

The recommended citation for the paper is:

Reilly, M., & Sharkey Scott, P. (2014). Subsidiary driven innovation within shifting MNC structures: Identifying new challenges and research directions. *Technovation*, 34 (3): 190-202.

Subsidiary driven innovation within shifting MNC structures: identifying new challenges and research directions

Abstract

The multinational (MNC) as an arena primed for the creation and sharing of innovations is well established. Within this arena, the creation of innovations is borne from leveraging the unique knowledge and opportunities of its globally dispersed subsidiaries.

The recent emergence of more transactional and cost focused approaches to the allocation of organisational activities within the MNC, under what is termed a 'global factory' structure, now challenges this dominant view whilst also providing a good vantage point to look back at research to date and to project the future impact of these changes. In the absence of research which hybridises recent literature on innovation with current insights from the international business domain this review paper contributes to our understanding of the impact of this shift by analysing current theory and practices to identify how narrower subsidiary roles, increased monitoring and constraints on combinative capabilities all have implications for managing innovation across the MNC.

A key contribution is presented via the modelling of current inhibitors of subsidiary innovation, advancing new and compelling insight into how a shift towards the fine slicing of value chain activities across the organisation threatens not only subsidiary driven innovation but also has longer term implications for MNC competitive advantage. We conclude the paper by highlighting critical issues for management in this emerging MNC landscape and by identifying the rich opportunities for relevant and responsive research presented by these new challenges.

Subsidiary; Innovation; MNC; Global Factory; Fine Slicing; Organisational Reconfiguration; Globalisation.

1. Introduction

The MNC - as the dominant organisational structure globally (Cantwell and Mudambi, 2011) - is generally configured via a network of geographically dispersed subsidiary units. These subsidiaries operate in a complex dual environment, required to be responsive to their local markets whilst also meeting the demands of their parent organisation. One of the key ways subsidiaries achieve this responsiveness and contribute to the MNC is through generating innovations, often in response to local opportunities. These innovations can then be utilised across the organisation (Cantwell, 1994; Cantwell and Mudambi, 2005; Pearce, 1999; Mudambi, 2011; Williams, 2009), affording the subsidiary the opportunity to leverage new and relevant knowledge whilst also protecting its position within the MNC. To date, research firmly positions the subsidiary at the nexus of MNC driven innovation based on its unique ability to diffuse locally acquired knowledge which can ultimately upgrade the MNC as a whole (Ambos et al., 2010; Andersson et al., 2002; Collinson and Wang, 2012; Tippmann et

al., 2012; Tsai, 2001).

Subsidiaries provide a particularly interesting context for studying innovation as many MNCs are currently undergoing a dramatic shift from traditional, horizontally integrated 'federal' structures, characterised by collaboration, embeddedness and knowledge sharing (Andersson et al., 2002; 2007) towards more vertically controlled, cost focused 'global factory' approaches to international operations (Buckley, 2009; 2011; Buckley and Ghauri, 2004). Advances in Information Communications Technologies (ICT), more sophisticated logistical capabilities and greater openness in global economic flows increasingly enables the 'fine slicing' of activities, giving the MNC the ability to locate each 'stage' of an activity in an optimally low cost location (Buckley, 2009; 2011, Contractor et al., 2010). Fine slicing, as a function of business model innovation on a global scale, can be defined as the 'disaggregation and dissection of value chain activities' into smaller component parts (Andersson and Pedersen, 2010:431). This structural shift, driven largely by cost savings, divides once holistic subsidiary level value chains into 'packages' of potentially unrelated activities which may span across multiple, dispersed value chains (Scott and Gibbons, 2011). As business model innovation continues to shape organisational structures globally (Chesborough, 2010), an important question emerges as to how these changes will impact upon MNC subsidiary innovation.

Recognising how business model innovation requires a reframing of both the challenges and opportunities facing organisations (Francis and Bessant, 2005), this paper identifies potential challenges created by this organisational transition on subsidiary innovation capacity and then identifies the latent avenues of future research which can address these new challenges. If the MNCs fundamental strategic advantage is its ability to leverage innovations and knowledge from its subsidiary units and to diffuse this knowledge internally (Bartlett and Ghoshal, 1986; 1989; Buckley and Casson, 1976), then constraints on subsidiary capacity to innovate demand greater management and academic attention. Anderson and Pedersen (2010) highlight how the fine slicing of activities experienced by subsidiaries with mandated R&D functions typically involves disaggregation of the R&D function into 'blue-sky' research, basic research and new technologies. The focus of this paper is not on the innovation capacities of such dedicated R&D sites, nor it is on chartered centres of excellence (Andersson and Forsgren, 2000; Frost et al., 2000; Moore, 2001), but focuses instead on the often neglected and overlooked national subsidiary unit. It's easy to forget the national subsidiary; they often sit on the periphery and engage primarily in local market penetration, they may also operate under a relative degree of autonomy, indicating that they are prone to strategic isolation from HQ and their sister operations (Monteiro, et al., 2008). Yet despite these limitations the national subsidiary, often referred to as a 'miniature replica' with strong links to its local environment, is poised to leverage and exploit local knowledge and thus plays an integral role in creating the lateral linkages conducive to innovation (Gupta and Govindarajan, 1991; White and Poynter, 1984). It is surprising therefore that fundamental structural change in the global configuration of MNCs has not yet been examined from the micro perspective of its effect on innovation capability at the national subsidiary level.

This paper makes a number of important contributions. Firstly, we categorise the drivers of subsidiary innovation under existing federal structures, encompassing both the

wider structural context of the MNC and the behavioural context of the subsidiary. Secondly, by demonstrating how the federal structure currently enables subsidiary units to generate innovations for exploitation across the MNC, we can then identify the potential challenges for subsidiary innovation that emerge from a shift towards the ‘fine slicing’ of MNC activities. Thirdly, we highlight implications for continuity in the generation of innovation in modern MNCs, and the future research opportunities that arise from the transition to the global factory. Specifically, we propose a more nuanced approach to examining subsidiary based innovation across and within value chains, the need to incorporate the broader phenomenon of problem solving in MNCs, and the opportunities and obstacles that arise from business model innovation and greater capabilities in ICT.

The rest of the paper is organised as follows: section (2), with the aid of a model, illustrates how the structural context encompassing the wider MNC organisation combines with the behavioural context, inherent and idiosyncratic to each subsidiary to shape innovation within federal MNC structures. Section (3) highlights how changes in the global structure and configuration of MNCs not only has implications for the generation of innovation at the national subsidiary level but also threatens the unique capacity of the MNC as an organisational form to leverage and exploit dispersed sources of knowledge. Finally section (4) identifies and discusses some prominent questions relating to subsidiary based innovation whilst also advancing some suggestions for future research.

2. Subsidiary Innovation

Up until the late 1970s international business research largely ignored the value of (or potential for) subsidiary driven innovation, choosing to focus instead on the agency problem, the potential for empire building and managing parent-subsidiary relationships (Buckley and Casson, 1976). The dominant logic of the time not only assumed subsidiaries were centrally controlled and co-ordinated (Doz and Prahalad, 1981), but that they were also dependent, subordinate and typically limited to local sales and manufacturing activities. Innovations or firm specific advantages were typically seen as centralised - created at headquarters and merely implemented at a local level (Birkinshaw and Hood, 1998a, 1998b).

In what has been coined as ‘evolution in thinking’ (Birkinshaw and Hood, 1998a:773) subsidiary roles were gradually reconceptualised and repositioned as potential providers of global innovative solutions (Andersson et al., 2002; 2007; Ghoshal and Bartlett, 1988; Gupta and Govindarajan, 1991, 2000). Researchers responded to the growing recognition of the value of subsidiary driven innovation to the wider MNC by asking some prominent questions: What leads to subsidiary innovation? Why do some subsidiaries contribute more than others? And how can a subsidiary’s local knowledge be leveraged and shared across the MNC to best exploit these dispersed assets?

