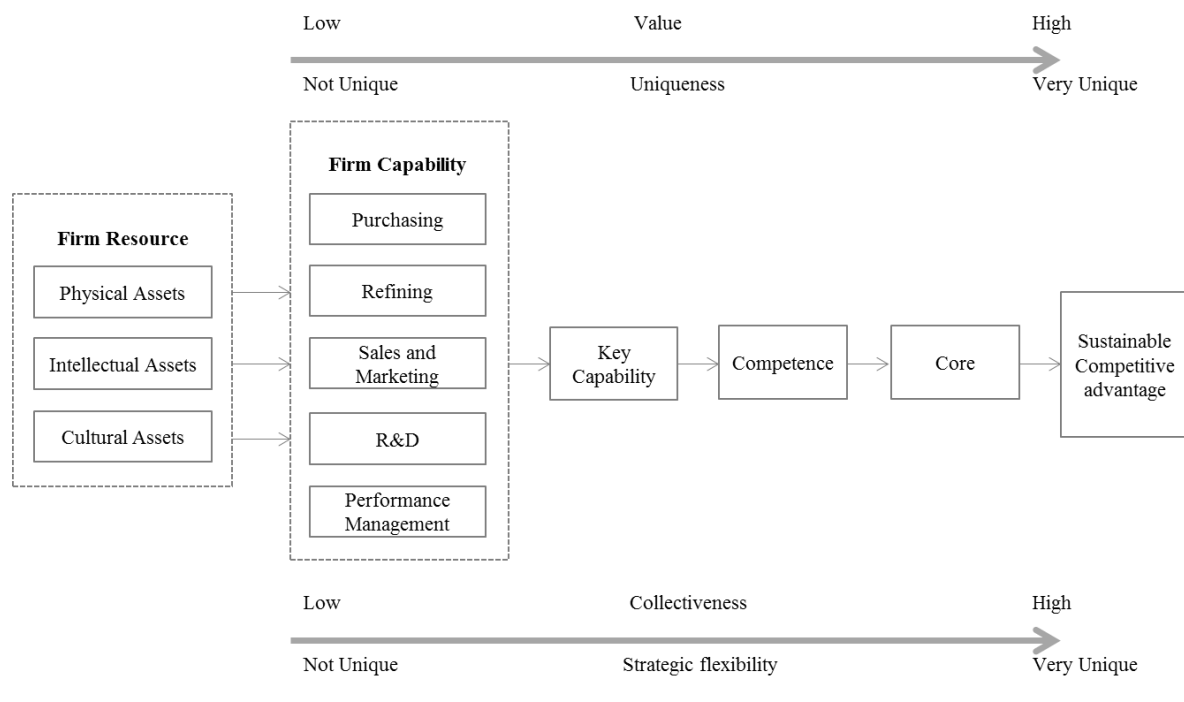


Figure 1: The architecture of core competence (source: Hafeez et al; 2002a&b)

