

**Developing the Commercial Capital of Buying Firms:
A Conceptual Supply Management Innovation Maturity Model**

ABSTRACT

The developing literature on open innovation clearly demonstrates that innovation from the supply base can have a significant impact on the innovation performance of a focus firm. Although the literature clearly indicates that supplier involvement can be critical to a focus firm's new product and process innovation, the role of supply management in these innovation projects is not clear. The purpose of this research is to help us understand how supply management can impact a focus firm's attractiveness to suppliers of innovation and therefore the innovation success of the focus firm. In particular, we identify five dimensions of supply management's innovation maturity, namely strategy, process, information, relationship and people, and propose a maturity model based on the five dimensions. Additional considerations and contingencies of the model are discussed. This paper contributes to the literature by introducing a new construct and an in-depth examination of the construct. In addition to help filling a hole in the literature, the construct can provide a valuable tool for business managers. Using the maturity model as a benchmark, corporate and supply management executives can analyze the innovation maturity level of their supply management function. Roles can then be redefined and adjusted to move supply management up the maturity curve, resulting in improved results from the company's innovation activities with suppliers.

Keywords: Innovation; supply management; supply management roles; maturity model

INTRODUCTION

The developing literature on open innovation (Chesbrough, Vanhaverbeke, & West, 2006; Chesbrough & M.M., 2007; Pisano & Verganti, 2008; Almirall & Casadesus-Masanell, 2010; Gassmann, Enkel, & Chesbrough, 2010) clearly demonstrates that innovation from the supply base can have a significant impact on the innovation performance of a focus firm. (We will use the term "focus" firm instead of "buying" firm to indicate that the source of the innovation and the resulting relationship may be different from that usually defined the buyer-supplier relationship construct.) Although the literature clearly indicates that supplier involvement can be critical to a focus firm's new product and process innovation (Ragatz, Handfield, & Scannell, 1997; Afuah, 2001; Petersen, Handfield, & Ragatz, 2003; Chen, Paulraj, & Lado, 2004; Benton & Maloni, 2005; Petersen, Handfield, & Ragatz, 2005; Song & Benedetto, 2008), the impact of supply management¹ in these innovation projects is not clear. The purpose of this research is to help us understand the various level of innovation maturity that can exist in supply management and how these maturity levels can impact a focus firm's attractiveness to suppliers of innovation and therefore the innovation success of the focus firm.

To identify the key components of supply management's innovation maturity we build on field work reported in (Monczka, Carter, Scannell, & Carter, 2010; 2011). From these reports and case interview notes we were able to define five dimensions of supply management's innovation maturity. These dimensions are: (1) strategy, (2) process, (3) information, (4) relationship and (5) people. These five dimensions were used to develop a maturity model to

¹ We use the term "supply management" to refer to the business function that has responsibility for sourcing and buying for the firm. This function is also called purchasing management and procurement management. It is often led by an executive called the Chief Purchasing Office or the Vice President of Supply. We do not use "supply management" to mean the general management of the relationships between suppliers and the focus firm, which usually includes additional business functions, such as finance and engineering, and even the CEO of the firm for important suppliers.

capture the different levels at which each role might be performed and to describe the combined effects of each role and each level of performance. In addition, we defined the five levels of the maturity model as: (I) absent, (II) ad hoc/reacting, (III) information hub, (IV) matchmaker/gate keeper, and (V) opportunity seeker.

SOURCES OF COLLABORATION ATTRACTIVENESS

Using the resource based view (RBV) of the firm and social network theory, Ahuja (2000) argued that a firm's attractiveness to innovation suppliers is likely to vary positively with its stocks of commercial, social and technological capital. Concerning commercial capital, Ahuja points out that

"....converting technical innovations to products and services entails the development of manufacturing and marketing capabilities and assets such as manufacturing facilities and service and distribution networks (Mitchell, 1989; Teece, 1986)."

"Other things being equal, firms possessing such assets are more attractive as partners than firms lacking such assets. Thus, a firm's stock of commercial capital is likely to have a positive impact on the linkage opportunities available to a firm."