Growing interest in the differentiating factors driving subsidiary innovation led to a realisation that both resources and competencies are spread across MNC networks, typically unevenly (Bartlett and Ghoshal, 1990; Collinson and Wang, 2012; Szulanski, 1996; Tsai, 2001; Zaheer and Bell, 2005), and some subsidiaries are uniquely positioned to leverage both local knowledge and the opportunities that arise from that knowledge. In addition to utilising local knowledge, it became apparent that some subsidiaries could also leverage relative degrees of local

autonomy (Andersson et al., 2007; Bartlett and Ghoshal, 1989, Ghoshal and Bartlett, 1990) to anticipate the needs and direction of the parent (Birkinshaw, 1996) and to drive new organisational innovations. The idea of the MNC as a federation of subsidiaries led, but not constrained by HQ, exemplifies these collective phenomena and captures how both the sourcing and responsibility of innovation creation in the MNC has been steadily shifting; no longer resting solely on the parent as the sole provider of knowledge, initiatives and innovation, but increasingly encompassing the salient roles played by subsidiaries.

2.1 The federal structure and innovation

Two central characteristics firmly position the subsidiary as a significant source of innovation for the collective federal MNC. Firstly, subsidiaries share access to the MNCs internal network of resources which they can leverage to develop competitive capability in their local markets (Andersson et al., 2002, 2007; Bartlett and Ghoshal, 1989; Ghoshal and Bartlett, 1988, 1990). This is captured by the literatures on both subsidiary embeddedness (Andersson, 1996; Andersson et al., 2001; 2002; Figueirdo, 2011, Meyer et al., 2011) and subsidiary entrepreneurship (Birkinshaw, 1997; Birkinshaw et al., 1998; 2005; Lee and Williams, 2007; Scott et al., 2010). Secondly, subsidiaries can typically engage in collaborative efforts and build combinative capabilities with other subsidiaries (Kogut and Zander, 1992). Essentially ‘an insider in two systems’ (Collinson and Wang, 2012: 1516), the national subsidiary can thus collaborate with both internal and external networks, which has been shown to not only improve innovation capabilities but also facilitates a greater degree of novelty in the resulting innovations that arise (Nieto and Santamaría, 2007). In addition to upgrading the ‘competence of the MNC as a whole’ (Andersson et al., 2002: 979), other units within the federal network may benefit directly from subsidiary knowledge flows, adding to the MNCs cumulative stock of knowledge (Ambos et al., 2006; Yang et al., 2008).

The generation of initiatives and innovations in the subsidiary is a path dependent process however, and builds upon existing proven capabilities in the subsidiary (Birkinshaw, 1997; 1996; Bouquet and Birkinshaw, 2008b). In accordance we identify facilitating factors to subsidiary driven innovation in terms of both the local behavioural context – which is idiosyncratic to the subsidiary itself - and the wider structural context of the collective MNC network (see also Tables 1 and 2 for facilitating factors of subsidiary driven innovation within a federal structure).

2.2. Structural context supporting subsidiary innovation

Recognising the importance of the structural context within which subsidiaries operate we identify three interrelated and complimentary factors enabling subsidiary innovation. Firstly, the *miniature replica* subsidiary model captures how a broad range of operations - typically spanning an entire value chain in one location - opens up greater opportunities for building the lateral linkages conducive to innovation (Gupta and Govindarajan, 1991; White and Poynter, 1984). Secondly, *multiple embeddedness* allows subsidiaries to be responsive to both local external opportunities and those originating within from within the wider internal organisation (Andersson and Forgren 1996; 2000, Andersson et al., 2001; 2005; 2007). Finally the scope for collaboration and *combinative capabilities*

links with the notion of embeddedness and underlies the importance of intra-organisational learning and coalescent knowledge creation (Reilly et al., 2012) in driving innovation at the subsidiary level.

2.2.1 The 'Miniature Replica' Model and innovation

The configurations of strategy and structure within MNCs continue to evolve, and with them, the roles of subsidiary units (Andersson and Pedersen, 2010; Birkinshaw and Morrison, 1995; Birkinshaw et al., 1995; Taggart, 1998). Heterarchical structures have replaced historic dyadic parent-subsidiary structures, allowing for more prominent subsidiary roles. The 'miniature replica' subsidiary model depicts a subsidiary as operating within a horizontal organisation - activities typically span entire value chains and there is considerable scope to influence strategic direction (White and Poynter, 1984; 1989). The level of subsidiary discretion and engagement in lateral decision making processes can be conceptualised along two dimensions; a broad product scope and a wider geographic scope (Enright and Subramanian, 2007). Further, this subsidiary level discretion ensures local responsiveness and enables the development of 'local innovator' roles (Gupta and Govindarajan, 1991). Following the natural progression from adopter-to-adaptor-to-innovator (White and Poynter, 1984), subsidiaries within federal MNCs essentially create their own paths, combining responses to local opportunities with the broader needs of the organisation to create and demonstrate value.

Geographically dispersed subsidiaries are exposed to different types of opportunities and contingencies, so their innovative responses will also vary in terms of how significantly they can add to, or refresh, organisational knowledge. Lee and Williams (2007) conceptualisation of the MNC as a dispersed community of entrepreneurship captures this phenomenon. Additionally, as the 'the MNC is a crucial arena for such institutional innovation... uniquely powered to address some of the most urgent problems of a global scale' (Hedlund, 1986: 32), it is critical that the local knowledge and innovative capabilities of subsidiaries are leveraged across the MNC network to contribute to organisational level innovation.

2.2.2 Multiple embeddedness and innovation

Viewing the MNC environment as a network of relationships, the extent of interdependencies between a subsidiary and its counterparts reflects its relative degree of embeddedness (Andersson and Forsgren, 1996, 2000). Embeddedness captures the closeness of relationships, the intensity of information exchange and the extent to which resources between internal and external parties are interlinked (Andersson et al., 2001). For example, a subsidiary has relationships not just with its headquarters and sister operations, but with local customers, suppliers, government institutions and universities. It is argued that a subsidiary unit's autonomy to engage in activities outside of its immediate mandate without formal approval (Birkinshaw et al., 2005; Ghoshal and Bartlett, 1988), coupled with the level of attention it enjoys from its headquarters (Ambos et al., 2010), will positively impact upon its innovative potential. In this sense, subsidiary embeddedness with both internal and external actors comprises 'the canvas within which subsidiary strategy takes place' (Garcia-Pont et al., 2009: 182) and is a critical aspect of the subsidiary's capacity to innovate.

As subsidiary relationships span across both internal and external stakeholders the opportunity to leverage local ties and knowledge - which are often unobtainable or 'invisible' to the parent, (Yamin and Sinkovics, 2007) - significantly influences subsidiary capacity to innovate and strengthen competitive position (Andersson et al. 2007; Cantwell and Mudambi, 2005; Ciabuschi et al., 2011; Figuerido, 2011). These myriads of connections and relationships therefore provide the subsidiary with a unique platform to contribute to the knowledge creation processes conducive to innovation-developing activities (Ciabuschi and Martín, 2011; Ciabuschi et al., 2011).

Acknowledging that local knowledge may be 'sticky' or context specific (Szulanski, 1996), a subsidiary must also act as more than a mere conduit and play an integral role in diffusing and disseminating knowledge throughout the network. As the absorptive capacity literature demonstrates, the ability to recognise the value of new, external knowledge, and to then assimilate this knowledge is conducive to learning and at a wider level, to organisational innovation (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998; Tsai, 2001). In addition, 'knowledge transfer among organizational units provides opportunities for mutual learning and interunit cooperation that stimulate the creation of new knowledge and, at the same time, contribute to organizational units ability to innovate' Tsai (2001: 996). So in order to exploit the MNCs potential synergies and utilise its dispersed assets, subsidiaries must combine skills and knowledge in concerted collaborative efforts. The *dual*, or *multiple embeddedness* of subsidiaries (Collinson and Wang, 2012; Figueiredo, 2011; Meyer et al., 2010) and how they engage in collaborative efforts with parents and/or peer subsidiaries to create 'coalescent knowledge' (Reilly et al., 2012) is therefore a factor that contributes significantly to organisational innovation.

2.2.3 *Combinative capabilities and innovation*

Cooperation between units is a necessary condition for creating the 'complex and overlapping networks that shape global markets, provide intelligence about innovation opportunities around the world, and serve as the organizational base for acquiring relevant knowledge' (Rycroft and Kash, 2004: 188). Both interaction and embeddedness are fundamental characteristics of the MNC as an inter-organisational network (Ghoshal and Bartlett, 1990), and potential synergies arise from leveraging knowledge and competencies through collaborative effort and creating combinative capabilities (Kogut and Zander, 1992). Defined as 'the capability that permits the integration and recombination of knowledge' (Phene and Almeida, 2008: 904), combinative capabilities are recognised as a fundamental antecedent to subsidiary driven innovation due to the tacit and complex nature of distributed MNC knowledge.

