

Multi-plant improvement programmes: A literature review and research agenda

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Abstract

Purpose: To advance the productivity of all plants in the network, multinational corporations develop and deploy multi-plant improvement programmes. In this paper, we systematically review and synthesise the emerging literature on multi-plant improvement programmes.

Methodology: Through a systematic manual search, we examine fifteen top journals from operations management, general management and international business literature in the time span between 1998 and 2011.

Findings: We found 30 papers that specifically deal with operational improvement programmes in a multi-plant international setting, of which only nine take a headquarter perspective. This low number contrasts sharply with the magnitude and importance of such programmes in industry. We discuss key dimensions that explain how multi-plant improvement programmes result in the *adopting*, *adapting*, *acting* or *avoiding* of programme practices in subsidiaries and propose a related research agenda.

Research implications: We affirm that a new field is in the making, with *IJOPM* as the leading professional journal. Further empirical research is called for, but particular methodological caution must be paid to the phenomenon of acting in subsidiaries.

Originality: No coherent stream of research has addressed multi-plant improvement programmes. This paper represents a focused review that supports the field's development.

Keywords: *improvement program; production system; process improvement; global operations management; knowledge transfer; literature review*

1 Introduction

Many multinational corporations (MNCs) have strategically used the steeply increasing globalisation of the past two decades to grow internationally through acquisitions, mergers and green field establishments in foreign markets. As economic conditions tighten and competition gets tougher, many MNCs find themselves struggling with a dispersed, heterogeneous and low-performing network of plants. Experiencing a legitimate need for continuous process improvement in all plants in the network, corporations seek to improve operational capabilities and, hence, increase the competitiveness of the MNC as a whole. With the knowledge that the ability to learn within international networks offers a potent source of competitive advantage (Shi and Gregory, 1998), the latest trend for process improvement sees MNCs going from plant-specific improvement projects to *multi-plant improvement programmes* (Netland, 2013).

Despite the magnitude and popularity in industry, however, there is yet no established stream of literature for such programmes. A review by Prasad and Babbar (2000) of the international operations literature up to 1998 affirmed a need for more research that investigates (1) international operations in general, (2) practices in international operations and (3) the effects of specific global strategic initiatives. The field of multi-plant improvement programmes, which we review in this paper, spans all three of these issues. Other authors have also found a limited body of research on intra-firm knowledge and practice transfers (Anakwe *et al.*, 2000; Gupta and Govindarajan, 2000; Maritan and Brush, 2003; Ansari *et al.*, 2010), which remain central to the implementation of multi-plant improvement programmes.

This study contributes to research and practice by offering the first full review of the recent literature on multi-plant improvement programmes. We cover the literature over the last fourteen years from fifteen top journals in three research streams: operations management, international business and general management. We aim to

1. review the research in the field according to its methodologies, themes and key conclusions;
2. summarise the body of research into key dimensions that explain how multi-plant improvement programmes play out in subsidiaries; and
3. suggest a research agenda for multi-plant improvement programmes based on the current research frontier.

In the section that follows, we define the scope of this review. In Section 3, we shape the discussion on improvement programmes in intra-firm manufacturing networks by presenting a framework drawn from seminal contributions in the broader field of international practice transfer. The proposed theoretical framework later guides the presentation and analysis of the relevant work that has been published in the selected journals. In Section 4, we outline the research method applied. Section 5 summarises the included papers. In Section 6, we derive a suggested research agenda for further research. We conclude and address implications for practice and limitations of the study in Section 7.

2 Theoretical Background and Definition of Scope

We are investigating the union of multi-plant coordination literature and process improvement literature. In order to define our scope, these two topics are now introduced.

2.1 Multi-plant coordination

Research on international business distinguishes between *configuration* and *coordination* (Porter, 1986). Configuration is about the global set-up of the corporation; with what resources to innovate, source, produce and sell what for which markets where and when. Coordination is about the management of the network; how to most effectively and efficiently share resources and knowledge between the dispersed plants. Seminal research in the field of international business even suggests that the ability to share knowledge in the intra-firm network efficiently is the prime reason for the existence of MNCs in the first place (Kogut and Zander, 1993; Buckley and Casson, 1998).

With more units to manage and more complexity to handle, a tempting strategy for MNCs has been to rely more on standardised best practices when deciding how to operate production (Jensen and Szulanski, 2004). Consequently, they seek to continuously develop and share best practices in the intra-firm network (Kostova, 1999). For this purpose, many manufacturing MNCs are developing firm-wide process improvement programmes (Netland, 2013). This paper deals with this specific type of multi-plant coordination.