Ahuja's empirical results support the hypothesis that a positive relationship exists between the level of a firm's commercial capital and the number of (innovation supplier) linkages formed by it.

However, Ahuja and most other researchers have failed to appreciate the importance that supply management has in the creation of commercial capital for the focus firm. We posit that, for projects that rely on innovation from sources outside the firm, supply management can play an important part in increasing the commercial attractiveness of the focus firm.

INNOVATION AND SUPPLY MANAGEMENT

Innovations are among the most complex projects a firm undertakes and can involve people from many functions within the firm, such as operations, marketing, engineering and top management (Krishnan & Ulrich, 2001), as well as people from other firms in the value chain, such as suppliers and customers. Many studies have shown that buyer-supplier collaboration will benefit a firm's innovation success through information and knowledge sharing, decreasing transaction costs and providing financial and social support (Clark, 1989; Afuah, 2001; Takeishi, 2001; Grover & Malhotra, 2003; Song & Benedetto, 2008; Carter, Monczka, Ragatz, & Jennings, 2009; Monczka, Handfield, Giunipero, & Patterson, 2009a; Monczka, Scannell, Carter, & Carter, 2009b). However, other studies point out that the benefit may not always be realized through simply adopting supplier techniques such as early supply involvement and frequent communication in innovation projects (Hartley, Meredith, McCutcheon, & Kamath, 1997). The mixed findings indicate that there may be other factors affecting the success of buyer-seller collaboration on innovation. A deeper and better understanding of supply management's role in innovation is critical to gaining a better understanding of the complex relationships between buyers and sellers.

Although previous research focused on supply management's external roles, such as supplier identification and selection (Zacharia, Nix, & Lusch, 2009) and building mutual trust in the buyer-supplier relationship (Ring & Ven, 1992; Mayer, Davis, & Schoorman, 1995; Zaheer & Harris, 2006), supply management's role in innovation can, in fact, be broad and multi-dimensional. Based on extensive case studies interviews about specific innovation projects with focus firms and corresponding suppliers (Monczka et al., 2010; Monczka, 2011), we identified five dimensions: strategy, process, information, relationship and people (See Figure 1). The detailed descriptions of the five dimensions are discussed in as follows.

Insert Figure 1 Here

Dimension 1: Strategy

The first dimension, strategy, refers to whether innovation is one of the strategic goals of supply management. Ideally, the goals of supply management as a function are in alignment with the firm level strategies. In other words, if innovation is one of the firm's strategic goals, it should also be a strategic goal for supply management. In this case, supply management takes innovation/innovativeness into consideration when it makes sourcing decisions, e.g., supplier selection and supplier development. In reality, however, the goals of supply management may not always be in alignment with the firm level strategies. Therefore, this dimension is correlated and, yet, distinctive from firm level innovation strategies. In addition, the strategic goals of supply management should also be reflected by the measurements of supply management performance. For example, in cases where innovation is a strategic goal, the contributions of supply management will be measured not only on "cost reduction", but also on innovations, e.g., percent of supplier ideas adopted, number of new qualified innovative suppliers and percent of revenue from new products that were supported by supplier innovation.

Dimension 2: Process

The process dimension refers to how supply management encourages supplier innovation through the implementation of processes for receiving and evaluating the innovation ideas. For example Supply Management can establish processes for supplier innovation "on-boarding", for directing supplier ideas to the appropriate technical and market people in the focus firm and for supply follow up on submitted ideas. In addition, supply management can ensure that IP rights

and investment/costs for supplier innovations are formally addressed and agreed to by both parties. These process improvements are aiming at motivating suppliers to bring innovations to the focus firm, by standardizing and simplifying the procedures and by mitigating suppliers' perceived risks.