Within the MNC network we can frame knowledge flows along two dimensions. Firstly, intra-organisational knowledge flows encompass interaction between and across subsidiary units (Persaud, 2005). On the other hand, inter-organisational knowledge flows are a function of local embeddedness, and allow subsidiaries to leverage knowledge spillover from other firms within the local external environment (Jansen et al., 2008). A significant body of literature and research focusing exclusively on intra-organisational knowledge flows attests to knowledge accessibility as a driver of innovation capability within the MNC (Ambos et al., 2006; Gupta and Govindarajan, 2000; Monteiro et al., 2008; Mudambi and

Navarra, 2004; Tippmann et al., 2012; Tsai, 2001). As addressed (in section 2.2.2) the absorptive capacity literature is particularly useful in indicating how an ability to recognise the value of new knowledge and to then assimilate this knowledge is conducive to both new competence development and at a wider level to organisational innovation (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998; Tsai, 2001). Similarly, inter-organisational learning provides subsidiary units with the scope to leverage locally based knowledge in generating initiatives or innovations which can subsequently be exploited across the organisation. As knowledge may have little value in isolation, and needs to be augmented, Kogut and Zander (1992: 392) outline the benefits of collaboration as the innovation search becomes localised incorporating technologies which are *proximate*, can be more easily acquired, and may ‘not require a change in an organization’s recipes of organizing research’.

Similarly, Mudambi and Swift (2011: 187) highlight that, while the MNC network may be distant in terms of geographic space, it can remain proximate in terms of expertise, common interfaces and relationships, thus providing an ample environment to leverage ‘the creativity that bubbles up from within the multiplicity’ of its dispersed subsidiary units.

In summary, collaborative subsidiary efforts pave the way for incremental approaches to innovation as the organisation’s existing ‘recipes’ for development remain intact (Kogut and Zander, 1992), whilst a continuous level of improvement is facilitated. Mutual learning, intra-unit cooperation and the creation of new knowledge (Tsai, 2001) then allows the subsidiary and/or its parent to identify where these combinative capabilities can be utilised to provide the greatest value to the organisation.

Table 1
Thematic Summary of Research Capturing Structural Facilitators of Innovation within Subsidiary Context

Theme	Studies/ Year	Research Focus	Core findings/ arguments
<i>Miniature Replica Configuration</i>	White and Poynter (1984)	Strategies and configurations of subsidiaries	<ul style="list-style-type: none"> • Subsidiaries leverage relative flexibility to evolve over time • Subsidiaries develop their own specific capabilities naturally progressing from adopter-to-adapter-to innovator
	Gupta and Govindarajan (1991)	Micro subsidiary specific focus to explore differences in roles and strategic contexts of subsidiaries	<ul style="list-style-type: none"> • Identifies how inflows and outflows of knowledge from the subsidiary ultimately shapes the unit's strategic role within the MNC • 'Local innovators' and 'Global innovators' differ in their knowledge outflows and the dependencies that stem from these knowledge outflows
<i>Multiple Embeddedness</i>	Andersson, Forsgren and Holm (2001)	Sourcing of subsidiary knowledge via relationships with both internal and external stakeholders	<ul style="list-style-type: none"> • Knowledge assimilation is conducive to building innovative capabilities in the subsidiary • Focusing exclusively on highly embedded relationships may close the subsidiary off from new and innovative processes
	Collinson and Wang (2012)	Evolution of innovative capabilities through dual embeddedness	<ul style="list-style-type: none"> • Innovative capabilities at the subsidiary level are contingent upon integration within the local economy and the parent firm globally • Capability development at the subsidiary level is strongly subject to network configurations and can be abruptly cut short by intermittent restructuring initiated by the parent
	Meyer, Mudambi and Narula, (2011)	Opportunities that arise from multiple embeddedness	<ul style="list-style-type: none"> • MNC must find a 'balance' between leveraging the subsidiary's strategic role and the unit's local identity and linkages • MNC should maintain flexibility through shaping and deliberately designing intra-firm and inter-firm networks that enable innovation
<i>Combinative Capabilities /Scope for Collaboration</i>	Faems, Van Looy and Debackere (2005)	Inter-organisational collaboration and the effectiveness of innovation strategies	<ul style="list-style-type: none"> • Positive relationship between inter-organisational collaboration and innovative performance • Proposes a portfolio approach recognising specialisation coupled with collaboration with a variety of different partners
	Kogut and Zander (1992)	How cumulative knowledge is leveraged via sharing and transfer between individuals and groups within an organisation	<ul style="list-style-type: none"> • Advances that innovation and learning stems from an organisation's 'combinative capabilities' • Combinative capabilities allow organisations to generate new applications from existing knowledge through exploiting current knowledge and exploring the potential of new technologies

(continued on next page)

Studies/ Year	Research Focus	Core findings/ arguments
Tsai (2001)	Network position, ability to absorb knowledge and impact on performance and innovation	<ul style="list-style-type: none"> • Stresses the importance of network centrality for knowledge accessibility and ultimately for innovation • Network centrality allows for greater sharing, transfer and exchange of relative knowledge • By extension warns of the implications of isolation within the MNC network

2.3. Behavioural context supporting innovation

In building upon the concepts developed in section (2.1) and the key studies highlighted (in Table 2) we now examine determinants and traits of subsidiary behaviour - highlighting the idiosyncratic behavioural attributes conducive to driving subsidiary innovation. The first of these behavioural determinants addressed is *subsidiary autonomy*, which shapes the subsidiary's strategic freedom to make decisions independently. Subsidiary autonomy is considered here as a behavioural aspect, but we recognise that a counter argument for its inclusion as a structural facilitator of innovation exists given that a subsidiary's decision making freedom is largely determined by its parent. However, on balance, and similar to other studies (Birkinshaw, 1997; Scott et al., 2010) we consider subsidiary autonomy as a behavioural element given its impact on the decision making freedom of the subsidiary unit. The second behavioural attribute we highlight is how an *entrepreneurial orientation* captures not only a proactive drive towards conceiving, assuming and implementing new ways in which the organisation can use or expand its resources (Birkinshaw, 1997), but also a propensity to pursue exploratory and experimental trajectories in embracing change. Finally, *subsidiary strategy development* involves positioning and aligning existing or future competencies with current opportunities. Similarly to the application of structural factors, the aspects of the behavioural context are deemed as interrelated and operate in unison in shaping the behavioural context conducive to driving subsidiary innovation.

2.3.1 Subsidiary autonomy and innovation

To be innovative and responsive at a global level the MNC must be open to flexibility at the subsidiary level (Ghoshal and Bartlett, 1988; Hedlund, 1986). While subsidiary level autonomy also encompasses the structural context of the MNC and is heavily determined by the parent, it can be assumed that most subsidiaries within decentralised federal structures operate with at least some degree of decision making authority (Boehe, 2007; Dörrenbächer and Gammelgaard, 2006). As a driver of subsidiary innovation intensity (Ciabuschi and Martín, 2011) autonomy captures the ability to act independently, or as Ambos et al., (2010:10) define it, 'the extent to which the subsidiary managers are able to make decisions without headquarters' involvement'. The extent of this local autonomy determines both the subsidiary's ability to pursue strategically valuable opportunities (Ambos et al., 2010; Birkinshaw and Hood, 1998a; 1998b Taggart and Hood, 1999) and to foster the linkages with strategic partners, suppliers and customers conducive to building a broader value creating scope (Birkinshaw et al., 2005). Earlier we addressed how multiple embeddedness allows subsidiaries to develop linkages with actors both internal and external to the organisation. By extension, autonomy fosters innovation by allowing subsidiaries greater scope to leverage these relationships (Gammelgaard et al., 2012), and is therefore a crucial element of the behavioural context.

