The Innovation Process in Alliances

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Abstract

The increasing complexity of business and social settings has lead to innovation becoming a strategic imperative. The need for innovation in the quest for competitive advantage also means that firms must be dynamic and flexible. This is often achieved through collaborative arrangements such as alliances. Many organizations form alliances by leveraging their resources to gain access to the partner's skills and capabilities; ultimately to enhance innovation and performance. We demonstrate empirically that the "chain of innovation" is central to the process of innovation in alliances. This chain comprises the creativity and learning processes and knowledge stock in alliances. Moreover, we show that individual, group dynamic and alliance level factors affect the chain. Our empirical analysis is based on a survey of alliances that resulted in 397 responses.

Introduction

The increasing complexity of business and social settings has lead to innovation becoming a strategic imperative (Stringer, 2000). Innovations are vital for business performance and longevity in the marketplace. Commonly, novel and useful solutions to problems or revamping of stagnant processes are innovative outcomes. These efforts aim to conserve resources and time, gain increased efficiency and achieve financial and strategic goals.

The need for innovation in the quest for competitive advantage means that firms must be dynamic and flexible. This is often achieved through collaborative arrangements such as alliances. Between 1990 and 1995 for example, alliance formations grew by 25 percent annually (Bleeke and Ernst, 1995). Many organizations form alliances by leveraging resources to gain access to the partner's skills and capabilities. In doing this, they aim to complement and strengthen not only their core competencies but also their competitive position. Without access to an alliance-type partnership, individual organizations may find the development of their business more challenging as it is based on self-sufficiency. The volatility of markets, increase in competition and rapid obsolescence of techniques and products, means that the self-sufficiency model is often too slow to compete in a fast-paced and dynamic environment. Self-sufficiency is becoming a progressively more difficult task, of which the viability is questionable. Growth and performance-oriented companies form alliances (Kanter, 1989), believing that these are most likely to help them create advantage through combining and/or sharing resources.

Indeed, collaboration is a more cost-effective means of achieving goals than is building resident capabilities within the firm (Sharma, 1999). Additional advantages include cost sharing in the development of solutions, gaining access to external resources and expertise, limiting exposure risk and increasing market worth through value adding (Sharma, 1999). It is for these benefits that partnering is an option increasingly adopted by innovative firms, wanting to improve performance by seizing rather than losing new opportunities (Kanter, 1989).

Alliances and innovation are complementary for achieving strategic and financial goals. Instant access to resources allowing synergy that is difficult to imitate is pertinent in creating a competitive advantage for collaborating firms. Although, despite the popularity of alliances, their failure rate has been reported to be as high as 60 percent within the first two years of operation (Das and Teng, 2000). While most

companies seek to have resources and skills that enable them to innovate, many and in particular large firms, are often not equipped to implement an innovation-based strategy. The biggest problem for large firms is the mis-management of the innovation process (Stringer, 2000). The mis-management includes management placing precedence on economic indicators, while neglecting the development and maintenance of interpersonal relationships among team members (Kitching, 1967). The concentration on short-term financial measures sacrifices strategic positioning and long-term performance (Aaker, 1989). Thus, managers would benefit from a better understanding of the importance and significance of interpersonal relationships, cultural and structural issues, learning and creativity in the alliance so that these can be managed more effectively.

This research aims to focus on the key drivers of the process of innovation in alliances and to identify how these can be managed. A better understanding of the process should lead to a more effective management and, hence, an increase in the success rate of alliances.

There has been little if any, empirical research done on the process of innovation in alliances and although there are some theoretical contributions in areas related to innovation, conceptual contributions on the process of innovation in alliances are scarce. There is neither a comprehensive theoretical nor an empirically tested framework guiding researchers in the area. Therefore, there is a substantial gap in knowledge.

In this paper, we discuss theoretical frameworks aiming to explain creativity, learning and knowledge in alliances. We then develop our conceptual model and explain the constructs used to form the foundation for the *Process of Innovation in Alliances Model*. Finally, we describe the results from testing our model empirically and conclude with a summary of limitations and directions for future research.

Existing Literature on alliances

Existing research on alliances and learning positions learning and knowing as necessary for continuous innovation (Luis, 1998). Although, most sources only implicitly link innovation to the process of learning. More commonly, the necessity of learning is emphasised by the link to alliance performance, business excellence and achievement of economic and learning objectives. Larsson, et. al., (1998) for instance, suggest that the way partners manage the collective learning process plays a

central role in the success and failure of the alliance. Doz (1996) supports this view by suggesting that a better understanding of the learning process will lead to a better understanding of the pitfalls of alliances. It seems that firms enter alliances to create economic value and to acquire knowledge to enhance their competencies.

Commonly, in the literature addressing learning and innovation, the learning process in the alliance context is perceived as a means of exploiting the partner. That is, there is a "race to learn", which can limit sharing of information and learning processes (Fiol and Lyles, 1985). In these situations, there tends to be a "student" and a "teacher". Once the "student" has learnt from the "teacher" the alliance tends to become less valuable in terms of gaining knowledge.

Alliances and learning are frequently linked although explicit links to innovation are uncommon. Although, there have been recent contributions explicitly outlining the importance of innovation in alliances, such as the work of Gudergan et al (2001). Their *Integrated Framework of Alliance Governance and Performance [AGP Framework[1]]* stresses and empirically validates the importance of innovation in driving alliance performance. The basic framework illustrates that alliance performance is driven by the nature of the decision-making or managerial practices as well as implementation processes of the partners. These, in turn, are affected by two external influences, the setting in which the alliance is occurring (exogenous alliance setting)—such as the divergent legal and cultural conditions—and the characteristics of the alliance itself (collaborative alliance agreements and interaction patterns)—such as whether an alliance requires specific informal and/or formal arrangements.

The AGP Framework supports an adaptation of the resource-based theory of firm. In the resource-based perspective alliances are viewed as creating and replacing rent-generating resources. Their study provides significant evidence for the creation of rent-generating resources (i.e., *Alliance Competencies*) through the pooling of partner capabilities. This, in turn, supports the view that alliances reflect interdependent production functions for their activities. Further, their conceptualization shows how these production functions take into account the extent to which the alliance's

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[1] The *AGP Framework* is supported by (i) empirical analyses that are based on data from two extensive cross-sectional surveys that resulted in 146 usable responses in the first survey and 46 in the second one; and (ii) in-depth case research on 25 business partnerships of a global financial services company (see S. Gudergan, T. Devinney and S. Ellis, An Integrated Framework of Alliance Governance and Performance, *CBI Conference Volume of the Fifth Carnegie Bosch Institute for Applied Studies in International Management International Conference* (2001)).

capabilities match competitive market conditions. Moreover, there is confirmation about the acquisition of resources through investment to enhance the organization's competitive position. Therefore, they argue that the resource-based perspective provides a solid foundation for understanding and explaining the effectiveness of an alliance.