Dimension 3: Information

The information dimension refers to how supply management collects and shares information and knowledge among internal and external players. Supply management acts as a boundary spanner collecting information regarding innovation needs within the focal firm by participating or coordinating with new product/service develop (NPD) team and sharing this information with potential suppliers. Conversely, it collects information from current and potential suppliers regarding their innovation capabilities and technical skills and shares this information with the NPD team or other people within the firm. Innovation information flows in both directions between internal players and suppliers through supply management.

Dimension 4: Relationship

The relationship dimension refers to how supply management builds and maintains relationships with current and potential suppliers for supplier innovation. In this case, supply management focuses on developing and maintaining trust and collaborative relationships between the focal firm and its suppliers. On the one hand, supply management assesses and reports suppliers' trustworthiness to the focus firm based on past experiences. On the other hand, supply management builds its own trustworthiness by identifying key personnel to interact with suppliers and by establishing appropriate behavior guidelines.

Dimension 5: People

The last dimension, people, refers to the technical skills of supply management. (We assume that Supply Management has the requisite commercial skills). Supply management personnel should have a high degree of technical competency and an ability to communicate about technical issues with cross functional and cross enterprise team members (e.g., finance, marketing, engineers, project managers and so forth).

With the five dimensions now defined, in the next section we develop a five level maturity model of supply management's role in innovation.

A SUPPLY MANAGEMENT INNOVATION MATURITY MODEL

Maturity models have been widely used in different disciplines, such as information technology (Paulk, Weber, Curtis, & Chrissis, 1995), product development collaboration (Fraser, Moultrie, & Gregory, 2002), and supply chain operation (Netland & Alfnes, 2011). A maturity model serves two purposes. The first purpose is “that it describes in a few phrases, the typical behavior exhibited by a firm at a number of levels of maturity, for each of several aspects of the area under study” (Fraser, Moultrie, & Gregory, 2002), pp. 244). In other words, from a research point of view, it provides a way of describing different levels of a multi-dimensional research construct. The second purpose is that a maturity model can help companies benchmark the development of their operations relative to industry "best" practice. Note that the term "maturity" does not imply biological maturity, an aging process, or an inevitable progression. Indeed, for supply management innovation maturity it is possible for a firm to drop from a higher level of maturity to a lower level, something that is not possible in a biological maturity model. Furthermore, a higher level of maturity for supply management is generally a better, or more desirable, state, whereas in biology one maturity state is not necessarily better than another.

Because maturity models are easy to understand and communicate and are useful research constructs, we developed a five-level maturity model for supply management's role in innovation. The five levels, defined by the combinations of the states of the five dimensions identified above, are (I) absent, (II) ad hoc/reacting, (III) information hub, (IV) matchmaker/gate keeper, and (V) opportunity seeker (See Figure 2).

Insert Figure 2 Here

Maturity Level I: Absent

At maturity level I (Absent) supply management is not part of the core innovation team. It is likely to be unaware of the innovation projects and their progresses at this stage. It is only responsible for sourcing raw materials and parts when the design and pre-test is done.

The strategic goals of innovation is absent at this level either because innovation is not part of the firm level strategies, or because of the misalignment between firm level and supply management strategies. In the process dimension, supply management focuses only on criteria other than innovation so that supplier innovation is ignored or discouraged. In addition, the process of supplier innovation is long and complicated, and the suppliers are facing high risks in supplier innovation because IP rights and risk/rewarding sharing between firms are unclear.

In terms of information, supply management is not knowledgeable about either the innovation needs within the firm or the innovation capability of the supply base. Thus, information is blocked between the focal firm and its suppliers or it is transferred through channels other than supply management. In the relationship dimension, supply management has

not established a trusting and collaborative relationship with the supply base. At this stage, it is likely that supply management has not demonstrated its own credibility nor has assessed suppliers' trustworthiness regarding supplier innovation. In the people dimension, supply management, as a team, does not have a high degree of technical competency or the ability to communicate with cross functional and cross enterprise team members. In summary, supply management is immature in all five dimensions at this level.

Maturity Level II: Ad hoc/Reacting

At maturity level II (Ad hoc/Reacting) supply management is not part of the core innovation team. However, it may be aware of certain innovation projects and their progress if it is responsible for sourcing certain tools and parts during the development.