2.2 Process improvement programmes

As for the content of the practice programmes, MNCs turn to proven production philosophies including, for example, total quality management (TQM) (Deming, 1986), the Toyota

Production System (TPS) (Ohno, 1988), just-in-time production (JIT) (Monden, 2010), lean thinking (Womack and Jones, 1996), continuous improvement (CI) (Zangwill and Kantor, 1998), time-based manufacturing practices (Koufteros *et al.*, 1998), six sigma (Schroeder *et al.*, 2008), business process reengineering (BPR) (Hammer and Champy, 1995) and world class manufacturing (WCM) (Schonberger, 1986).

In the big picture, programmes that are based on one or a combination of these philosophies retain the same purpose under different names: They focus on making the most out of the *existing* resources and capabilities of a plant (Repenning and Sterman, 2002), and share a common goal of improving the productivity of manufacturing operations through improving the processes. Holweg (2007) establishes the close relationship between TPS, JIT and lean; Andersson *et al.* (2006) find that TQM, lean and six sigma share origin, methodologies, tools and effects; Koufteros *et al.* (1998) argue that time-based practices follow from TPS and JIT; and Schonberger (2007) describes how TQM, TPS, JIT, lean, CI, BPR and WCM are all evolutionary offspring of Japanese production management rooted in process improvement.

As collective terms, programmes like these have been called *meta-routines* (Feldman and Pentland, 2003) and *strategic organisational practices* (Kostova, 1999). They are vehicles for how organisations update what they do. Therefore, at the general level, the core challenge is to update and share *procedural knowledge* or *know-how* in the network of plants—most often standardised in what has been called *best practices* (Voss, 1995).

2.3 Defining multi-plant improvement programmes

Drawn from the literature above, we define a multi-plant improvement programme as *the systematic process of creating, formalising and diffusing better operational practices in the intra-firm production network with the aim of increasing competitiveness*. In other words, this describes an MNC's effort to implement and share a process improvement programme in more than one plant simultaneously.

3 Conceptual Background

The multi-disciplinary nature of the topic becomes apparent when reviewing influential theoretical studies in the broader field of knowledge and practice transfer in MNCs. This literature unveils two explanatory axes for how *wide* and *deep* multi-plant improvement

programmes play out in subsidiaries—one stems primarily from international business and the other primarily from organisation science:

- First, when designing and implementing multi-plant improvement programmes, corporations must manage trade-offs between *global conformity and local contingencies* carefully. This refers to the *width* of practice transfer.
- Second, corporations face challenges they must manage between *superficial and profound implementation* in subsidiaries. This refers to the *depth* of practice transfer.

3.1 Global conformity versus local contingencies

Top management of MNCs establishes incentive schemes that motivate subordinates to work according to group-optimising behaviour (Agrell *et al.*, 2002); however, intra-firm practice diffusion presents challenges and often fails (Kostova, 1999; Prasad *et al.*, 2001; Ferdows, 2006). MNCs are heterogeneous because subsidiaries have developed under different historical conditions and are embedded in different national environments (Ghoshal and Nohira, 1989). Because the pressure for globalisation and the pressure for local responsiveness represent two competing forces (Miltenburg, 2009), we can expect a differentiated implementation of even standardised practices (Jensen and Szulanski, 2004). This variation can be presented on a continuum from *adoption* to *adaptation*, which corresponds to the two ideal types of strategies for transplantation of work practices identified by Mefford and Bruun (1998)—respectively, the minimal-modification model and the culture-adaptive model—and to the replication and adaptation perspectives of Winter *et al.* (2011). The extreme case of adoption is full acceptance of the practice in all its aspects. The extreme case of adaptation is full rejection.

Researchers have often used *contingency theory* to investigate the adaptation processes (Ghoshal and Nohira, 1989; Sousa and Voss, 2001). Ansari *et al.* (2010) define *adaptation* as ‘the process by which an adopter strikes to create a better fit between an external practice and the adopter’s particular needs to increase its zone of acceptance during implementation’ (p. 71), whereas they define *fit* as ‘the degree to which the characteristics of a practice are consistent with the (perceived) needs, objectives, and structure of an adopting organisation’ (p. 68). Successful knowledge transfer requires some degree of adaptation (Prahalad and Doz, 1987; Bartlett and Ghoshal, 1998) and the degree of adaptation depends on the strength and mix of contingencies. A core idea of institutional theory, *isomorphism*, suggests that units that

share the same environment will also share the same practices (Kostova and Roth, 2002). A low degree of adaptation will most likely occur if the practices sought transferred are isomorphic; it thus resembles existing practices in place (DiMaggio and Powell, 1983).