In addition, their examination illustrates the existence of and relationships between the constructs of learning, creativity and innovation in alliances. They demonstrate how the explicit integration of innovation and its antecedent factors in the resource-based perspective helps provide a more comprehensive explanation of the *Alliance Effectiveness*. However, they have not explicitly examined the process by which innovation occurs in alliances. To address this gap in the literature about the process of innovation in alliances, we review additional selected models from social psychology and social interaction theories addressing creativity, learning and knowledge.

Model of Creativity and Innovation in Organisations

The Model of Creativity and Innovation in Organisations (Amabile, 1988) a distinctive theory as it explicitly aims to n explain the creative process in organisations, relevant to innovation. The analysis of creative behaviour is divided into three main components: domain relevant skills, creativity relevant skills and motivation. Domain relevant skills include expertise, knowledge and ability, accumulated through formal or informal learning. Creativity relevant skills include idea generation, learning and work styles, personality traits and cognitive styles, including critical thinking. These skills are important in the learning process and for using new knowledge to produce new ideas. Motivation includes intrinsic and extrinsic forms. Intrinsically motivated people engage in tasks to achieve personal goals while extrinsically motivated people concentrate on achieving externally generated goals.

Amabile (1988) suggests that all three domains are essential to creativity at any organisational level, implying that these domains can be extended to the alliance as a unit of analysis. Further, she adds that in addition to these components, resource and innovation management are factors central to the process of creativity. Amabile (1988) is among the first theorists to explicitly position creativity as underlying to

innovation and recommends that the creative process at both individual and organisational levels should be treated as parts in a larger model of innovation.

Interactionist Model of Creative Behaviour

The Interactionist Model of Creative Behaviour (Woodman and Schoenfeldt, 1989) is the second model in our discussion. It is grounded in social psychology theory and its framework is derived from interactional psychology theory (Terborg, 1981). It aims to explain individual creative behaviour in the context of situational influences, including social aspects and physical surroundings as derived from Amabile's (1983a, 1983b) work on creative behaviour.

The model recognises the necessity of cognitive factors influencing creative behaviour, including problem solving styles (Keshner and Ledger, 1985), lateral thinking (Mednick, 1962) and divergent thinking (Guilford, 1967). The limitation of the model for our research is that the unit of analysis is the individual. Further, it excludes learning or knowledge and therefore is incomplete for exclusive usage in the development of a framework for the process of innovation in alliances.

Theory of Organisational Creativity

The final model in our discussion of creativity, is the Theory of Organisational Creativity (Woodman, Sawyer, Griffin, 1993). This theory integrates the Interactionist Model of Creative Behaviour (Woodman and Schoenfeldt, 1989) and the Model of Creativity and Innovation in Organisations (Amabile, 1988) by incorporating social as and contextual issues into the creativity framework at an organisational level. It extends the framework by including the group as a unit of analysis. The group is divided into two areas - group characteristics and group processes. Group characteristics describe the ideal composition of a creative group of individuals while group processes describe the practices that are prominent in the group. The identification of these processes is a significant contribution as it recognises that creative behaviour is derived from a process involving suitable individuals. However, this model does not account for interorganizational relationships and does not explicitly address learning and knowledge in relation to innovation and therefore is limited in explaining the process of innovation in alliances.

Some Limitations

In what is almost a trilogy, these complementary theories comprehensively address creativity and creative behaviour at the individual, group and organisational levels. Although they address the importance and relevance of the creative process the models do not explicitly explain creativity and creative behaviour at the alliance level. They also exclude the learning process and alliance knowledge stock, both crucial in the innovation process. We argue however, that the models can be integrated to provide building blocks for the development of a conceptual framework addressing the process of alliance innovation. We follow the suggestion that creativity alone is not sufficient for the creation of innovation (Lindsay and Evans, 1999; Amabile, 1988), and therefore discuss learning theories.

Learning models

The relevance of learning and the learning process to the process of innovation has been clearly documented (Eskilden, Dhalgaard and Norgaard, 1999; Lindsay and Evans, 1999). For example, Stata (1989) argues that the only way an organisation can achieve competitive advantage is through learning. Learning literature is abundant although, there is limited research that has been done on the learning process at the alliance level. We focus on selected theories including the Theories of Action (Schon 1975), The Model of Experiential Learning (Kolb, 1984) and Adaptive/Generative Learning Models (Argyris and Schon 1978) to form the foundation of the alliance learning process construct in our model.

Theories of Action

Schon (1975) emphasised three phases of the learning process - the "theories of action". These comprised "one's espoused theory of action", referring to an individual's method of dealing with contextual factors. This developed into the "reflection in action theory" including experimentation and inquiry; and then developed into a "theory in use". This suggests that as learning increases, the individual is pushed beyond the limits of current theories and develops into extended learning allowing a more adequate match between actions and reality, in light of new understandings (Schon, 1975; Gersick, 1998).

Fundamentally, the theories are limited for the scope of our framework, as they are primarily concerned with the individual unit of analysis and do not address the process of creativity.

Experiential learning

Kolb (1984) extends Schon's (1975) view by applying it to the group setting and renaming it to "experiential learning". He suggests that the focus on generative learning is insufficient and that there must be routines for the standardisation of problem solving to guard against degeneration into inefficiency (Dahlgaard et al, 1999). Further, Kolb emphasises the necessity of effective communication, team member initiation, social interaction and establishment of common frames of reference (Torbert, 1991). He suggests in experiential learning, that these activities assist in unifying the members and making the best use of diverse skills and experiences available within the group. For the purposes of our research, this model is limited for explaining the process of innovation in alliances as innovation is not explicitly addresses and the unit of analysis does not move beyond the organisation.

Adaptive and generative learning

Argyris and Schon (1978) were among the first to suggest that creativity has a direct impact on, and forms the foundation for generative learning. They suggest that learning and creativity are influenced by similar variables. Primarily, though, their contribution includes the learning typology comprising of single-loop-learning and double-loop-learning. Single-loop-learning also known as adaptive learning (Senge, 1990) involves detecting and correcting errors. It is used in strategies where there is a dominant management logic focusing rigidly on accomplishing exact goals or targets. Slater and Narver (1995) have described this as the most basic form of learning, as does not move beyond a recognised set of assumptions regarding the organisation and the environment and mainly involves repetition and association building. Double-loop-learning not only detects and corrects errors; it also involves re-examination and revision of frameworks and routines within the organisation. This is known as higher-level learning (Lyles, 1988) and generative learning (Senge, 1990). Slater and Narver (1995) are more accepting of this style as it challenges assumptions, mission statements and capabilities or strategies of the firm and makes adjustments to suit dynamic environments. A third level or learning derived from Bateson's (1968) work

is deutero-learning. This describes the process by which organisations learn to learn. In Lyles (1988) work, this third level is includes unlearning, innovation and experimentation.