Level II differs from Level I mostly in the information and people dimensions. Since supply management facilitates tools and parts sourcing for certain innovation projects, it is knowledgeable about the focal firm's internal innovation needs. It also shares this information with certain suppliers. However, supply management is not cognizant of the innovation capability of the supply base. The information flow between the firm and its suppliers transfers unidirectionally from the firm to suppliers via supply management. In the people dimension, supply management, as a team, does not have a high degree of technical competency, but has the ability to communicate with cross functional and cross enterprise team members.

Maturity Level III: Information Hub

At maturity level III (Information Hub), supply management supports the innovation team. It is aware of the innovation projects and is, at least, partially informed about the needs and goals of these projects. It is also familiar with the supply base and acts as a bridge between internal needs and external resources.

Level III is considered as a breakpoint in the maturity model because all five dimensions have moved up from level II. Innovation becomes a goal of supply management but is not a strategic objective. It is likely that innovation is part of the core strategy of the firm. However there is a misalignment between firm level strategies and supply management strategies. In the process dimension, supply management promotes supplier innovativeness by considering it as a key criterion in supplier selection and evaluation. However, the process of on-boarding supplier innovation and issues such as IP rights and risk/reward sharing are somewhat unclear so that suppliers may have concerns regarding to these issues.

In the information dimension, supply management is knowledgeable about both internal innovation needs and the innovation capability of the supply base and shares this information with potential suppliers and the internal innovation teams. Thus, the information transfer is bidirectional. However, the information gathering and sharing are done in a passive way. Supply management does not have a primary decision making role in technology or supplier selection in the innovation team. In the relationship dimension, supply management has established a trust and collaborative relationship with the current supply base. It has demonstrated its trustworthiness and assessed suppliers' trustworthiness regarding to supplier innovation. In the people dimension, supply management has an enough technical competency to communicate with cross functional and cross enterprise team members.

Maturity Level IV: Matchmaker/Gate Keeper

At maturity level IV (Matchmaker/Gate Keeper) supply management is part of the core innovation team. It has full information on the needs and goals of the projects. It is also familiar with the innovation capabilities of the supply base so that it can match the internal needs and external resources. It also acts as a key decision maker in selecting projects and promoting ideas.

This is also a critical stage in the maturity model because four of the dimensions changed from level III. In the strategy dimension, innovation becomes a strategic goal of supply management. Supply management takes innovation/innovativeness into consideration when making sourcing decisions. Contributions of supply management are not only focused on “cost reductions”, but also contributions to innovation such as percent of supplier ideas adopted, number of new qualified innovative suppliers and percent of revenue from new products that were supported by supplier innovation.

In the process dimension, supply management adjusts supply performance measures and evaluation to recognize the need for supplier innovation for certain purchase categories. Supply Management establishes processes for supplier innovation "on-boarding", for directing supplier ideas to the appropriate technical and market people in the focus firm and for supply follow up on submitted ideas. Supply management ensures IP rights and investment/costs for supplier innovations are formally addressed and agreed to by both parties. In the information dimension, similar to the previous stage, supply management collects and shares information with internal and external partners. However, since supply management is part of the core innovation team, it actively searches for information needed (mostly from current supply base) and shares the information with key people identified.

The relationship dimension remains the same at this level as in level III. In the people dimension, supply management personnel have a high degree of technical competency and an ability to communicate with cross functional and cross enterprise team members (e.g., finance, marketing, suppliers, business managers, and so forth).

Maturity Level V: Opportunity Seeker

At maturity level V (Opportunity Seeker) supply management, as in level IV, is part of the core innovation team and it has good understanding of internal needs, external resources, and technology trends. However, at this level, supply management not only focuses on current projects, but also seeks new innovative ideas from suppliers that can be of value to the firm.