Paradoxically, the required adaptation of practices significantly increases the stickiness of cross-border knowledge transfer and, hence, makes the transfer process more difficult (Jensen and Szulanski, 2004). Two generic practice-sharing mechanisms exist: sharing codified manuals for explicit practices and sharing people for tacit practices. Either way, formalisation of practices is needed to render possible their easier diffusion (Kostova, 1999). This formalisation, or *standardisation*, on a group level contradicts a high degree of local adaptation. Zaheer (1995) finds that companies must adapt with care because the local environment might present difficulties when interpreting information. Thus, she argues, following the original template might prove a more risk-free way to proceed than to embark on full adaptation to the local environment from the outset—a standpoint empirically supported by Winter *et al.* (2011). This debate on the balance between global integration and local adaptation rests at the heart of any multi-plant improvement programme.

3.2 Superficial versus profound implementation

Theory gives both economic and social explanations for the diffusion of improvement programmes. Economic models of practice diffusion tend to argue for the value of the practice as its reason for diffusion, whereas social models in general argue for the reputational reasons for practice adaptation (Ketokivi and Schroeder, 2004; Terlaak and Gong, 2008; Ansari *et al.*, 2010). Tolbert and Zucker (1983) suggest that early-movers follow economic rationales seeking value, whereas late-movers generally follow social arguments seeking legitimacy.

The successful transfer of a strategic practice goes beyond the mere transfer of a written rule to include the underlying values and beliefs of the specific practice (Ferdows, 2006). Such normative integration of common goals and values represents the single most important activity for successful implementation of improvement programmes in multinational enterprises (Ghoshal and Bartlett, 1988). Kostova (1999) argues that companies can measure the success of a practice transfer by its degree of *institutionalisation* at the recipient unit, where ‘To institutionalise is to infuse with value beyond the technical requirements of the task at hand’ (Selznick, 1957, p. 17). Institutionalised practices are profoundly implemented.

However, some critics of improvement programmes point to a superficial, insubstantial and fake adoption of practices that often takes place (Oliver, 1991; Baxter and Hirschhauser, 2004), and others refer to them as ‘fads and fashions’ (Dale *et al.*, 2001; Abrahamson and Eisenman, 2008). Practices regarded as superior by the parent company are not always easily institutionalised in subsidiaries due to *institutional duality* (Kostova and Roth, 2002), which means that subsidiaries have to cope with partly competing institutional pressures from both the mother company and the local culture and environment. Even if the corporation regards a particular practice as technically superior and therefore wants to diffuse it to its subsidiaries worldwide, it does not follow that the practice will prove efficient in all locations. To comply with the institutional pressure of implementation from the mother, subsidiaries might engage in a symbolic or *ceremonial adoption* of the practice that disguises nonconformity (Oliver, 1991). Kostova and Roth (2002, p. 220) describe such ceremonial adoption as ‘the formal adoption of a practice on the part of a recipient unit’s employees for legitimacy reasons, without their believing in its real value for the organisation’.

3.3 Theoretical framework

Multi-plant improvement programmes are by logic designed to seek institutionalised adoption of the same operational practices in all subsidiaries. They seek a certain amount of global standardisation, but they must not standardise to such a degree that they nullify location advantages. To achieve this, the corporation must carefully manage any legitimacy-seeking pitfall that leads to shallow implementation of practices and the trade-off between adoption and adaptation. Figure 1 summarises how subsidiaries can respond to multi-plant improvement programmes. This theoretical framework sums all the work discussed above but has particular similarities with the ‘dimensions of practice variability and adaptation’ of Ansari *et al.* (2010, p. 72) and the ‘strategic responses to institutional processes’ of Oliver (1991, p. 152). Our model differs, however, from Ansari *et al.*’s model with the added perspectives that follow from avoidance and acting in subsidiaries—aspects well described by Oliver as escaping and concealing.