Some Limitations

While complementary, the theories and models discussed, omit discussion of the critical factors of creativity and knowledge, and of an overall process of innovation. Further, these models do not extend their frameworks to explain learning at the alliance level and are therefore not suitable as complete models of innovation in alliances. While there is some very recent work that has included learning within alliances, to achieve innovation (Gudergan, 2001), this focuses on alliance performance. We are not concerned with performance, but with the process of innovation in alliances.

Knowledge

Since the resource-based theory of the firm (Barney, 1991; Rumelt, 1984; Wernerfelt, 1984) it has been assumed that competitive advantage is created by firm-specific processes and knowledge. Hedlund (1994) suggests that the development and distribution of knowledge integrating different parts of the value chain are important in new theories of growth and development of firms. However, even though there is acknowledgment of the importance of knowledge, solid frameworks addressing it are scarce. The most comprehensive theory that we have found is the knowledge-based theory (Grant, 1995).

Firstly emphasised by Teece (1991) and then Teece, Pisano and Shuen (1994), knowledge was portrayed as imperative in the dynamic capability theory for its role in the renewal of resources. The knowledge based theory (Grant, 1995) developed following the dynamic capability theory (Teece, Pisano and Shuen, 1997). This theory explicitly focuses on the importance of knowledge for the renewal of the evolving system proposed by the dynamic capability theory. Its limitation, though, is that it focuses solely on the importance of knowledge and neglects learning and creativity processes.

Polanyi (1962), Nonaka (1991) and Kogut and Zander (1992) have looked into tacit and explicit knowledge for explaining knowledge stocks in organisations. Tacit knowledge is unarticulated, while explicit knowledge is codified and readily imitable.

Tacit knowledge includes factors that are derived from personal beliefs, experiences and values. These are difficult to communicate and are instead, inferred. Examples of tacit knowledge include expectations, commitment, continuous improvement, relationships. Explicit knowledge is communicated more easily through codified processes or through data. Although, the tacit influence is associated with instruction on how to use explicit knowledge (Inkpen, 1996). To make best use of its knowledge stock, a firm needs integration and a balance of tacit and explicit knowledge sharing (McEvily, Das and McCabe, 2000).The combination of tacit with explicit knowledge makes imitation difficult (Zack, 1999).

Soo, Midgley and Devinney (1999) agree that capability renewal is knowledge based. They suggest that this is achieved by developing tangible and intangible assets. This is done through acquisition and integration of external knowledge with internal processes such as problems solving and decision-making, to create new knowledge.

Thus, knowledge theories in general and in particular at the alliances level, are limited. The main model of knowledge that is available for our purposes is the knowledge-based theory (Grant, 1995), which, though, is limited for our research as it omits the alliance level of analysis and excludes creativity and learning process aspects in its discussion.

Some Conclusions

Although not explicitly discussed here, the resource-based theory, the dynamic capability theory form the foundations for this research, by emphasising the importance of management experience, insights, of inter-firm processes. These theories emphasise the necessity of non-imitable processes for the development of core competencies and competitive advantage. However, dynamic capability theory does not address the process of innovation and does not address specifically the alliance as a unit of analysis.

The creativity theories including the Interactionist Model of Creative Behaviour (Woodman and Schoenfeldt, (1989), the Model of Creativity and Innovation in Organisations (Amabile, 1988) and the Theory of Organisational Creativity (Woodman, Sawyer and Griffin, 1993) address the creativity process at the individual, group and organisational levels. They identify domains of creativity that are applicable at all levels of the organisation, and provide descriptions of situational and contextual factors affecting creativity.

The learning literature includes an array of work with limited integration. From Schon's (1975) three-phase model of action theories at the individual level, to Kolb's (1984) experiential learning at the organisational level, learning styles are most consistently titled generative and adaptive learning (Argyris and Schon, 1978). The summary from the learning literature is that it is necessary to have a balance between the adaptive and generative styles if an organisation is to achieve stability in dynamism.

Although limited, the knowledge literature provides support for the importance of knowledge in capability renewal and includes discussion on the knowledge-based theory and tacit and explicit knowledge forms. The idea of a combination of easily expressed knowledge combined with coded knowledge was exciting as it represented non-imitable resources to the firm. These resources then had to be renewed to maintain advantage in the marketplace, as suggested by the knowledge-based theory (Grant, 1995).

In summary, the literature identified in this discussion is representative of the perspectives that address creativity and learning processes and knowledge stock. Most work is done at a conceptual and individual, group or organisational level. Almost all work is lacking in empirical support and does not include the alliance as a unit of analysis. Although recently, there have been alliance level models such as Gudergan's (2001) AGP framework which was developed to address specific components of innovation or alliance performance through innovation, the actual process of innovation has been neglected.

The Process of Innovation in Alliances Model

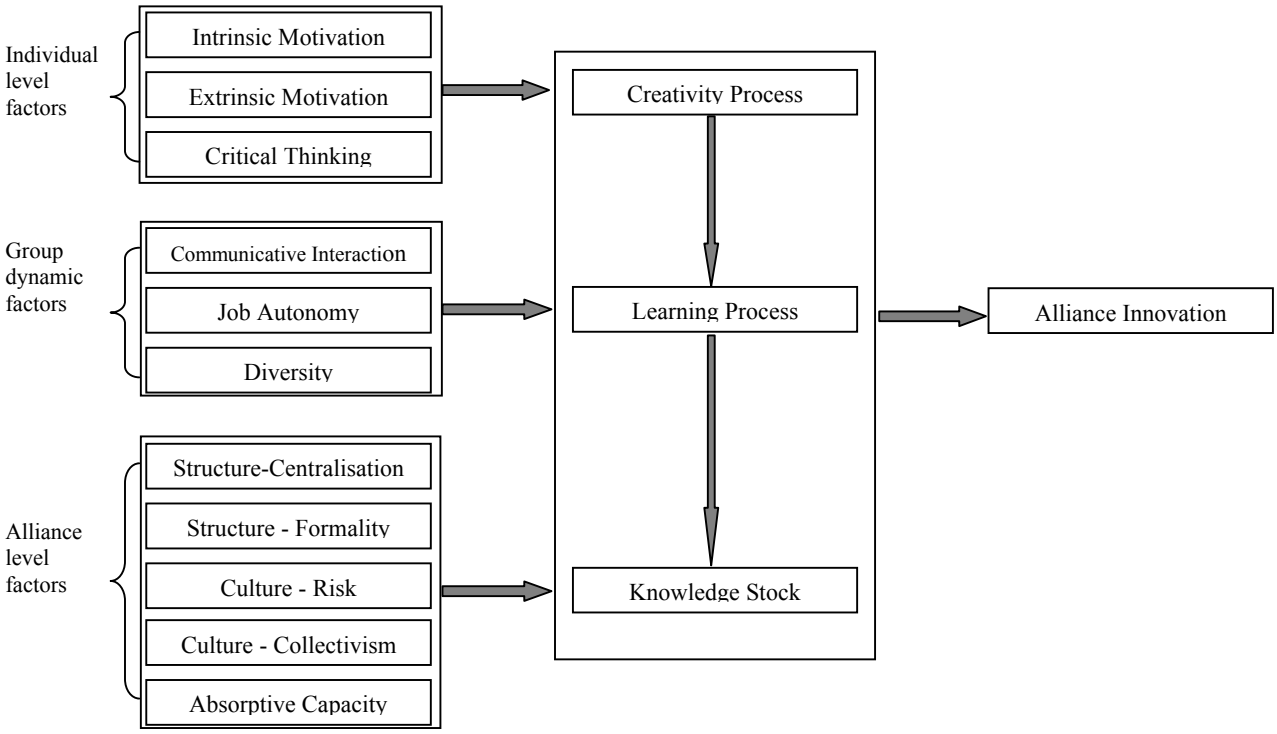
We combine the creativity, learning and knowledge theories to form the foundation for the Process of Innovation in Alliances model. We divide our model into three blocks: alliance innovation, the "chain of innovation' and the factors influencing the chain of innovation. A graphical representation is presented in Figure 1.