This level builds on the previous levels and extends the information and relationship dimensions. In the information dimension, the information collecting and sharing is not limited to the firm's current supply base. The purpose of information collecting and sharing is not limited to current innovation project as well. Supply management actively look for potential innovation opportunities by broadly reviewing firm's current and future innovation need and current and potential suppliers innovation capability and matching the two. In the relationship dimension, supply management not only has established a trust and collaborative relationship with the current supply base, it also builds a reputation among potential suppliers on trustworthiness. Also, supply management can reliably assess the innovation capability of current and potential suppliers.

Table 1 summarizes the five levels in the maturity model for each of the supply management roles identified above. The descriptions are not meant to be all inclusive but are representative of the activities for each role at each level of the maturity model.

Insert Table 1 Here

DISCUSSION

We proposed the five level innovation maturity model for supply management in innovation based on five dimensions, namely, strategy, process, information, relationship and

people, which we identified from previous case studies. In this section, we will address several addition issues to further clarify our proposed model.

Additional Considerations

Three important points are implied by the maturity model. First, the maturity levels are cumulative. That is, for the company whose supply management is at maturity level N, it is likely that it also covers the practices at maturity level N-1. For example, if supply management has built trust relationships with suppliers at maturity level III, it will maintain the trusting relationships, if not improve them, at maturity levels IV and V. Second, the maturity levels are defined by the combination of all five dimensions. In this circumstance, there will be cases that the roles are higher in some dimensions while lower in the others. Therefore, assessing the overall maturity level from the individual dimensions is a blending process.

Lastly and most importantly, the innovation maturity level of supply management is determined in large part by organizational design decisions made at higher levels in the organization. That is, supply management's role does not naturally mature from Level I to Level V, as a biological process might mature. In general, the position of supply management within the organizational structure is part of the organizational design, which is affected by the organization's history, industry sector, organization size, total value of goods and services purchased and overall organization design (e.g. highly centralized or highly decentralized) (Monczka et al., 2009a). Since supply management's role in innovation is only part of the overall role of supply management, innovation roles are largely established by the organizational design. Thus, the innovation maturity level of supply management is not naturally formed but rather the result of decisions from upper management.

Contingencies of the Proposed Model

Some contingencies in the proposed model are discussed in this section. The proposed model is applicable only when: (1) the focal firm considers innovation as a core competency and (2) suppliers are considered a key source of innovation. Under these assumptions, the firm can assess its current maturity level and invest or reallocate resource to move up to a higher maturity level. However, if a firm considers innovation as a core competency but mostly relies on in-house innovation, then the positive relationship between maturity level and innovation success might not hold. In this case, a level III innovation maturity may be sufficient and higher levels may not be required (or possible). Lastly, if the focal firm does not consider innovation as a core competency and therefore does not place a high value on supplier innovation, a level I innovation maturity can be sufficient and the positive relationship between maturity level and innovation success is a moot point.

Managerial Implications

This paper provides several managerial implications. First of all, we highlighted the importance of supply management's role in the focus firm's innovation success, which has been overlooked in literature and, perhaps, in practice. Using our maturity model as a benchmark, managers can analyze the innovation maturity of their supply management function. If they find supply management innovation to be inadequate to support the company's overall innovation strategy, steps can be taken to increase the maturity level, and, consequently increase the probability of innovation success.

Second, not only does our model help managers assess the overall maturity level, the model also suggests the maturity level of each of the five dimensions. Thus, managers should examine all dimensions to understand to ascertain if a particular dimension of supply management is underdeveloped or if certain dimensions are more important to their firm.

CONCLUSION AND FUTURE RESEARCH

Although supply management's role in sourcing has been widely studied, its role in innovation is not clear. The paper contributes to the literature by developing a construct that can be used to help analyze and explain firm innovation success. Additionally this paper helps to fill this research gap by identifying five dimensions of the innovation maturity of supply management. A measurement model can be developed for these dimensions that will allow empirical testing of the maturity model and its relationship to firm innovation success. The maturity model can also be introduced into more complex models of firm innovation success that might incorporate such constructs as absorptive capacity, social network theory and collaboration strategies. Finally, the antecedences and drivers of the various dimensions of the maturity model can be investigated.