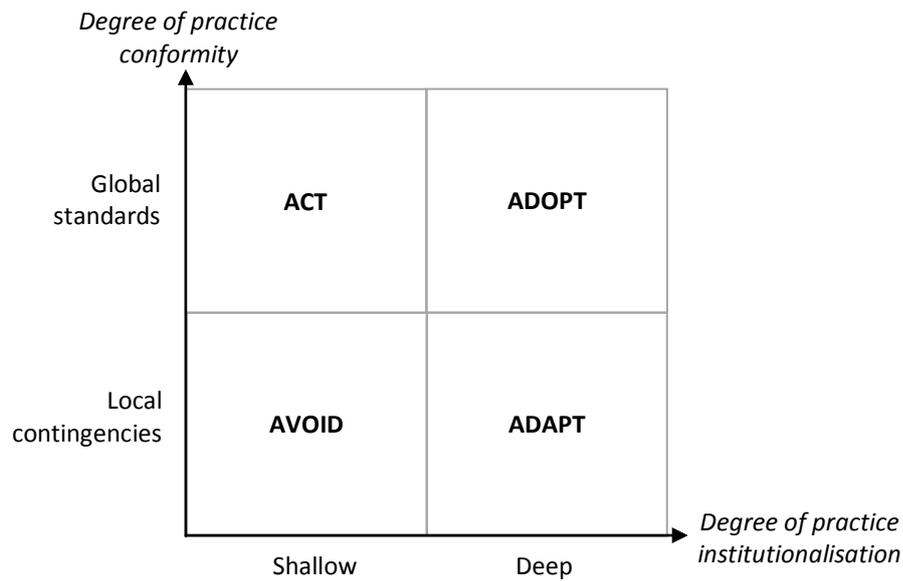


Figure 1. The 4A framework for subsidiary response to a multi-plant improvement programme.

The two axes in Figure 1 leave four quadrants as typologies for ways subsidiaries might respond to multi-plant improvement programmes, subsets of the programme or even specific practices in the programme. Because multinational companies operate under multiple and often conflicting institutional pressures (Oliver, 1991; Fenton-O’Creevy et al., 2008), subsidiaries can arguably fall into any of the four quadrants.

- The upper right quadrant, ‘Adopt’, represents the theoretical ideal of an improvement programme. Adoption means that the subsidiary embraces and implements the transferred improvement practice in full. This is not to say that it is the desired outcome for all practices in all subsidiaries, however.
- The lower right quadrant, ‘Adapt’, means that the practice—while profoundly implemented—has been adjusted to better fit the local contingencies. This also increases the stickiness of the practice and thus complicates the management of multi-plant improvement programmes.
- The upper left quadrant, ‘Act’, describes how subsidiaries engage in pretending behaviour to comply with institutional pressures to implement the improvement programme. From the perspective of multi-plant improvement programmes, such ceremonial adoption must be regarded as undesirable because it does not realise the sought-after operational improvement.
- The lower left quadrant, ‘Avoid’, describes how subsidiaries seek to sidestep the corporate improvement programme or sub-practice altogether and continue with the

practices and routines they already have in place. If the subsidiary has not achieved world-class status, this ‘business-as-usual’ behaviour fails to increase competitiveness, and we consider it undesirable.

We will return to the framework in Section 6, where we discuss the papers reviewed.

4 Research Method

A research synthesis summarises and cumulates the findings of different studies on a topic (Tranfield *et al.*, 2003). To synthesise the state of the art on multi-plant improvement programmes, we undertook a systematic literature review. Starting where Prasad and Babbar (2000) ended their 1986–1997 review on international operations management, this review spans the fourteen years from 1998 to 2011.

4.1 Academic journals included

We cover fifteen top journals from three areas: (1) operations management, (2) international business and (3) general management. Acknowledged journal rankings (Soteriou *et al.*, 1999; DuBois and Reeb, 2000; Mingers and Harzing, 2007; Segalla, 2008) were used to decide which journals to include. Table 1 presents the fifteen journals we examined.

Table 1. The fifteen included journals in the 1998–2010 review (ranked according to sources).