The positive relationship between subsidiary autonomy and success in providing new initiatives for sister subsidiaries, and the organisation as a whole, is widely accepted (Birkinshaw, 1997; Birkinshaw et al., 1998; Ciabuschi and Martín, 2011; Ghoshal and Bartlett, 1988). Autonomy is key to this ability of 'developmental subsidiaries' (Taggart and

Hood, 1999) to maximise their contribution (Delaney, 2000) and to seize the opportunities which can lead to greater innovative output. While subsidiary autonomy is heavily determined by the relative degree of freedom allowed by the parent, the two factors of *subsidiary entrepreneurship* and *subsidiary strategy development* which follow are more reflective of the idiosyncratic behavioural traits within the subsidiary.

2.3.2 *Subsidiary entrepreneurship and innovation*

The second factor advanced in understanding the facilitators of subsidiary driven innovation is an ‘entrepreneurial orientation’ which encompasses innovativeness, pro-activity and risk-taking (Anderson et al., 2009; Covin and Slevin, 1989, 1991; Covin and Miles, 1999; Lumpkin and Dess, 1996). In the same way the literature on entrepreneurship at the firm level describes such an orientation, the entrepreneurial subsidiary ‘engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with ‘proactive’ innovations’ Miller (1983: 771). Highlighting the importance of entrepreneurship within federal MNC structures, Birkinshaw (1997) recognises how such subsidiary efforts and initiatives have the potential to enhance responsiveness (locally, within the external market), learning (internally within the MNC), and to facilitate greater integration of activities globally (internal-global hybrid).

The subsidiary must also be cognisant of existing organisational boundaries during the process of experimentation and selection (Burgelman, 1983). Thus the scope and magnitude of subsidiary driven entrepreneurship can be seen to vary widely between responsiveness at a local level to much broader global scale applicability. Indeed numerous studies, both empirical (Birkinshaw 1997; Birkinshaw et al., 2005, 1998; Holm and Sharma, 2006; Scott et al., 2010) and conceptual (Rugman and Verbeke, 2001) highlight how proactive subsidiaries navigate both internal and external environments to sense and seize new opportunities for development. Well cited examples of explorative trajectories adopted by subsidiaries include the UK subsidiary of *Philips* and their development of Teletext technology in the 1980’s (Bartlett and Ghoshal, 1986) and the Scottish subsidiary of *NCR* and their development of the automatic teller machine (Ambos et al., 2010). Recognising this variance in magnitude, scope and scale of subsidiary entrepreneurship, the emergence of the ‘listening post’ subsidiary role, tasked with filtering and diffusing local knowledge back to the parent has gained increased attention within research (Meyer, et al., 2010; Mudambi and Navarra, 2004), and may provide some direction in reconceptualising subsidiary roles.

In contrast to viewing the parent-subsidiary relationship via a dyadic principal-agent lens (Williamson, 1981), the federal view of the MNC incorporates more complex combinations of the types of parent control (O’Donnell, 2000), and a more interdependent view of subsidiaries (Pearce, 1999), as well as placing a greater onus on subsidiaries to add value through creativity and novel strategic responses (Scott et al., 2010). These factors combine to drive greater entrepreneurial behaviour across MNC networks. Subsidiary managers are intensely aware of the need to appease their parent MNCs, and of the danger that standing still means to be left behind. Despite these pressures, a subsidiaries’ scope to be entrepreneurial remains conditional upon a relative degree of autonomy and the capacity to take risks. Risk is therefore a distinguishing feature of both an entrepreneurial orientation and subsidiary driven innovation for if headquarters are risk adverse, there is likely to be little

scope for opportunity development in the subsidiary (Eisenhardt, 1989; Grossman and Hart, 1986; Jensen and Meckling, 1976). Thus we can summarise that risk taking and a ‘shared vision’ (Colakoglu, 2012), within an MNC culture that values entrepreneurial behaviour, will drive both the development and breath of its subsidiaries’ innovation capabilities.

2.3.3 *Subsidiary strategy development and innovation*

In today’s demanding global environments, subsidiaries are expected to not only remain responsive to local markets but also to adapt, innovate and find new ways of demonstrating value to the collective organisation. In addition to autonomy and entrepreneurship, the scope to achieve these aims rests on its ability to develop and articulate a local subsidiary strategy. Birkinshaw (1997: 210) captures this imperative, contending that ‘creativity and innovation should be endemic to the national subsidiary as the driver of its strategy. The subsidiary has ongoing managerial responsibilities but at the same time it has the responsibility to respond to entrepreneurial opportunities as they arise’. The opportunities that do arise however are likely to significantly shift over time, indicating that as subsidiaries evolve, so do their strategies (Andersson et al., 2005).

In terms of shifting MNC configurations, Gammelgaard et al., (2012) outline how subsidiary strategy development links strongly with changes in both the host country environment and parent driven strategy – so, during periods of change, the scope to re-shape interdependencies with the parent becomes critical (Balogun et al., 2011). While a pre-set business domain may limit the range of strategic options the subsidiary can deploy (Birkinshaw and Hood, 1998a), subsidiary’s operating within federal structures ‘have the latitude to address their own future’, to improve performance and, via their strategic outcomes, to influence the MNC as a whole (Garcia-Pont et al., 2009: 183).

In what is arguably the most comprehensive framework on subsidiary strategy to date, Taggart (1998) build upon Jarillo and Martínez (1990) to identify four main subsidiary strategies and corresponding roles. Within the integration-responsiveness framework Taggart (1998: 666) labels these roles as: the *active subsidiary* (high integration, high responsiveness), secondly the *autonomous subsidiary* (low integration, high responsiveness), thirdly the *quiescent subsidiary* (low integration, low responsiveness), and finally the *receptive subsidiary* (high integration, low responsiveness). Among these, we can assert that it is the *active* and *autonomous* subsidiary types, both characterised by high levels of responsiveness, which are most conducive to driving innovation within the MNC.

The environment within federal MNC structures, characterised by multiple embeddedness (see section 2.2.2), and combinative capabilities (see section 2.2.3), is well suited to accommodate active subsidiaries. The assimilation and absorption of new and relevant knowledge in this network of relationships and interdependencies drives collaborative efforts and ultimately innovation. Additionally, (in section 2.2.1) we highlight how ‘miniature replica’ subsidiaries within federal structures can also enjoy considerable autonomy to drive their own strategy (White and Poynter, 1984; 1989) and to adopt ‘local innovator’ roles (Gupta and Govindarajan, 1991). Table 2 which follows augments the above discussion of facilitators driving innovation in the subsidiary context. We then advance a model (Fig 1) to illustrate how the existing federal structure supports active and autonomous subsidiary roles, and how the subsidiary-level behavioural context encompassing autonomy,

entrepreneurship and strategy combines with the overall MNC structural context to drive and nurture subsidiary innovation.

Table 2
Thematic Summary of Research Capturing Behavioural Facilitators of Innovation within Subsidiary Context

Theme	Studies/ Year	Research Focus	Core findings/ arguments
<i>Subsidiary Autonomy</i>	Ambos, Asakawa and Ambos (2011)	Subsidiary autonomy as a dynamic process evolving over time, building upon Ambos and Schlegelmilch's (2007) study of innovation and control in the MNC	<ul style="list-style-type: none"> • Suggests the utilisation of power to obtain autonomy may not be a sustainable strategy, arguing that the subsidiary should build trust and linkages with parent driven strategies • Research will benefit from further exploring subsidiary driven innovation outside of refined and mandated global innovation units (R&D units)
	Birkinshaw (2003) Bouquet and Birkinshaw (2008a) Bouquet and Birkinshaw (2008b)	How subsidiaries gain power and flexibility within the MNC	<ul style="list-style-type: none"> • Subsidiaries are engaging in risky strategies and 'breaking the rules' to push subsidiary strategy • High risk behaviour is often celebrated when successful. When it goes wrong those responsible are branded empire builders who manipulate the rules to justify self-serving actions
	Ghoshal and Bartlett (1988)	How subsidiaries create, adopt and diffuse innovations within the MNC	<ul style="list-style-type: none"> • Findings show a positive relationship between autonomy and innovation, mediated by integration and communication mechanisms • Inter-linkages within structural context are illustrated
	Hedlund (1986)	The MNC as a shifting 'heterarchy', open to risk-taking and innovations stemming from subsidiary operations	<ul style="list-style-type: none"> • To be innovative the MNC must be open to supporting learning from failure • The MNC as a dispersed bundle of assets is a crucial arena for innovation and uniquely positioned for responsiveness at a global scale; based largely upon subsidiary contribution
	Taggart and Hood (1999)	Linkages between autonomy, and a number of strategic variables including: R&D intensity and local responsiveness	<ul style="list-style-type: none"> • Study finds that greater autonomy at the subsidiary level leads to a more export orientated role, higher levels of R&D complexity (conducive to innovation) and greater responsiveness at a local level • Points to greater autonomy needed for 'developmental' subsidiaries
<i>Subsidiary Entrepreneurship</i>	Birkinshaw (1997)	Subsidiary entrepreneurship via subsidiary developed initiatives	<ul style="list-style-type: none"> • Builds upon White and Poynter (1984) arguing that creativity and innovation should be endemic to the subsidiary as a driver of its strategy • Identifies four distinct types of initiatives: global, local, internal and a global-internal hybrid