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Table 1: Maturity model for supply management roles in innovation

Level of Maturity	Level I: Absent	Level II: Ad hoc/Reacting	Level III: Information hub	Level IV: Matching/gate keeper	Level V: Opportunity Seeker
Dimension 1: Innovation as a strategic goal (Strategy)	The goals of supply management do not include innovation.	Supply management reacts to needs of other functions for tactical items to support innovation projects.	Innovation is a tactical goal of supply management. This could include negotiating with suppliers that were selected by the technical team.	Innovation is a strategic goal of supply management. Supply management takes innovation /innovativeness into consideration when making sourcing decisions. Supply management is evaluated on its contribution to innovation in the firm.	Innovation is a strategic goal of supply management. Supply management actively seeks out new innovation and new suppliers of innovation in the supply base.
Dimension 2: Motivate/Encourage supplier innovation (Process)	Supply management focuses on criteria other than innovation so that supplier innovation is ignored or discouraged. In this case, suppliers are not evaluated on their innovativeness. In addition, the process of vetting supplier innovation is long and complicated. Finally, the IP rights of the suppliers are not protected and risk/rewarding sharing between firms is unclear.		Supply management promotes supplier innovativeness by considering it as a key criterion in supplier selection and evaluation. However, the process of supplier innovation and issues such as IP rights and risk/reward sharing are somewhat unclear so that suppliers may have concerns regarding to these issues.	Supply management adjusts supply performance measures and evaluation to recognize the need for supplier innovation for certain purchase categories. Supply management establishes a common process globally for innovation development and supplier collaboration, including project management and speedy decisions about supplier innovations. Supply management ensures IP rights and investment/costs for certain supplier innovation are formally addressed and agreed by both parties.	
Dimension 3: Collect and share information and knowledge (Information)	Supply management is not knowledgeable about either the innovation need within the firm or the innovation capability of the supply base.	Supply management is cognizant about some internal innovation needs and shares this information with certain suppliers. However, supply management is not	Supply management is informative about both internal innovation needs and innovation capability of the supply base and shares the information with internal NPD team and potential suppliers. However, the information	Supply management collects and shares information with internal and external partners. However, since supply management is part of the core innovation team, it actively searches for information needed	The information collecting and sharing is not limited to the firm's current supply base. Information collecting and sharing is not limited to current innovation projects. Supply management actively looks for innovation opportunities by broadly

		knowledgeable about innovation capability of the supply base.	gathering and sharing are done in a passive way, i.e., only when supply management is asked to do so.	(mostly from current supply base) and shares the information with key internal personnel.	reviewing the firm's current and future innovation needs and current and potential supplier innovation capability and matches between the two.
Dimension 4: Build and maintain relationships (Relationship)	Supply management has not established a trusting and collaborative relationship with the current supply base. Supply management has neither demonstrated its trustworthiness nor assessed suppliers' trustworthiness regarding innovation capabilities.		Supply management has established a trusting and collaborative relationship with the current supply base. Supply management has demonstrated its trustworthiness and assessed suppliers' trustworthiness regarding supplier innovation capability.		Supply management not only has established a trust and collaborative relationship with the current supply base, it also builds a reputation among potential suppliers on trustworthiness. Also, it assesses current and potential suppliers' trustworthiness regarding to supplier innovation capability.
Dimension 5: High quality personnel (People)	Supply management personnel do not have a high degree of technical competency or an ability to communicate with cross functional and cross enterprise team members.	Supply management, personnel does not have a high degree of technical competency, but has the ability to communicate with cross functional and cross enterprise team members.	Supply management personnel have a limited degree of technical competency and the ability to communicate with cross functional and cross enterprise team members.	Supply management personnel have a high degree of technical competency and an ability to communicate with cross functional and cross enterprise team members (e.g., finance, marketing, suppliers, engineers, etc.).	