Alliance innovation is the combined output of the creativity process, the learning process and knowledge stock within the alliance. The interrelated nature of the three constructs explains the process of innovation within alliances. The "*chain of innovation*" is a systematic flow between the inputs of the creativity process in alliances, the learning process in alliances and the knowledge stock in alliances. The creative process has a direct influence on the learning process and the learning

process has a direct impact on the level of knowledge stock in alliances. The chain suggests that the constructs are most important in the process of innovation development in alliances. The *factors influencing the chain of innovation* are divided into three main groups. These include individual[2] factors, group dynamic factors and alliance level factors. This breakdown allows for a clearer identification and understanding of the variables that affect the key drivers of innovation, subsequently allowing for their reproduction in a similar setting.

The *individual level factors* include intrinsic and extrinsic motivation and critical thinking. These describe attributes that are fundamentally personal to individuals. The *group dynamic factors* consist of communicative interaction, job autonomy, and diversity. These factors most commonly occur at the group level of the alliance and comprise social factors impacting on individual behaviour, in interaction. The *alliance level* factors comprise of culture - risk orientation and collectivism, structure-centralisation and formality and of absorptive capacity. The alliance level factors influence individual throughout all levels of the organisation and of the alliance.

Figure 1: The Process of Innovation in Alliances Model



Definitions of constructs used in this model are presented in Appendix 1: Table 1.

[2] We assume that people in the alliance team are homogeneous in regards to the three constructs integrated in this research. This is consistent with the literature.

In this next section we develop hypotheses to test the proposed model. We address the chain of innovation and then its effect on alliance innovation. A summary of the hypotheses is presented in Appendix 1: Table 2.

Motivation -Intrinsic

Motivation is comprised of intrinsic motivation and extrinsic motivation (Amabile, 1988). Intrinsic motivation is the drive that an individual has when engaging in an activity for one's own interest and involvement. Amabile's (1988) research has suggests that people have greatest motivation when they enjoy the task, and are interested and challenged by the actual work. They are less concerned with external influences such as rewards and meeting assessment criteria (Shalley, 1991). Intrinsically motivated people are more likely to actively and voluntarily look for new ideas and solutions to problems for complex tasks, rather than simply performing repetitive algorithmic steps to solve problems (Cummings 1965, Amabile 1983). The interest and challenge of a task typically leads people to pursue continuous involvement (Amabile, 1988). Intrinsically motivated people have greater propensity to seek new ideas for approaching problems (Amabile, 1983).

We argue that individual intrinsic motivation has a positive impact on both the creativity and learning processes. We also argue that intrinsically motivated people are more willing to develop skills and expertise to seek novel solutions than those who are intrinsically motivated. We define intrinsic motivation as *individual involvement in an activity for personal interest and satisfaction* and derive the following hypotheses;

H1: Greater intrinsic motivation has a positive effect on the alliance creativity process

H2: Greater intrinsic motivation has a positive effect on the alliance learning process

Motivation -Extrinsic

Extrinsic motivation drives individuals who are not primarily interested in the task itself, but in rewards such as recognition, prizes or strict adherence to external guidelines (Amabile, 1985). Extrinsically motivated people are most likely to perform algorithmic tasks. They rely on familiar and already learned behaviours rather than searching for new solutions (Amabile, 1983). Extrinsic motivation prompts people to seek efficient methods of task completion, increasing the potential for generating rewards (Calder and Staw, 1976). Extrinsic motivation is influenced

by the presence of co-actors and the expectation of evaluation (Zajonc, 1965; Shalley, 1991; Amabile, 1985). The presence of co-actors and expectation of evaluation are detrimental to creativity (Amabile, 1985).

We argue that extrinsically motivated individuals are not likely to consistently seek creative solutions unless they are promised rewards or recognition hence, extrinsic motivation is an inhibitor of creativity. We also argue that extrinsic motivation is beneficial for the learning process as it drives the individual to develop their existing knowledge in the anticipation of appraisal. We define extrinsic motivation as *individual involvement in a task to meet external criteria* and derive the following hypotheses;

H3: Greater extrinsic motivation has a negative effect on the alliance creativity process

H4: Greater extrinsic motivation has a positive effect on the alliance learning process

Critical thinking

Schon (1975) describes critical thinking is a self-referencing system that is built on and influenced by social and contextual factors such as feedback, evaluation and previous experiences. These factors are combined into a continuous process involving experimentation and inquiry into new means of completing tasks. Critical thinking involves reflection and synthesis of past actions and existing knowledge in the context of new information and results in the generation of new individual knowledge or theories of action (Gersick, 1998).

We argue that critical thinking influences creativity through continuous idea generation and that it influences learning through the generation of new theories of action. We define critical thinking *as an inquiring approach to problem solving that that is most likely to lead to set-breaking and novel ideas*. We derive the following propositions;

H5: Critical thinking has a positive effect on the alliance creativity process

H6: Critical thinking has a positive effect on the alliance learning process

Communicative interaction

Communicative interaction - refers to communicative actions among individuals as applied by Gudergan (2002). Firm members communicate in a variety of ways. This encourages open communication and information sharing emphasise broad thinking

and encourage exposure outside the company. It encourages lateral thinking, acceptance of criticism, continuous training and a willingness to consult others (O'Reilly, 1989).

We argue that the style of interaction - formal of informal impacts on the creativity process by either positively by allowing for individual autonomy or negatively by imposing guidelines and evaluation. Further, we argue that informal and personalised communicative actions are conducive to learning through encouragement of members to share knowledge in a variety of contexts. We define communicative interaction as *formal and informal styles and means of sharing information among alliance members* and derive the following hypotheses:

H7: A more informal style of communicative interaction has a positive effect on the alliance creative process

H8: A more personalised style of communicative interaction has a positive effect on the alliance learning process

Job Autonomy

Zajonc (1965) explained the facilitating and inhibiting effects of the presence of others, in particular, finding that the authority of others increases the probability of dominant responses (limiting creative behaviour). Amabile (1990) supports this by saying that people are most creative when they are motivated primarily by the interest, enjoyment, satisfaction and challenge of the wok itself, and not by external pressures. Job autonomy allows for decision-making at lower levels of the organisation, leading to flexible decision-making. It encourages decentralisation and gives freedom to the individual and empowerment (O'Reilly, 1989).