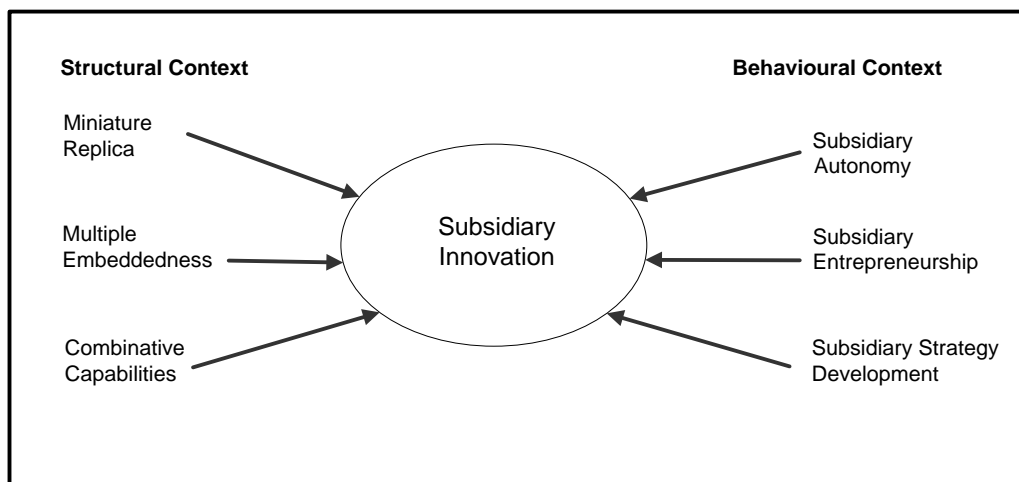
(continued on next page)

Studies/ Year	Research Focus	Core findings/ arguments	
Birkinshaw, Hood and Young (2005)	How a subsidiary's competitive environment shapes both its entrepreneurial behaviour and performance	<ul style="list-style-type: none"> • The relationships between the subsidiary and its internal and external networks can be both competitive and collaborative. A competitive relationship provides a greater stimulus for growth and innovation • Subsidiary autonomy developed through an entrepreneurial capacity facilitates stronger linkages with both local suppliers and customers leading to a broader value-adding scope 	
Lee and Williams (2007)	Dispersed entrepreneurship within the MNC via a community perspective	<ul style="list-style-type: none"> • Reciprocal knowledge sharing and creation (akin to <i>Federal</i> models of the MNC: Ghoshal and Bartlett, 1990; Andersson, Forsgren and Holm, 2007) between community-networked participants promotes dispersed entrepreneurship 	
Scott, Gibbons and Coughlan (2010)	Linkages between subsidiary entrepreneurship and contribution to the wider MNC	<ul style="list-style-type: none"> • Entrepreneurial behaviour at the subsidiary level encourages more creative responses to escalating environmental change • Parent may set the context for the subsidiary but the level of entrepreneurship within the subsidiary will determine how context shapes contribution 	
<i>Subsidiary Strategy Development</i>	Birkinshaw and Hood (1998a)	Subsidiary role evolution via a capabilities perspective	<ul style="list-style-type: none"> • Subsidiaries evolve through developing capabilities which in turn can be used to shape subsidiary strategy • Subsidiary capabilities can be specific to a functional area or be more broadly based encompassing innovation capabilities built over time
	Delaney (2000)	Challenges the traditional hierarchical view of the MNC in exploring how subsidiaries shape strategy through maximising contribution via initiative taking	<ul style="list-style-type: none"> • Fulfilling a narrow mandate is inadequate; subsidiary management must do so in a superior manner to their peers whilst also developing strategic initiatives which add value • Drive, ambition and building innovative capabilities are crucial in facilitating growth and renewal at the subsidiary level

2.4 Combining elements of the structural and behavioural context to drive innovation

The figure below (Fig. 1) combines both the structural and behavioural facilitators conducive to driving subsidiary based innovation within traditional MNC structures. As discussed (in section 2.2) the structural context comprises the miniature replica type subsidiary role, multiple embeddedness of subsidiaries and finally the scope to build and generate combinative capabilities. The behavioural context advanced (in section 2.3) incorporates autonomy, entrepreneurship and strategy development at the subsidiary level. In the subsequent section (3) we highlight how recent transformations in both the capability base and structure of modern MNCs threaten to undermine the relevance of this traditional model. Further, we critically evaluate how these changes at a macro level can potentially reduce not only the subsidiary's scope to add value and innovate but also the capacity of the MNC as a whole to adapt and survive.

Fig. 1. Facilitators of subsidiary driven innovation within the federal structure.



3. Emergence of the global factory and implications for MNC innovation capacity

In the introduction we discuss how business model innovation continues to shape organisational structures globally (Chesborough, 2010), we also outline the key purposes of this paper – to identify the potential challenges created by organisational transition on the capacity of subsidiaries to innovate; and to then identify the avenues of research which might address these new challenges. To meet this agenda, this section, and the subsequent discussion (section 4) identifies how structural and behavioural inhibitors within the modern MNC are creating a new landscape for subsidiary driven innovation.

Our wide ranging subsidiary literature review considers not only the integral role of innovative and competence creating subsidiaries from within, but by extension also provides a greater understanding of how federal organisations as a whole continuously adapt, evolve and survive. In capturing these key tenets, Fig.1 illustrates both the structural and behavioural contexts conducive to driving subsidiary innovation within federal MNC structures. As

addressed within the subsidiary literature, and specifically Ambos et al., (2010), subsidiary based innovations are path dependent, building upon existing knowledge and the lessons learned from previous initiatives. Similarly, Bessant and colleagues (1994, 2001) recognise how innovation is often approached through incremental problem solving where a level of continuous improvement is linked to the wider goals of the organisation. As new institutional forms, structures and configurations are emerging, however, fundamental changes in the subsidiary context now question the applicability of incremental, problem solving approaches to subsidiary driven innovation. This is particularly evident in the emerging shift towards a 'global factory' configuration, which represents a significant change in the organisational structure of MNCs. In contrast to evolutionary or incremental approaches to change, discontinuous transformation cannot easily be reversed and involves breaking path dependencies and 'replacing important parts of a company and its strategy, and affect the long term prospects of the firm' (Agarwal and Helfat, 2009: 283). We now highlight how this radical approach to transformation raises some pertinent questions as to how the sourcing of innovations is, and will be managed within evolving MNC structures.