Area (Source)	Abbrev.	Journal title
Operations management (Soteriou <i>et al.</i> , 1999)	JOM	Journal of Operations Management
	IJOPM	International Journal of Operations and Production Management
	POM	Production and Operations Management
	IJPR	International Journal of Production Research
	IJPE	International Journal of Production Economics
International business (DuBois and Reeb, 2000)	JIBS	Journal of International Business Studies
	MIR	Management International Review
	JWB	Journal of World Business
	IMR	International Marketing Review
	IBR	International Business Review
General business (Mingers and Harzing, 2007; Segalla, 2008) ¹	AMJ	Academy of Management Journal
	AMR	Academy of Management Review
	ASQ	Administrative Science Quarterly
	SMJ	Strategic Management Journal
	MS	Management Science

¹ Segalla (2008, p. 127) points to the five top general management journals as AMR, AMJ, ASQ, Organization Science (OS) and SMJ, based on the University of Texas at Dallas Database. We have included Management Science (MS) instead of OS because MS ranks well above OS in Mingers and Harzing’s (2007) ranking.

4.2 Inclusion and exclusion criteria

The unit of analysis is the multi-plant improvement programme in an MNC. To be included, a paper simultaneously had to match (1) the improvement programme criteria and (2) the MNC multi-plant criteria, with the following clarifications:

First, for the purposes of this review, we operationalise an ‘improvement programme’ as a *systematic improvement initiative in the production area that spans more than a single improvement practice and targets several competitive priorities (safety, cost, quality, delivery, flexibility, people and environment)*. The papers must study the multi-plant implementation of practice programmes such as those mentioned in Section 2.2 or the intra-firm transfer of procedural operational knowledge between plants. In line with this definition, the literature review omits papers focusing on single practice programmes (e.g., statistical process control, single minute exchange of die, 5S, etc.). In addition, topics such as multi-plant configuration and planning and control were not included. Similarly, we excluded the many articles dealing with ISO programmes and certification because ISO represents a meta-company standardisation that firms can only influence in a limited manner (the argument to exclude ISO programmes is similar to Power et al., 2010, who argues that ISO is a structural issue). We also excluded papers dealing with practice programmes within human resource management (HRM) because of their broader focus on union issues, leadership, wage agreements, etc., and given their indirect tie to manufacturing operations only. For the same reason, we excluded papers studying environmental impact programmes.

Second, with the criterion ‘MNC multi-plant’, we limit the selection to articles that we understand as *dealing either with a corporation’s global, multinational or international manufacturing operations, or the operations of subsidiaries where the link to foreign mother or sister companies is explicitly stated and part of the research*. The implementation of multi-plant improvement programmes presents greater challenges for MNCs because they also need to overcome multiple barriers related to differences in language, culture, business practices and legislation. Following the definitions, the literature review omits practice programmes in multi-firm supply chains, joint ventures and inter-firm networks. Finally, because we focus on manufacturing MNCs, papers concerning service industries, governmental organisations, not-for-profit organisations and small- and medium-sized enterprises, were all excluded.

4.3 Literature search

Several attempts to perform key word searches on the topic failed because of the extremely broad variety of terms used to describe research on improvement programmes (e.g. best practice, knowledge, know-how, routines and different practice programme names such as those mentioned in Section 2.2) and the same held true for multinational enterprises (international, multinational, global, multi-plant or not explicitly stated). Instead, we found it necessary to undertake a structured and manual search of articles in the fifteen selected journals. This involved reading and considering a total of approximately 20,500 titles as well as the corresponding abstracts, when necessary, for inclusion in the review. Thus, the paper selection method resembles that used by Prasad and colleagues (Prasad and Babbar, 2000; Prasad *et al.*, 2000; Prasad *et al.*, 2001).

To ensure conformity and validity in the search process, we employed a two-step funnel strategy: First, the first author systematically scanned issue by issue in journal by journal with the sole task of keeping all articles that could *potentially* be included. The time-consuming search process resulted in a first sample of 531 potentially related papers. A literature review database was established and continuously updated. Second, we considered this first sample in light of the inclusion criteria explained in Section 4.2. This resulted in 80 articles subject to full reading. We made several iterations of consideration and discussion, which finally resulted in 30 papers that complied with our strict inclusion criteria.

5 Presentation of Findings

The review found 30 papers that explicitly address multi-plant improvement programmes in MNCs. The papers are summarised in Appendix 1, which provides a short description of all the included papers in terms of publication channel and year, type of improvement programmes studied, methodological approach and research focus, and main finding.