We argue that the increase in dominant logic is not conducive to creativity as it limits idea generation and argue that an individual is most creative when they are able to make some independent decisions about their work. We define job autonomy as the *permission of individuals making independent decisions regarding their job functions* and derive the following hypothesis:

H9: Job autonomy has a positive effect on the alliance creativity process

Diversity

Simon (1991) argues that an organisation learns through the learning of its members and by ingesting new members who have knowledge the organisation did not have

previously so that existing members may learn from new members. This suggests that by having members who possess a range of backgrounds and experiences, the firm is able to have access to a wide knowledge pool that only needs to be shared and systemised. That is, learning is dependent on past experience (Cohen and Levinthal, 1990) and diversity brings together both experience and knowledge.

We argue that since diversity bring together individuals with a broad set of expertise, skills and experiences to work together in the same group, they invariably assist the generation of new and creative ideas and information exchange, for learning to occur. We define diversity as *the varied composition of individuals in an alliance team.* We derive the following hypotheses:

H10: Alliance team member diversity has a positive effect on the alliance creative process

H11*:* Alliance team member diversity has a positive effect on the alliance learning process

Structure - Centralisation

Structural centralisation indicates roughly the ability of an individual to reach others in the network (Poncet, 2001). Mintzberg (1982) suggests that centralisation refers to the concentration of decision making processes in one area of the organisation. A decentralised structure is one in which the power is shared among many people.

We argue that the concentration of decision-making authority is restrictive for both creativity and learning as it encourages conformity among members. We define structural centralisation as an *authoritative structure in guiding the extent to which decisions are made by a 'central authority'* and derive the following hypothesis:

H12: Greater structural centralisation has a negative effect on the alliance creativity process

H13: Greater structural centralisation has a negative effect on the alliance learning process

Structure - Formality

Formally structured firms are defined by rigid and strict job definitions. These typically have hierarchically administered control and require conformity among members, policies and methods. Formal - or mechanistic structures are appropriate in stable environments that do not require change. The negative aspect of these types of

structures is that they consume internal resources when concentrating on passing ideas through many different levels, and are slow to respond to change. Eventually, this influences people to be mechanical in their approach to problems solving and interaction (Burns and Stalker, 1965).

We argue that formality inhibits creativity by enforcing conformity among both its members and their approaches to task execution - through the hierarchical control. Further, we propose that high formality is detrimental to learning as it enforces rigidity and strict adherence to job outlines, diminishing the effect of intrinsic motivation to learn. We define formality as an *authoritative structure guiding the required level of formality for communication exchanges, decision making and task execution,* and derive the following hypotheses:

H14: Greater structural formality has a negative effect on the alliance creativity process

H15: Greater structural centralisation has a negative effect on the alliance learning process

Culture - Risk Orientation

Culture refers to learned patterns of behaviour of members in a given society. Further, it is the unique lifestyle of a particular group of people (Ball and McCullock, 1996). At an organisational level, culture includes the values, assumptions and symbols that define the way in which a firm does its business (Alveeson, 1993). The value a firm places on risk affects the way that its members respond to risky situations, options or decisions. A positive cultural risk orientation encourages members to accept risky situations while a negative orientation discourages risk-taking. It accepts mistakes and allows the freedom to fail. Risk taking tendencies encourage innovation to be a part of the job and has positive attitudes towards change (O'Reilly, 1989).

We argue that a climate the supports members decisions and does not enforce heavy penalties for mistakes encourages people to experiment with new ideas, whereas one enforcing risk avoidance encourages conformity. We define cultural risk orientation as *the set of values and beliefs reflecting the overall risk taking tendencies* and derive the following hypothesis:

H16: The greater the risk orientation the better the alliance creativity process

Culture - Collectivism

Individualism and collectivism represent dominant logic - a culture in the firm, guiding the actions of members (Alveeson, 1993). Individualism means a strong bias towards independence and responsibility. It is characterised by personal goals that support competitiveness to collect sole decision making and other power (Krokosz-Krynke 2001). Collectivism is the opposite of individualism. It encourages a firm culture where members are willing to co-operate for the greater good rather than for personal goals. Through teamwork, it instils pride in the organisation and a willingness to share the credit. Interdependence are managed and job and functional areas are flexible. There is mutual trust and respect and goals are built by consensus (O'Reilly, 1989).We argue that collectivism is particularly useful in group situations where there are divers individuals with a myriad of skills and experiences. Their cooperation and mutual exchange of skills and expertise is likely to lead to a higher level of learning in the team. We define cultural collectivism as *the set of values and beliefs reflecting the overall willingness to collaborate* and derive the following hypothesis:

H17: Greater cultural collectivism has a positive effect on the learning process

Absorptive capacity

Absorptive capacity refers to a firm's ability to recognise valuable information and to then integrate it into existing systems to produce output (Cohen and Levinhal, 1990). By inference, Cohen and Levinthal (1990) suggest that effective learning enhances innovation. Absorptive capacity can be accounted for by the extent to which knowledge is produced, exchanged and used in the selection or rejection of creative actions and innovations (Ford, 1996). The deeper and more diverse a company's pre-existing knowledge structure, the greater is its absorptive capacity. Greater absorptive capacity generates more knowledge resources, for use within the organisation, increasing the potential for efficiency and innovation.

We argue that absorptive capacity directly influences the level of knowledge stock in a firm. We define absorptive capacity as a*lliance ability to recognise and integrate valuable information into existing activities.* We derive the following proposition;

H18: Greater alliance absorptive capacity leads to a greater alliance knowledge stock

Alliance learning

Factors including intrinsic motivation, extrinsic motivation and critical thinking are central to the creativity process (Amabile, 1983a, 1983b, 1988; Woodman and Schoenfeldt, 1989; Woodman, Sawyer and Griffin, 1993). These factors in addition to others, also affect the learning process (Gersick, 1998; Woodman and Schoenfeldt, 1989; Woodman, Sawyer and Griffin, 1993).

We argue that the alliance creativity process produces new ideas and unique solutions that can then be replicated (through translating information) and applied to the business through the process of alliance learning. We define *alliance learning process* as *the process of translating information and expertise to develop new knowledge in alliances.* In addition, suggest that the alliance creativity influences the alliance learning process and derive the following hypothesis:

H19: The alliance creativity process has a positive effect on the alliance learning process

Alliance Knowledge stock

Learning and knowledge are commonly linked in both learning and management research (Schon, 1975, Kolb, 1985; Nonaka and Takeuchi, 1995). The learning process enables alliances to gather information for the development of knowledge from internal and external sources. Once this information has passed through the learning channels, it becomes knowledge – either explicit or tacit. Knowledge that can be shared in written or verbal forms, for example, is explicit knowledge. Knowledge that can be shared through observation only is tacit knowledge.