3.1 New challenges and opportunities for subsidiary driven innovation

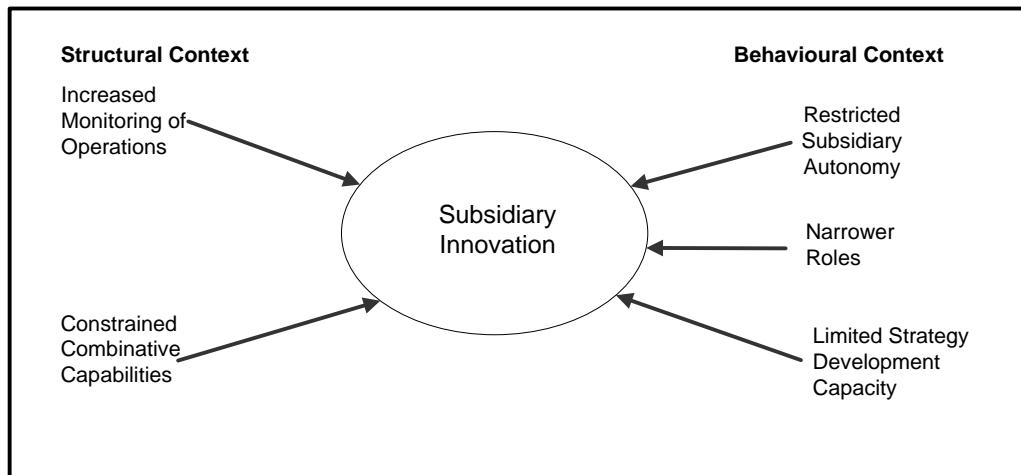
Huizingh (2011) analyses revolution as a series of incremental and evolutionary processes. Recent developments in MNC structures – especially shifts towards 'global factory' configurations – may arguably be more along the lines of radical, discontinuous change. Striving for greater resource utilisation and efficiency, global organisations have learned to 'fine slice' their activities, separating value chains into stages, and then locating each 'stage' in its optimal location (Buckley, 2009; 2011; Gerybadze and Reger, 1999). Instead of holding responsibility for many of the value chain elements associated with particular products or services, subsidiary units may now find their responsibility narrowed to just limited aspects of much wider activities. Essentially this structural shift, driven largely by a desire for cost saving, divides once holistic value chains at the subsidiary level into 'packages' of potentially unrelated activities spanning across multiple and dispersed value chains (Scott and Gibbons, 2011). In turn, within these competitive environments, location based advantages are likely to erode as global value chains become disjointed, leading subsidiary roles to become even more focused, narrow and specialised (Buckley, 2009).

It would be naïve however to dismiss entirely the potential opportunities for innovation that arise from more specialised and fine sliced subsidiary roles. For example, Contractor et al., (2010) highlights how pharmaceutical firms typically narrow the scope of their core activities to focus on highly specialised and tightly defined functions. This practice serves a multitude of purposes; firstly, sub-activities placed in optimal geographic locations can benefit from knowledge spillover and existing talent pools. Secondly, increased specialisation of activities facilitates knowledge sharing with only those who most need it, promoting economies of scale through reducing managerial effort and communication costs. Thirdly, if cost savings can be achieved from maximising economies of scale and reducing duplication of activities across MNC networks (Buckley and Ghauri, 2004), and then re-directed into new and nascent technologies, this approach could promote more cyclical and continuous models of MNC innovation. Finally, Andersson and Pederson (2010) highlight

that competitive advantage in distinct technological domains does not stem from expertise in one area but arises from simultaneously mastering technologies in several related areas. The global factory structure, primed as an arena for the disaggregation of activities into smaller, more specialised component parts is arguably better positioned to achieve this latter goal.

While there are undoubtedly potential benefits from this shift towards fine slicing subsidiary activities, these benefits may come with many caveats; notably the associated costs of coordination and the inherent difficulties of managing more complex sets of interdependent activities across networks (Andersson and Pederson, 2010). We also argue that the implications of these changes may in fact be counterintuitive and myopic; while cost savings may be celebrated in the short term the disproportionate long term consequences for subsidiary innovation may be ignored. Additionally, a narrower focus may facilitate specialisation at subsidiaries but may also curb the potential for building the capabilities conducive to collaborative innovation and intra-organisational learning. As subsidiary level innovation rests upon an ability to combine and augment access to local knowledge with the competencies of the wider organisation (Ciabuschi et al., 2011; Figuerdo, 2011; Ghoshal & Bartlett, 1988; Tippmann et al., 2012). Fundamental structural change in the configuration of MNCs is therefore likely to pose a very real threat in terms of subsidiaries' scope to pursue innovative paths in the future. Subsidiaries which are only exposed to a section of a value chain may not develop the required path dependent knowledge - nor will their restricted view of the organisations activities allow them to recognise new opportunities, developments or the capacity to absorb new knowledge effectively (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998). Further, given the reduced scope for collaboration such approaches entail, any resulting innovations may be patchy and lacking overall coherence (Francis and Bessant, 2005). Fig. 2 which follows, summarises how transformation in MNC structures, coupled with the reconfiguring of capabilities and resources across their networks, is likely to create new barriers to subsidiary driven innovation, factors which we now consider.

Fig. 2. Inhibitors of subsidiary driven innovation within the global factory structure.



3.2 Structural context inhibitors to subsidiary innovation

3.2.1 Increased monitoring of operations

Monitoring is intended to prevent, or at least restrain, clandestine or unexpected behaviour (Ambos et al., 2010; Eisenhardt, 1989). For the MNC greater globalisation creates much broader opportunities for outsourcing non-core activities (Buckley, 2009; 2011; Roy and Sivakumar, 2012); but it also creates challenges. Firstly, there is a need to coordinate dispersed activities both internal and external to the organisation. Secondly, the parent must also monitor these dispersed activities and supply chains to ensure that all the pieces fit coherently into a wider organisational picture. As headquarters deploy the increasingly global resourcing opportunities at their disposal, a more commoditised and transactional view of the MNC network emerges, held together through increased coordination and monitoring at the vertical level (Buckley, 2009). While greater transparency of operations may be achieved, tighter controls and monitoring may also prevent the parent from realising the well documented benefits of strategically independent subsidiaries - notably 'learning from local systems of innovation, using and integrating local resources and competencies, and generally introducing a heightened level of dynamism into the parent MNC' (Mudambi and Navarra, 2004: 387).

As headquarters adopt and utilise more sophisticated ICT to monitor and control subsidiary operations, the potential for subsidiary experimentation and initiative taking becomes increasingly challenging (Yamin and Sinkovics, 2007; Scott and Gibbons, 2011). Without significant operational flexibility, subsidiaries' discretion to pursue local opportunities is also reduced, in the same way as increased MNC centralisation has been shown to impede subsidiary innovation (Ghoshal and Bartlett, 1989). While scholars have recently discussed how headquarters should grant more freedom to allow independent subsidiaries to benefit from local learning (Andersson et al., 2007; Gupta and Govindarajan,

1991), we argue that recent trends in MNC structures may now point to a very different reality, where exploiting short term certainties may take precedence over exploring new opportunities.

3.2.2 Constrained combinative capabilities

We addressed how multiple embeddedness, interaction and access to knowledge flows drives collaboration and allows subsidiaries to augment organisational knowledge with local knowledge to generate innovations. But what if the MNC, as a potentially collaborative network, no longer accurately reflects the environments in which subsidiaries must compete? And what if increased internal competition within the MNC causes subsidiaries to become proprietorial about their specialist knowledge?

The resource dependency literature, which examines both the criticality of resources and the magnitude of exchange between actors (Banerjee, 2003; Johnston and Menguc, 2007; Pfeffer and Salancik, 1978), addresses the changing power structures in play within MNCs, and how the internal environments in which subsidiaries operate can become increasingly competitive. More recently, this competitiveness has been attributed to subsidiaries challenging for resources, rent seeking behaviour and intra-organisational rivalry (Bouquet and Birkinshaw, 2008a; Mudambi and Navarra, 2004; Rugman and Verbeke, 2011). Increasing power plays within MNCs - arguably an ex post result of more outsourcing - suggests that headquarters are becoming less reliant on the skills and competencies of specific subsidiary units. As a result, a subsidiary wishing to protect its own position may become less willing to share or integrate knowledge, actuating a shift from internal collaboration to internal competition (Reilly et al., 2012). As the ability to assimilate and use knowledge is dependent on both the receiving and diffusing units - and in particular on successful relationships between them (Lane and Lubatkin, 1998; Schulze et al., 2013) - this competition may threaten to erode one of the critical benefits of the MNC as an organisational structure (Ghoshal and Bartlett, 1988), and may ultimately hinder the potential for creating and developing combinative capabilities within the MNC's nexus of innovation.