5.1 Publication year and channels

Figure 2 shows a fairly stable rate of publication over the years.² The majority of articles (21) appeared in operations management journals. This journal, the *International Journal of Production and Operations Management (IJOPM)* is a dominant vehicle and included one

² We controlled for the effect of special issues and found that only five of the papers appeared in special issues and only two belonged to the same special issue (*IJOPM*, 1999, Vol. 19, Iss. 11).

third of the articles (12). Contributions also stem from general management (6) and international business (3) journals, adding important perspectives to operations management research (and vice versa). Of the fifteen investigated, the final sample includes ten journals, which points to a scattered academic interest that spans several disciplines and academic societies. This comes as no surprise considering the complex and multifaceted environment in which multi-plant improvement programmes play out.

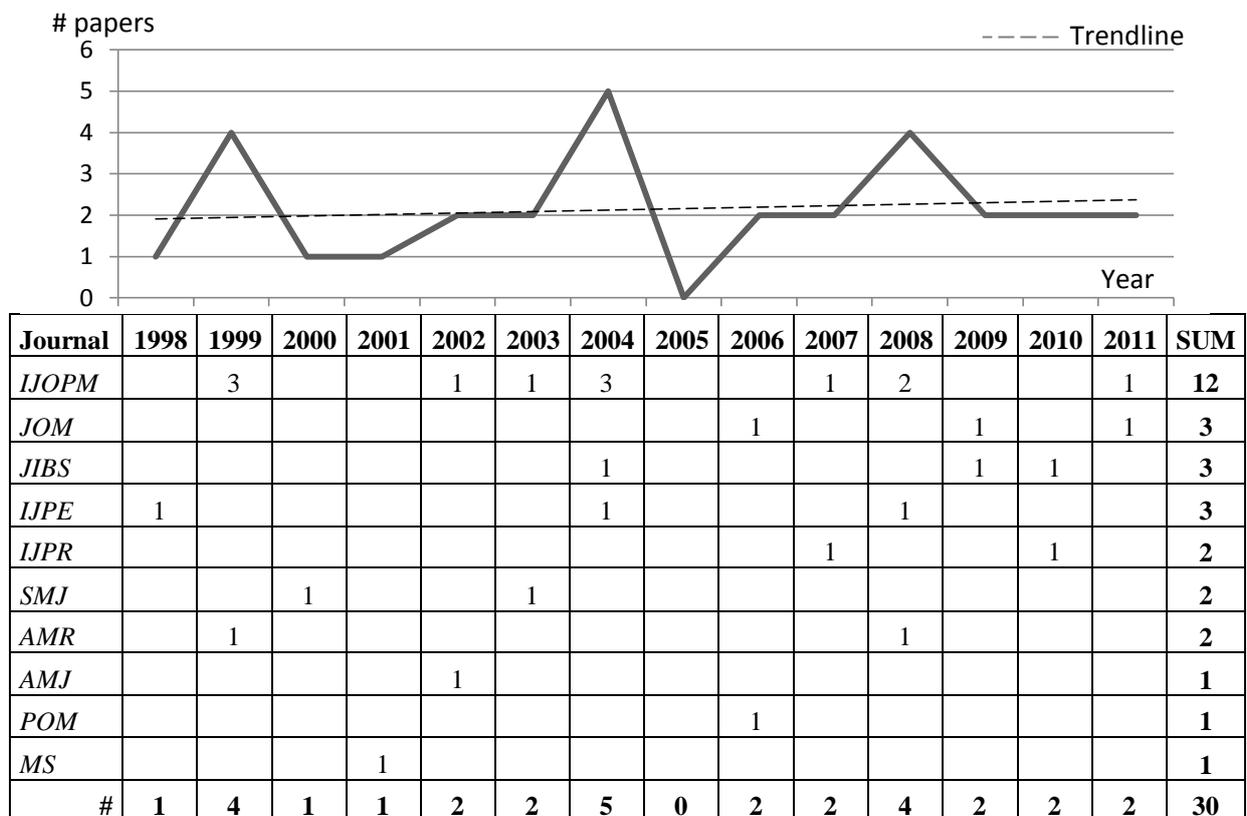


Figure 2. Number of included papers per year and journal.