We argue that since knowledge is an output of learning, that the alliance learning process has a positive impact on the alliance knowledge stock. We define *alliance knowledge stock* as *the accumulation of meaningful information as derived from the learning process in alliances, including tacit and explicit forms* and propose the following hypothesis:

H20: A greater alliance learning process leads to a greater alliance knowledge stock

Alliance Innovation & Creativity

Cummings and O'Connell (1978) suggest that the process of idea generation should be regarded as distinct to the evaluation of ideas. The generation of ideas is the fundamental concept of the creativity process (Majaro, 1992), leading to its definition

as the process of developing novel and appropriate solutions to problems (Amabile et al, 1990). In other words, creativity is the cause of innovative progress (de Bono, 1996). The process of creativity involves the interactions between the individual and surrounding environments. These environments vary when factors such as individual variables, group dynamics and alliance variables affect interaction. Each of these units of analysis have measures of success that determine the viability of the creative process (Csikszentmihalyi, 1988; Drazin, et al, 1996). This description of creativity as a dynamic and fragile process, is supported by Woodman, Sawyer and Griffin (p296, 1983), who have described it as "a complex interaction of person and situation…repeated at each level of analysis". The importance of creativity arises from its proven link to innovation (Amabile, 1988) and its positive correlation with innovation (Paolillo and Brown 1978). Woodman et al (1993) categorise creativity is a subset of innovation, suggesting that the relationship between process and outcome are that creativity is involved through the development of new ideas and innovation is the implementation of those new ideas.

We argue that the alliance creative process through the generation of new ideas, is crucial to innovation at the alliance level. We define alliance innovation as *the novel outcome of a dynamic and renewable system of value adding at the alliance level* and the creativity process as *the process of generating new ideas and unique solutions to problems or situations* and derive the following hypothesis;

H21: The greater the effectiveness of creativity process the greater the positive impact on alliance innovation

Alliance Innovation & Learning

Cyert and March (1963) first featured learning as a core feature of the theory of the firm. Since then, learning has been increasingly investigated for its part in knowledge creation and influence in the process of innovation (Imai, 1985). Fiol (1994) adds to this view by suggesting that in collective learning, frames of reference are necessary for people to gain common understanding. Learning does not necessarily create a visible change in effectiveness or behaviour, rather the learning process causes an increase in understanding and alters the range of potential behaviour through reinforcement (Huber, 1991). Organisational capabilities (Teece, 1990) are then formed through the sharing of individual capabilities. Learning is important for its role in facilitating knowledge and information exchange to diverse

groups and has been closely related to innovation (de Bono, 1996). The need for learning is derived from the need to be flexible and adaptable to change (Kanter, 1989). The outcome of learning is knowledge.

We argue that the learning process is fundamental to innovation as it helps to transfer skills among alliance members and facilitates the development of processes and products within the alliance. We define the learning process as *the process of developing expertise and skills* and derive the following hypothesis;

H22: The greater the effectiveness of learning process the greater the positive impact on alliance innovation

Alliance Innovation & Knowledge Stock

Organisational intelligence or knowledge, refers to the organisational competency of learning. The level of knowledge determines the extent to which the firm is able to adapt to change, to renew itself (Cohen and Levinthal, 1990) and to innovate. Knowledge is the output of learning and as such is affected by the same factors influencing learning as well as alliance factors including absorptive capacity, structure and culture.

We argue that the knowledge stock directly influences innovation. That is, it is impossible to produce innovations without having a body of knowledge available from within the organisation. We define knowledge stock as *an accumulation of knowledge from internal and external sources* and derive the following hypothesis;

H23: The greater the knowledge stock the greater the positive impact on alliance innovation

Research Methodology

The research design used for testing the hypothesis in the *Alliance Innovation Process* model was a cross-sectional mail survey. This was posted to key informants of organisations in industries having a high tendency to form alliances. The sample was generated by an independent data/list base supplier[3]. The list comprised a random sample of medium to large sized companies from relevant industries, Australia-wide. The diversity in industries was requested to reduce the chance of skewing results in favour of any potentially dominant sectors.

[3] "Top 5000 CEO" Strategic Research, Fairfax Business Media, Australia, 2001

For each potential respondent in the sample, we posted a questionnaire, a cover letter and self addressed reply paid envelope. The "packages" were addressed to key informants being the General Manager, Chief Executive Officer or Managing Director. The cover letter explained the purpose of the research and requested that the addressee pass the pack on to the most suitable Alliance Manager for completion and return. Alliance Managers were selected as it was assumed that they possess detailed and intricate knowledge relevant to the alliances within the company, moreso than any other member of the firm. These Alliance Managers were then requested to identify one particular alliance of their choice and to complete the questionnaire with reference to that specific alliance. We requested that respondents complete the questionnaire based on their insights and experiences with the one alliance rather than in general to increase the specificity of information collected. That is, responses were expected to be a more accurate reflection of the nature of the alliance including extreme experiences. We avoided asking for generalisations as this would potentially increase the chance of deriving misleading conclusions. The incentive given to increase participation comprised a summary report of the findings to be posted to respondents.

A pilot study was conducted to test the appropriateness and ease of understanding of items. For this exercise, randomly selected manages and other relevant individuals were contacted fort heir suggestions on specific areas that they considered to be of importance, for inclusion in the survey instrument. Following the development of the questionnaires, industry and academic representatives were asked to complete the survey, testing the time taken to complete and also for ambiguity or general lack in clarity. Feedback received was used to refine the survey items.

Preliminary data analysis

The final 12-page questionnaire consisted of three/six multi-item formative scales and one/ten multi-item reflective scale(s). These scales were selected to measure constructs used in the model. The reflective scales included creativity, intrinsic motivation, extrinsic motivation, critical thinking, cultural risk orientation, cultural collectivism, structural autonomy, structural centralisation, structural formality, absorptive capacity.

Within three weeks of posting the questionnaires, a personalised reminder fax was sent to the entire list, requesting completion and return of surveys. The fax requested a reply fax, completing the following response options:

(1) We have not received the questionnaire, please resend

(2) We have received the questionnaire an

   a) We have returned the questionnaire

   b) The questionnaire is being completed and will be returned in a week

   c) The questionnaire is not applicable to our company

   d) We are not interested in completing the questionnaire

   e) Other

Of the 4,500 questionnaires posted out, 146 could not be delivered to the list address (as indicated by fax response and return to sender mail) and an additional 129 were returned to sender as having been posted to incorrect recipients or addresses. Therefore, a total of 275 (6.11%) questionnaires were invalid. Of the remaining 4,225 potential respondents, 279 (8.80%) indicated by return fax that they were not interested in completing the questionnaire and the questionnaire was not relevant to 1,056 (25%) organisations. A total of 397 (12.53%) respondents returned fully completed questionnaires. All responses were useable as the respondents completed all components satisfactorily. A summary of return mail is provided in Appendix 1; Table 3.