3.3 Behavioural Context inhibitors to subsidiary innovation

3.3.1 Restricted Subsidiary Autonomy

Innovation at an organisational level is driven by risk taking, flexibility and experimentation (March, 1991). At the subsidiary level, innovation is equally contingent on a relative degree of local freedom and autonomy (Ciabuschi and Martín, 2011; Ghoshal and Bartlett, 1988; Hedlund, 1986; Gammelgaard et al., 2012). We addressed in section (2.3.1) how 'developmental subsidiaries' need a degree of flexibility and independence (Taggart and Hood, 1999) to maximise their contributions (Delaney, 2000) and to seize explorative opportunities leading to greater innovation output. Subsidiary level flexibility is fast eroding however, as Hedlund's (1983) conceptualisation of the MNC as a 'heterarchy' is replaced by a global network of dispersed activities which are closely monitored and coordinated by the parent. To date, subsidiaries enjoying 'miniature replica' status have often been forgiven for 'breaking the rules' in pursuing local opportunities without explicit parental approval (Delaney, 2000). The emergence of the global factory structure, and the shift towards more

transactional parent-subsidiary relationships suggests that many subsidiaries may no longer have the latitude or autonomy to take such actions.

3.3.2 Narrower subsidiary roles

The emergence of narrower, more specialised roles typical of global factory structures suggests that subsidiaries run an increased risk of becoming isolated, or worse still, that their management develop a 'silo' mentality. Thus Andersson and Pedersen (2010: 434) have argued that 'a too-fine subdivision of the value chain may be suboptimal for many reasons' - some of which we now examine.

Firstly, considering the implications of isolation on subsidiary performance, Monteiro et al., (2008: 91) describe how the 'liability of internal isolation' may also be symptomatic of broader, more fundamental problems of knowledge sharing within modern MNCs. Without access to intra-organisational knowledge, any initiatives that are developed are likely to remain focused at a local level indicating that subsidiaries may become 'standalone' entities; 'neither well integrated within a host country network of R&D nor within the parent MNC's own network of R&D' (Williams and Nones, 2009: 113). Further, without reciprocal knowledge transfer between subsidiaries, the relationships which could foster collaboration may remain undeveloped.

Secondly, as developing subsidiary capabilities for innovation typically stem from leveraging local opportunities in a concerted effort with other subsidiaries (Andersson and Holm, 2010; Kogut and Zander, 1992), a narrower role is likely to dictate a more confined space for sensing and seizing those opportunities. Traditionally, many subsidiaries enjoyed a unique capacity to leverage the benefits of multiple embeddedness through diffusing knowledge and initiatives to the wider organisation (Andersson et al., 2001; Davis and Meyer, 2004; Meyer et al., 2010); but with the narrowness of a more specialised focus, the opportunity to augment knowledge and contribute collectively is likely to deteriorate. A reduced scope of activities may also mean that knowledge of other operations in the network grows weaker, so that individual subsidiaries become less able to understand and leverage their roles in the wider organisational context (Scott and Gibbons, 2011).

3.3.3 Limited strategy development capacity

The disaggregation of value chain activities into disjointed parts poses very significant challenges for strategy development at the subsidiary level. Traditionally, subsidiary management have been able to leverage relative autonomy and 'strategic discretion' (Birkinshaw, 1997; White and Poynter, 1984) to push local subsidiary strategy. This typically involves using slack resources and local knowledge, while working 'under the radar' to develop independent subsidiary initiatives and to generate innovations (Delaney, 2000). If these local undertakings show demonstrable strategic value they are then 'sold' to the parent, and the subsidiary's success story is celebrated across the wider MNC (Bouquet and Birkinshaw, 2008b).

As subsidiaries are forced to adopt narrower, more specialised roles, not only is the capacity to use slack resources hindered by greater transparency and monitoring of operations (Yamin and Sinkovics, 2007; Scott and Gibbons, 2011), but the potential window to explore opportunities beyond the immediate subsidiary mandate may also shrink. In addition, by

reducing a subsidiary's ability to appreciate the broader needs of the organisation, units may become overly focused on their own local objectives, and as a consequence become more marginal and less visible to their collective organisation. The ability to align with wider strategic goals and objectives will thus deteriorate without a coherent understanding of where the organisation is going, and secondly, without the potential to create new knowledge and generate innovations with the parent or other subsidiaries. Given these changes highlighted above, we next address the implications for managing innovation at both the wider MNC parent level and at the subsidiary level.

3.4 Implications for managing innovation at the parent level

Research to date shows how differences in resources and capabilities across local subsidiary contexts provide 'arbitrage opportunities' for leveraging new knowledge across the wider MNC network (Mudambi and Swift, 2011: 186). Thus as the MNC evolves, HQ should not rely exclusively on its own research or innovation capacity, but must ensure that there are processes in place to capture and exploit local subsidiary knowledge. This could be achieved through shifting the subsidiary role from innovation instigator to that of advisor on innovation opportunities to HQ; an indirect approach that echoes the recent identification of 'listening post' subsidiaries tasked with receiving, filtering and diffusing knowledge back to the parent (Meyer, et al., 2010; Mudambi and Navarra, 2004). The subsidiary contributes through leveraging gainful insights via reverse knowledge flows back to the parent, which are then used to generate innovations centrally or at dedicated 'centres of excellence'.

The focus of innovation is also anticipated to shift from within subsidiary units to across value chains, so that, akin to cross-functional, multi-disciplinary innovation teams (Love and Roper, 2009; Lee and Chen, 2007; Terziovski et al., 2002), geographically dispersed units working on different aspects of the same value chain will need to work together closely to develop innovations. The role of HQ as 'orchestrator' of activities is inherent in Buckley's (2009, 2011) depiction of the global factory. It is thus argued that HQ must build the skills necessary to move beyond a 'command and control' mentality and to adopt progressive techniques ensuring that adequate time and resources are spent on driving and nurturing collaboration across the MNC network.

In the introduction of this section (3) we discussed how the global factory style structure increasingly adopted by MNCs has led to subsidiary activities becoming more focused and concentrated, a trend made all the more acute by the narrowing definitions of their roles. As subsidiary contributions become more specialised, an increasing onus is therefore placed on the parent to orchestrate and unify value chain activities, and to then gauge where the greatest scope for value creation lies before integrating and assimilating knowledge developed at the subsidiary level into organisational innovations.

3.5 Implications for managing innovation at the subsidiary level

While the global factory is the extreme end of the continuum, subsidiaries must respond to the potential impact of structural changes in the configuration of MNCs and find new ways to maintain their position and capacity to contribute. This particularly applies to vulnerable Western economy operations with high cost bases, for whom the value of local

initiatives and innovations previously provided some protection from relocation risk.

For subsidiaries without dedicated R&D mandates, the scope to innovate – and contribute to the collective organisation – is likely to become increasingly challenging. If subsidiary operations are reduced to narrow subsets of activities, units may become isolated from the parent and find it increasingly difficult to renew their knowledge of the organisation and its strategic direction. It may be that in extreme cases subsidiaries come to be treated like independent outsourcers, where relationships with the parent are subject to constant review before renewal. Worse still, efforts which appear misaligned with corporate strategy may be seen as wasteful of organisational resources or as empire building (Bouquet and Birkinshaw, 2008b). Further, as more transactional approaches to benchmarking emerge, cost and responsiveness are likely to take precedence over innovation generation in the subsidiary. The role of a subsidiary as a ‘listening post’ (Meyer, et al., 2010; Mudambi and Navarra, 2004), while it falls short of an active role in generating innovation, highlights the need for subsidiaries to be open to changing their roles and mandates if they are to survive and grow in this new landscape. This puts further pressure on subsidiary general managers to drive innovation, for, as the subsidiary’s main interface with headquarters they play a critical role in communicating the organisation’s strategic direction and interpreting headquarters’ expectations of its dispersed units.

One alternative option for subsidiary managers is to drive the unit towards building new and unique technological capabilities. Phene and Almeida (2008: 914) found that, after controlling for R&D intensity, ‘sourcing and combinative capability still have an important effect on innovative ability’ of dispersed subsidiary units. While integration and knowledge sharing may be curtailed in modern global factory structures, subsidiaries still retain some scope to leverage their existing relationships with external stakeholders such as local institutions and government bodies. Considered a resource in itself, embeddedness in the local external environment facilitates access to resources and capabilities outside of the organisation which may in turn drive new innovations (Andersson and Forsgren, 2002). Subsidiary managers must leverage their unique access to external knowledge and to engage and interact with external bodies to develop new and relevant technological capabilities in maximising their unit’s contribution and safeguarding its future within the MNC.