5.2 Methodological approaches

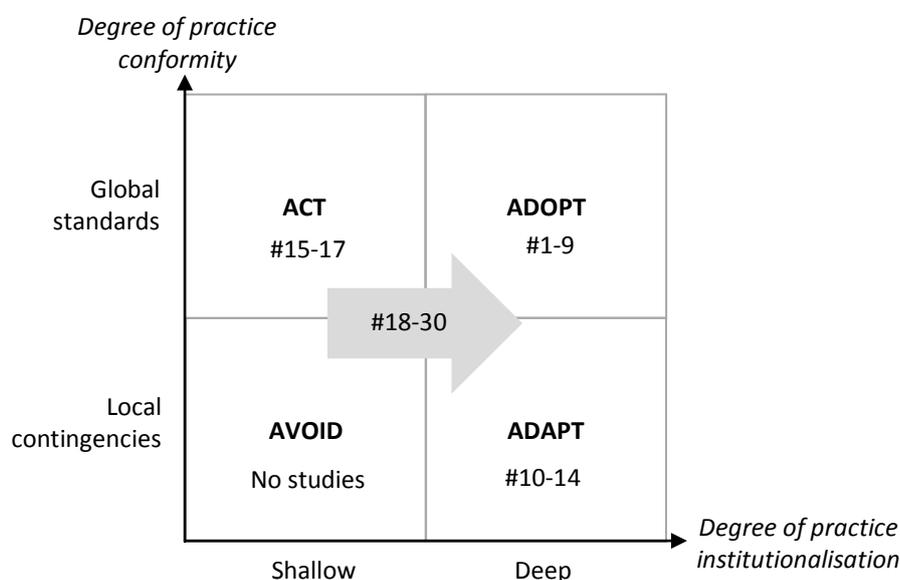
Most of the research takes a qualitative approach, but quantitative and conceptual studies are also represented. Single-case studies dominate the sample. This could be expected as a result of the multi-plant inclusion criteria. Most likely, the complexity of the topic makes it hard to model and test relationships through survey data, so researchers prefer in-depth studies of one or a few entities. Moreover, in general, emerging fields of research are predominantly conceptual and qualitative as researchers in this phase try to establish a common vocabulary, define concepts and explore the phenomenon for causal relationships. Table 2 shows the distribution of methodologies applied in the papers.

Table 2. Research methods among the included 30 papers.

Qualitative			Mixed methods	Quantitative surveys	Conceptual / Theoretical
Single-case	Multiple-cases	Action Research			
11	4	2	4	5	4

5.3 Key empirical findings and propositions

It makes sense to categorise the papers according to their main contribution to the proposed 4A framework in Figure 1. One group of papers is mainly concerned with the multi-plant improvement programme from an MNC-perspective, generally exploring the possibility for adoption across plants. The second and the third groups take an explicitly subsidiary perspective and focus on adaptation and acting respectively. The fourth group of papers focuses mainly on the practice transfer and implementation perspective that takes subsidiaries toward the two right A-quadrants. We found no papers studying avoidance in subsidiaries per se. Figure 3 categorises the papers accordingly.



MNC perspective	Subsidiary perspective	Transfer perspective
¹ Bessant & Francis (1999) ² Colotla <i>et al.</i> (2003) ³ Delbridge & Barton (2002) ⁴ Ferdows & Thurnheer (2011) ⁵ Freknel (2008) ⁶ Goel & Chen (2008) ⁷ Lee & Jo (2007) ⁸ Maritan & Brush (2003) ⁹ Mefford & Bruun (1998)	<i>Adaptation</i> ¹⁰ Aoki (2008) ¹¹ Browning & Heath (2009) ¹² Nair <i>et al.</i> (2011) ¹³ Wallace (2004) ¹⁴ Yu & Zaheer (2010)	¹⁸ Bond (1999) ¹⁹ Bruun & Mefford (2004) ²⁰ Collins & Schmenner (2007) ²¹ Ferdows (2006) ²² Gupta & Govindarajan (2000) ²³ Henriksen & Rolstadås (2010) ²⁴ Jensen & Szulanski (2004) ²⁵ Kerrin (1999) ²⁶ Kostova (1999) ²⁷ Lapr�e & Wassenhove (2001) ²⁸ McAdam & Lafferty (2004) ²⁹ Noorderhaven & Harzing (2009) ³⁰ Witcher <i>et al.</i> (2008)
	<i>Acting</i> ¹⁵ Baxter & Hirschhauser (2004) ¹⁶ Jun <i>et al.</i> (2006) ¹⁷ Kostova & Roth (2002)	

Figure 3. Categorisation of the papers in the 4A framework.