The response rate of 12.53 percent is adequate for testing purposes. We will use the dataset of 397 responses to evaluate the consistency of our model. We have evaluated the adequacy of the reflective scales used in the questionnaire. These included a four-item four-item creativity scale that was found to have a Cronbach alpha of .8851; a five-item intrinsic motivation scale had a Cronbach alpha of .7802; three-item extrinsic motivation had had a Cronbach alpha of .7894; four-item critical thinking had a Cronbach alpha of .8238; three-item cultural risk orientation had a Cronbach alpha of .7539; 5-item cultural collectivism had a Cronbach alpha of .8076; four-item job autonomy had a Cronbach alpha of .8128; three-item structural centralisation had a Cronbach alpha of .6870; four-item structural formality had a Cronbach alpha of .7481; and six-item absorptive capacity had a Cronbach alpha of .8174. A summary of Cronbach alphas is presented in Appendix 1; Table 4. The values for these scales are all over .6, indicating that the scales are adequate.

Model testing

In this section, we use PLS to describe the results of the first set of tests on the proposed model. At first, we conducted factor analysis on the reflective item of creativity to determine which measures had to be excluded. The model is evaluated on the R-square of the dependent latent constructs, the structural path coefficients and then, the t-tests obtained from the Jackknife procedure. For the model, we used the 397-response data set generated by our survey instrument. The model is presented in Appendix 2; Figure 2, and the summary of findings is presented in Appendix 1; Table5. Specifically, we look at the "chain of innovation", that is the alliance creativity process, the alliance learning process and alliance knowledge stock on alliance innovation. Then we examine the antecedent factors affecting the chain of innovation. These factors include individual level factors, such as intrinsic and extrinsic motivation, and critical thinking; group dynamic factors that is, job autonomy, communicative interaction and member diversity; and alliance level factors including structure – centralisation and formality, culture – risk orientation and collectivism and absorptive capacity.

i) Effects on alliance innovation - the innovation chain

The model produced an R-square of 0.308 for *alliance innovation.* For the *alliance creativity process* it was 0.516, for the *alliance learning process* it was 0.247 and 0.453 for *alliance knowledge stock*. These results support our hypothesis of a "*chain of innovation*". Given that all R-squares are high, we continued to test the model using the jackknifing procedure to obtain t-values to determine the significance of the structural paths. Results of this showed that effects on *alliance innovation* were as follows; *alliance creativity process* (0.241), *alliance learning process* (0.293), and *alliance knowledge stock* (0.168). In addition, the *alliance creativity process* had a path of 0.048 to the *alliance learning process* and *alliance learning process* had a path of 0.624 to *alliance knowledge stock.* These results support our hypotheses regarding the significance of the "*chain of innovation*" in alliances and it's relevance to the process of alliance innovation.

ii) Effects on the alliance creativity process

For the nine antecedents factors affecting the *alliance creativity process*, included in our model, we found the following results; *intrinsic motivation (0.200)* has a significant and positive impact on the creativity process; diversity (0.119), job autonomy (0.095), communicative interaction (0.141) and cultural risk orientation

(0.034) also had positive and significant impacts on the alliance creativity process. These factors scored in the highest significance level by virtue of their respective observed t-values. Critical thinking (0.238) had a positive, although weaker impact on the process, scoring at the second significance level by observed t-value. Extrinsic motivation (-0.034) also had second level significance and a negative impact on the alliance creativity process. Structural formality (-0.043) and structural centralisation (-0.078) had negative impacts, however, by observed t-value, these factors were not significant to the overall process of creativity in alliances. These findings support our hypotheses regarding the relationship between these antecedent factors and the process of creativity in alliances. Further, the findings show that although the impact of structural formalisation and centralisation has negative impacts as proposed in their respective hypotheses, their significance is not valid to the creativity process.

iii) Effects on the alliance learning process

There were nine antecedent factors affecting the alliance learning process. Communicative interaction (0.225) and structure – centralisation (-0.43) had the highest significance by observed t-value and respectively positive and negative impacts on the learning process. The creativity process (0.048) had a third level significance as indicated by the observed t-value, while intrinsic motivation (0.182), and cultural collectivism (-0.017) also had positive impacts. Extrinsic motivation (0.057), diversity (0.034), and structural formality (0.034) had positive path coefficients but by observed t-values, their impacts were found to be insignificant on the alliance learning process.

iv) Effects on the alliance knowledge stock

Alliance knowledge stock had only two influential factors, the learning process (0.624) and absorptive capacity (0.094). The learning process had a positive and strong impact on the alliance knowledge stock. Although, absorptive capacity had a positive but non-significant impact on the knowledge stock, as indicated by the observed t-value.

Discussion:

Alliance Innovation Process

The alliance innovation process had an R-square of 0.308, indicating that the model is capable of explaining variances. The constructs of the alliance creativity process, the alliance learning process and alliance knowledge stock had strong structural paths and

high R-squares also indicating ability for variance explanations. Overall, the chain of innovation was proven and linked to the alliance innovation process, supporting our hypotheses.

Alliance Creativity Process

The alliance creativity process had an R-square of 0.516, indicating that the construct is capable of explaining variances. The findings of the analysis supported the proposed direction of our hypotheses. Of particular interest are the structural formality and structural centralisation factors. While these produced negative impacts as proposed in the hypotheses, they proved to be insignificant, which we did not anticipate. Their insignificance implies that although alliance structural formality and centralisation produce negative effects, they do not have a great enough impact to be critical to the process of creativity in alliances.

Alliance Learning Process

Similarly in the alliance learning process, structural formality had a negative, as hypothesised, relationship to learning but was insignificant in impact. Surprisingly, critical thinking and extrinsic motivation, while positive in terms of their relationship, had non-significant impacts on the alliance learning process. This implies that the alliance learning process is not driven by structural formality, extrinsic motivation or critical thinking. Remaining factors follow hypothesised relationship directions.

Alliance knowledge stock

The alliance knowledge stock analysis was also of particular interest. As hypothesised, the learning process had a strong a positive impact on knowledge. However, absorptive capacity had a positive, albeit insignificant impact on alliance knowledge stock.

Conclusion

In this research we have contributed to filling the theoretical knowledge gap that exists in alliance research and specifically, in the field concerning the process of innovation in alliances. We have integrated the core elements of firm performance theories including the resource-based theory, dynamic capability theory, and knowledge based theory, with creativity, learning and knowledge frameworks. We have extended this combination to an alliance level with the inclusion of antecedent factors addressing individual level, group dynamic and alliance level factors. The result is the development of an empirically supported alliance innovation process

model. Further, we have empirically tested and proven our suggestion of the existence of the "chain of innovation". Our preliminary analysis supports the existence of the chain and its role as the core set of drivers in the alliance innovation process.