4. Discussion and future research directions

In the introduction and in section (2), we addressed how the survival and growth of the MNC as a whole is contingent upon the ability to adapt, shift and innovate (Hitt et al. 1997; Teece, 2012; Teece and Pisano, 1994; Verona and Ravasi, 2003). We further identified how the competitive advantage of MNCs rests largely upon leveraging the dispersed knowledge and innovative potential of its subsidiary units. By identifying how the capacity and scope of subsidiaries to engage in innovation may become constrained under the emerging ‘global factory’ structure, we raise some important questions, not just for subsidiary based innovation, but also at a more general level about how MNCs can adapt, and to what extent the synergistic and contributory potential of subsidiaries is being (under)utilised? Additionally, given that national subsidiaries are microcosms of many other organisational forms - such as international or small to medium enterprises, but with the added complexities

of being part of a larger organisational structure - our study also provides broader insight into evolving trends of innovation on a global scale.

We addressed in section (1) how innovation in business models continues to reshape organisational structures globally (Chesborough, 2010). Further, if the global factory approach becomes the dominant new business model for MNCs, the likely result will be the increasing prevalence of ‘fine slicing’ practices (Buckley, 2009; 2011). We have argued that the disaggregation of global value chains and the resulting narrower subsidiary roles emerging are also likely to significantly impact a subsidiary’s ability to augment its knowledge and to contribute to organisational innovations. Increasingly sophisticated ICT may also effectively diminish subsidiary autonomy by enhancing headquarters’ ability to orchestrate MNC value chain activities, both internally within the organisation and with external actors (Buckley, 2011, 2009). In addition, a growing tendency of headquarters to outsource and/or relocate activities to lower cost locations reflects a worrying shift as the focus moves from responsiveness at a local level towards a preference for short-term exploitation efforts.

Finally the capacity of subsidiaries to build the combinative capabilities required for generating innovations and to leverage the MNC network synergies becomes increasingly challenging as the intra-organisational, knowledge sharing perspective of the MNC is replaced by a potential reality of disjointed value chain activities and greater internal competition. By modelling both the facilitating and inhibiting factors which shape subsidiary innovation in this paper, we can now build upon this foundation and come closer to identifying the latent avenues of future research which can address transition under new organisational structures. The reconfiguration of organisational structures globally, while giving rise to many managerial challenges, also provides rich opportunities for future research, some of which we now identify.

4.1 Future directions for research

The traditionally rich stream of research on subsidiary innovation must now respond to the new portfolio of challenges and structural changes facing managers within MNCs. Even accepting that ‘global factories’ and federations represent the extremes of a continuum, and that most organisations may fall somewhere in the middle, this fundamental shift in how MNCs allocate activities represents a new organisational reality. We build upon the key concepts and challenges highlighted in this paper to identify the following areas as particularly critical if research is to develop rich theory and provide relevant managerial guidance.

Firstly, from a subsidiary perspective, the implications of a specialised focus for subsidiary units’ activities indicate that the scope to innovate may be confined to a narrow part of a value chain. Research needs to understand the innovation capacity of individual subsidiaries when activities are limited to a narrow slice, or several disparate pieces - and what does a shift from a traditional federal MNC towards a ‘global factory’ mean for subsidiary driven innovation? Without knowing how their activities fit within the larger picture of MNC activities, will subsidiaries be able to innovate? Addressing these challenges gives rise to a number of research opportunities. MNCs have become increasingly reliant on

their subsidiaries to generate innovations: if subsidiary capacity to be innovative is incrementally restricted by 'fine slicing' organisational activities, from where will MNCs source their innovations? What are the implications of diminished subsidiary capacity to innovate for overall MNC innovation capacity? How will HQ overcome the disadvantages that stem from over-centralised control and remoteness from local markets inherent within the global factory structure? How will growing internal subsidiary competition arising from fine slicing activities impact upon internal MNC collaboration, knowledge and innovation sharing? Will increased unit competition reduce collaboration, thereby effectively eroding the MNCs source of competitive advantage? An obvious option for the MNC is to place greater reliance on centres of excellence and dedicated R&D sites to generate innovations, but will such structures be sufficient to offset the constraints on general subsidiary driven innovation?

Secondly, even if subsidiaries can innovate in the new MNC landscape, we may need more novel approaches to understanding innovation opportunities and drivers. For example, research has long recognised how the capacity to innovate varies across subsidiaries, even within the same MNC (Birkinshaw et al., 1998; 2005; Ghoshal and Bartlett, 1988). This led Tippmann et al., (2012:747) to propose that 'problem solving is a broader phenomenon than innovation' - as subsidiaries, including assembly sites, or 'screwdriver operations' - may engage in problem solving activities even if they do not have the capacity to be innovative in the traditional sense of developing new products or services. These problem solving activities, including searching for, and combining new and existing knowledge still have the scope to generate valuable innovations (Tippmann et al., (2012). This suggests that a more nuanced approach to exploring innovation in the subsidiary may be required, for example by refining evolutionary models of continuous improvement presented by Bessant and colleagues (1994, 2001) and exploring problem-based approaches to innovation in subsidiary settings. Other alternative approaches to examining subsidiary innovation generation include exploring the implications of inclusion in both broader intra-MNC value chains and external organisational networks, possibly adopting value chain strands as the unit of analysis. Researchers have traditionally adopted the subsidiary itself as the unit of analysis, but this may no longer be appropriate for capturing innovation across collective value chain activities. While this shift entails conceptual, methodological and access complexities, it offers a rich vein of insights into value chain innovations which are currently untapped.

Thirdly, as MNCs increasingly adopt outsourcing and relocation strategies, what is the new role of emerging economy subsidiaries in the generation of innovations? Recent research indicates that, in the case of nanotechnology for example, significant innovations are stemming from emerging economies (see Gokhberg et al., 2012; Mangematin and Walsh, 2012). Similarly, Yu and Hang (2011:410) highlight how some MNCs primed for the challenge of exploiting the technological gains of disruptive innovation are beginning to establish R&D centres in emerging economies 'at the bottom of the pyramid'. This leads us to ask how MNCs can best leverage new knowledge and go beyond a cost saving or transaction based rationality towards benefitting from potential spillover knowledge in these increasingly valuable locations? Further, what will be the role of new MNCs originating in emerging economies? In the electronics space for example, *Samsung* and *LG* from South Korea are breaking new ground, while *Lenovo* and *Huawei*, both of Chinese origin, continue to disrupt and reshape industries through new and innovative product offerings.

Fourthly, from a broader perspective, there are two critical factors which increasingly impact MNC innovation generation and prompt future research; business model innovation and advances in ICT. Business model innovation has traditionally been associated with new, young firms, or ‘born globals’ which are flexible and responsive. For example, Teece (2010: 180) highlights how *Dell’s* global network and sourcing strategies posed significant challenges for incumbent firms to replicate as they were constrained by organisational structures, strategies, policies and procedures – but as ‘a new entrant, Dell had no such constraints’ and could demonstrate far superior flexibility. Recent research, however, indicates that business model innovation need not be confined to new entrants. In a case study on the R&D activities of an aluminium business, Calia et al., (2007) found that the small, family run firm was able to replace incremental innovation and product development approaches with industry shaping disruptive innovation and business model reconfiguration.

Finally, advances in ICT continue at a relentless pace, and it would be naïve to dismiss the innovation opportunities these offer MNCs with the size and resources to exploit their potential. Twenty years ago *Google* was merely a misspelt word used to denote an unfathomable number: but in the wake of ‘big data’, it is not just a verb for finding information, but also a reference point and an exemplar case of how organisations can use information to innovate and grow. If technological innovations provide the necessary conditions for firms to alter existing business models and position for global competitiveness (Calia et al., 2007), research must capture how MNCs - and indeed organisations in general - can generate innovations which leverage the value of ‘big data’. These represent just some of the key questions which must be addressed if we are to understand how MNCs can generate innovations in the era of the global factory.

In conclusion, we highlight a number of valuable opportunities for future studies to explore how, in an increasingly fast changing and complex environment, with new competitors emerging around the globe and unpredictable shocks, MNCs will overcome organisational rigidity and embrace business model innovation, while simultaneously managing to generate innovations from their dispersed subsidiary units. Whichever direction future research takes, one thing is certain - the changing MNC landscape provides a rich opportunity to add to our understanding of the phenomenon of organisational innovation.

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