Figure 1: Five dimensions of supply management innovation maturity

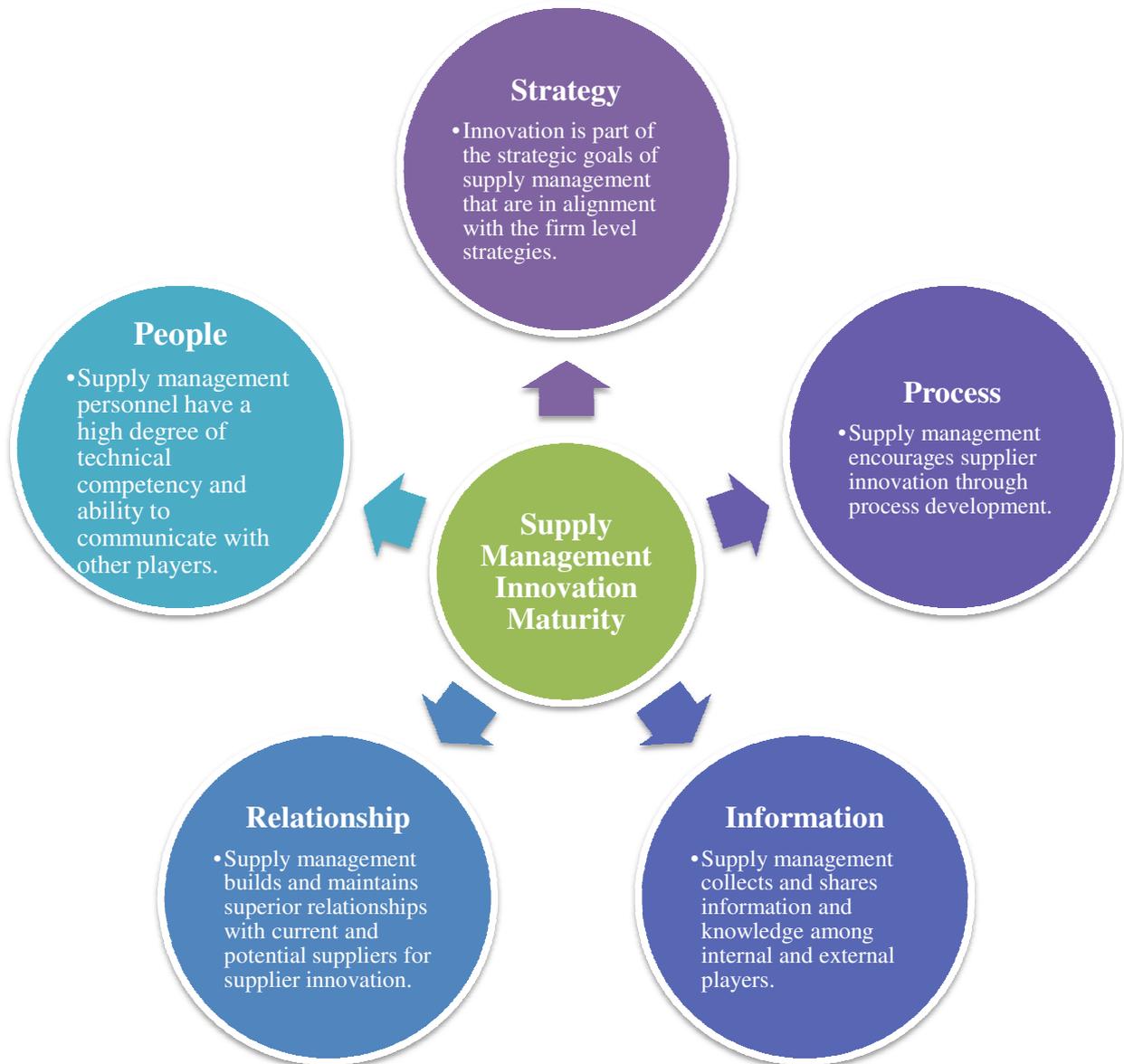


Figure 2: Five Level Maturity Model of Supply Management Roles in Innovation