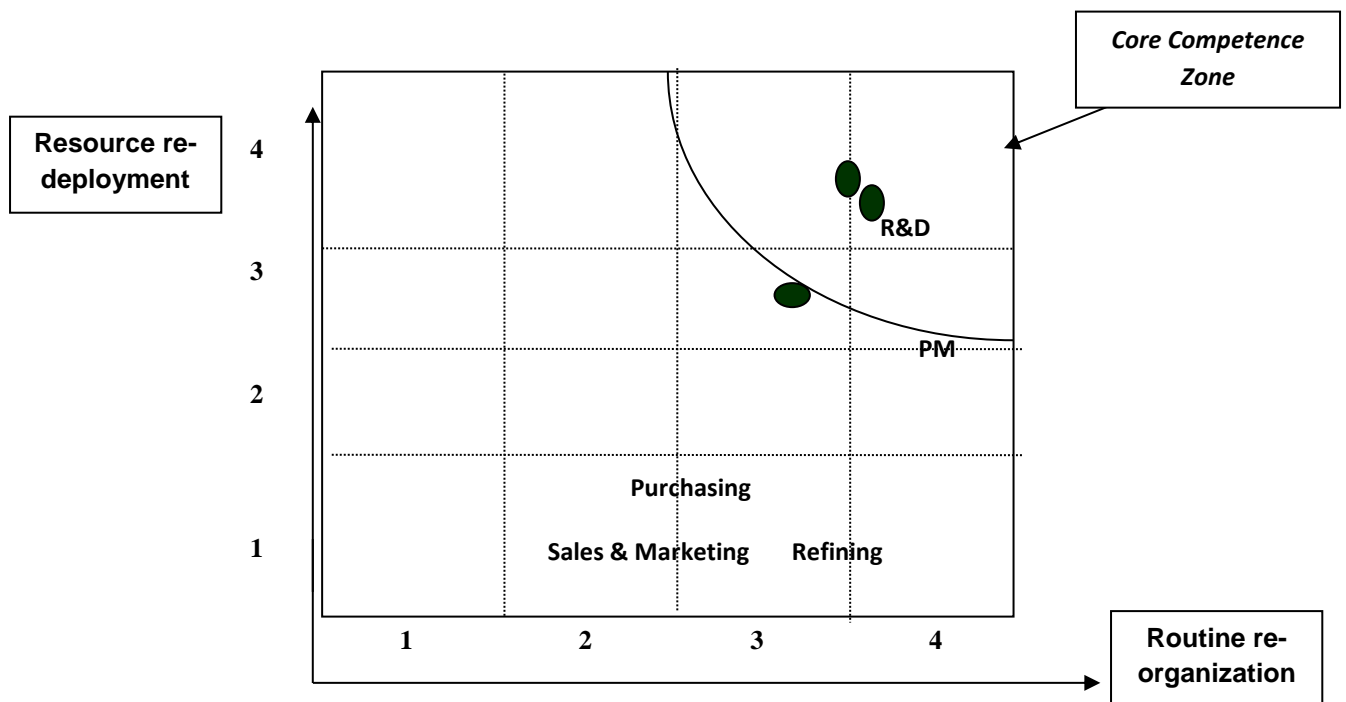


Figure 2: Core competence determination matrix

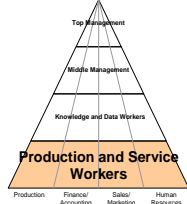
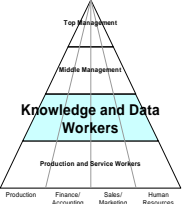
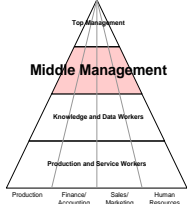

Primary features	OPERATIONAL NETWORK	KNOWLEDGE NETWORK	TACTICAL NETWORK	STRATEGIC NETWORK
Type of synergy	Operational	Knowledge	Tactical	Strategic
Main Focus	Material flow	Expertise flow	Activities flow	Competence
Main Enabler				
Type of Interdependency	Flow	Process	Scale	Capability/competence
Synergy achieved through Standardization of	Operations	Skills	Outputs	Capabilities
Type of Relationships	Formal	Informal and formal	Formal	Informal and formal
Points of Commitment	Inter and intra-departmental level	Individual, inter and intra-departmental levels	Intra-organization level	Individual, inter and intra-departmental; inter and intra-organization levels
Knowledge Sharing	Low - Medium	Medium - High	Low	Medium - High
Trust	Low – Medium	Medium - High	Low	High
Cultural Influence	Low - Medium	Medium-High	Low	High
Example	Supply Chain	Joint-Venture	Out-Sourcing Ad hoc pool	Strategic Alliance (consortia bonds)
Operational excellence strategy for company a	Sales and marketing, Purchasing		Non-core assets and capabilities	Performance Management
Competence development strategy for company a		Refining, R&D		R&D

Figure 3: A typology of network organizations for developing core competence