For management, this research has significant potential in guiding attention to the chain of innovation, to better manage the overall process of innovation in alliances. Our work shows that more effective creativity and learning processes and a greater knowledge stock lead to a more effective alliance innovation process. Managers therefore, need to concentrate on creating environments wherein the processes of creativity and learning are fostered, increasing the alliance knowledge stock and in turn, increasing innovative output via an effective innovation process.

Direction for future research

While the proposed relationship directions in our model have been satisfied, there have been some curious findings in relation to insignificance of factors including; structural formality on the creativity and learning processes, structural centralisation on creativity, critical thinking and extrinsic motivation on the learning process, and absorptive capacity on knowledge stock. We did not anticipate these findings and recommend that further research into the process of innovation in alliances investigates these factors and their suitability, substitutability or improvement of measurement items. By gaining a better understanding about these factors, we will be better able to manage antecedent factors affecting the chain of innovation, leading to a more effective overall alliance innovation process.

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Appendix 1:

TABLE 1: NAMES AND DEFINITIONS OF CONSTRUCTS IN THE PROCESS OF INNOVATION IN ALLIANCE MODEL

CONSTRUCT NAME	CONSTRUCT DEFINITION
Alliance Innovation	Novel ideas or solutions that have commercial potential
Creativity Process	The process of generating new ideas and unique solutions to problems or situations in alliances
Learning Process	The process of translating information and expertise to develop new knowledge in alliances
Knowledge Stock	Accumulation of meaningful information as derived from the learning process in alliances, including tacit and explicit forms
Intrinsic Motivation	Individual involvement in an activity for personal interest and satisfaction
Extrinsic Motivation	Individual involvement in a task to meet external criteria
Critical Thinking	Recurring inquiry concerning existing methods of reasoning
Diversity	The varied composition of individuals in an alliance team
Communicative Interaction	Formal and informal styles and means of sharing information among alliance members
Job Autonomy	Permission of individuals making independent decisions regarding their job functions in alliances
Culture - Risk Orientation	The set of values and beliefs reflecting the overall risk taking tendencies in alliances
Culture - Collectivism	The set of values and beliefs reflecting the overall willingness to collaborate in alliances
Structure - Centralisation	Authoritative structure in guiding the extent to which decisions are made by a 'central authority' in alliances
Structure - Formality	Authoritative structure guiding the required level of formality for communication exchanges, decision making and task execution in alliances
Absorptive Capacity	Alliance ability to recognise and integrate valuable information into existing activities

Table 2: Hypotheses in the Process of Alliance Innovation Model

	HYPOTHESES ON ALLIANCE INNOVATION
H21	The greater the effectiveness of creativity process the greater the positive impact on alliance innovation
H22	The greater the effectiveness of learning process the greater the positive impact on alliance innovation
H23	The greater the knowledge stock the greater the positive impact on alliance innovation
	HYPOTHESES ON THE ALLIANCE CREATIVITY PROCESS
H1	Greater intrinsic motivation has a positive effect on the alliance creativity process
H3	Greater extrinsic motivation has a negative effect on the alliance creativity process
H5	Critical thinking has a positive effect on the alliance creativity process
H10	Alliance team member diversity has a positive effect on the alliance creative process
H16	A high risk orientation has a positive effect on the alliance creativity process
H14	Greater structural formality has a negative effect on the alliance creativity process
H9	Job autonomy has a positive effect on the alliance creativity process
H12	Greater structural centralisation has a negative effect on the alliance creativity process
H7	A more informal style of communicative interaction has a positive effect on the alliance creative process
	HYPOTHESES ON THE ALLIANCE LEARNING PROCESS
H19	The alliance creativity process has a positive effect on the alliance learning process
H2	Greater intrinsic motivation has a positive effect on the alliance learning process
H4	Greater extrinsic motivation has a positive effect on the alliance learning process
H6	Critical thinking has a positive effect on the alliance learning process
H11	Alliance team member diversity has a positive effect on the alliance learning process
H8	A more personalised style of communicative interaction has a positive effect on the alliance learning process
H17	Greater cultural collectivism has a positive effect on the learning process
H13	Greater structural centralisation has a negative effect on the alliance learning process
H15	Greater structural formality has a negative effect on the alliance learning process
	HYPOTHESES ON THE ALLIANCE KNOWLEDGE STOCK
H20	A greater alliance learning process leads to a greater alliance knowledge stock
H18	Greater alliance absorptive capacity leads to a greater alliance knowledge stock

TABLE 3: SUMMARY OF RETURN MAIL

DESCRIPTION	RESULTS
Total posted	**4500**
Incorrect address/details	275 (6.11%)
Total remaining	4225
Not relevant	(1056) 25%
Total remaining	**3169**
Not interested	279 (8.80%)
Total respondents	**397 (12.53%)**

TABLE 4: SUMMARY OF CRONBACH ALPHAS

SCALE	ITEMS IN SCALE	CRONBACH ALPHA
Creativity	4	.8851
Intrinsic motivation	5	.7802
Extrinsic motivation	3	.7894
Critical thinking	4	.8238
Cultural risk orientation	3	.7539
Cultural collectivism	5	.8076
Job autonomy	4	.8128
Structural centralisation	3	.6870
Structural formality	4	.7481
Absorptive capacity	6	.8174

TABLE 5: SUMMARY OF FINDINGS

Construct	**Path Coefficient**	**Observed t-value**	**Sig. level**	**1 or 2-tail test**
Effects in Alliance Innovation (R2=0.308)				
Creativity Process	0.241	5.2654	****	
Learning Process	0.293	4.9351	****	
Knowledge Stock	0.168	4.1168	****	
Effects on Creativity Process (R2=0.516)				
Intrinsic Motivation	0.200	3.4444	****	
Critical Thinking	0.238	1.7319	**	
Extrinsic Motivation	-0.034	1.6584	**	
Diversity	0.119	4.4561	****	
Job Autonomy	0.095	3.3492	****	
Communicative Interaction	0.141	3.1180	****	
Structure - Formality	-0.043	-1.1293	<1.282	
Structure - Centralisation	-0.078	-0.4812	<1.282	
Culture - Risk Orientation	0.034	5.4693	****	
Effects on Learning Process (R2=0.247)				
Creativity Process	0.048	2.6541	***	
Intrinsic Motivation	0.182	2.1836	**	
Critical Thinking	0.186	0.3635	<1.282	
Extrinsic Motivation	0.057	1.0040	<1.282	
Diversity	0.034	1.4639	*	
Communicative Interaction	0.225	4.2470	****	
Structure – Formality	0.034	0.2088	<1.282	
Structure – Centralisation	-0.043	4.0631	****	
Culture – Collectivism	-0.017	-1.4391	*	
Effects on Knowledge Stock (R2=0.453)				
Learning Process	0.624	5.6767	****	
Absorptive Capacity	0.094	1.2234	<1.282	

Appendix 2: Figure 2