We now discuss the papers in accordance with the suggested classification:

1. Building global capabilities with multi-plant improvement programmes
2. Adaptation of practices to local contingencies
3. The phenomenon of acting in subsidiaries
4. How to succeed with practice transfer and institutionalisation

5.3.1 Building global capabilities with multi-plant improvement programmes

This category of studies deals with strategic use of globally standardised multi-plant improvement programmes with the intention of building global strategic capabilities through profound implementation. Goel and Chen (2008) discuss how General Electric Wind Energy aimed to move away from 'operating functionally as a holding company for multiple and autonomous units' to a globally integrated MNC. Similarly, Lee and Jo (2007) describe how Hyundai Motor Company have adopted and adapted the TPS into their own Hyundai Production System with the purpose of improving Hyundai's global competitiveness. Other studies show how improvement programmes can add to plant level competitiveness. For example, Colotla *et al.* (2003) find that multinational companies can develop specific capabilities on the network level that add to the factory-level capabilities.

Referring to the same motivation, Maritan and Brush (2003) show that this is a challenging task. They study the multi-plant implementation of flow manufacturing in a US MNC and find that subsidiaries may have different strategic priorities at different times and thus different aims with the shared programme. Their key finding is that heterogeneity in history, culture, managerial beliefs, physical attributes, current performance, strategic priorities and the transfer process itself strongly influence the implementation route and results of the improvement programme in the different subsidiaries, and hence provide challenges for a firm-wide lean programme. Likewise, Delbridge and Barton (2002) found little evidence of substantial learning among sister plants. Bessant and Francis (1999) found that a majority of UK manufacturers pursue CI, but most of them still operate on a suboptimal level where the continuous improvement programme has not developed into a strategic competitive advantage given by a learning organisation. The study by Mefford and Bruun (1998) describes the general intention among global improvement programmes and shows several obstacles to make this transition a reality. Freknel (2008) warns that global managers should not make the 'colonisation mistake' of pushing their domestic management practices and thereby not taking advantage of local cultural knowledge in the network.

Escaping this pitfall, Ferdows and Thurnheer (2011) suggest a slightly different approach to multi-plant improvement programmes. Using a longitudinal case study of Hydro Aluminium's worldwide network of extrusion plants, they argue that a cumulative capability building approach is a better choice than a typical lean production programme; where lean programmes focus on 'reducing fat', the proposed *factory fitness programme* focuses on 'building core muscles'. The approach successfully used by the case company was to relentlessly balance subsidiaries' KPI reporting for the strategic capabilities safety, process stability, sharing of know-how and responsiveness with the ones traditionally used for costs—in that specific cumulative order.

These studies show us the main objective of multi-plant improvement programmes: to create competitive strength by turning a dispersed production network into a symphony of world-class competitive plants. The means to achieve this is the shared improvement programme—centrally managed by the headquarters of the MNC and shared by all plants. The papers indicate the importance of multi-plant improvement programmes in industry and that it is a far from trivial topic.

5.3.2 Adaptation of practices to local contingencies

The literature has abundantly investigated the question of adaptation to local contingencies of a global improvement programme. Most authors argue in favour of strong adaptation (Maritan and Brush, 2003; Wallace, 2004; Jun *et al.*, 2006; Aoki, 2008; Nair *et al.*, 2011) and thus support traditional theories in the field of international business (e.g. Prahalad and Doz, 1987; Ghoshal and Bartlett, 1988; Kostova, 1999). Studies across different programme types, such as lean, TQM, CI and six sigma, argue for adaptation using contingency arguments. Jensen and Szulanski (2004) conclude differently; they find that adaptation of practices significantly increases the stickiness of cross-border knowledge transfer and, hence, makes the transfer process more difficult. Yu and Zaheer (2010) find that adaptation may better suit practices that hold strong social dimensions, such as quality management and HRM practices, whereas practices that hold strong technical dimensions better suit conformity and adoption.

Aoki (2008) points to two successful examples of *kaizen* transfer at Chinese plants where the foreign plants outperformed their Japanese sister plants. The study concludes that the success results from adaptation based on team-based implementation, cross training and management presence on the shop floor rather than a copy-exactly approach. Similarly, Wallace's (2004)

case study of how Volvo succeeded with the implementation of a hybrid Volvo-Toyota system in the Curitiba plant in Brazil argues strongly for adaptation of the global system to the local setting. He finds such ‘hybridisation’ of production systems to the local culture to be of pivotal importance for success. Browning and Heath (2009) make the argument that a lean programme has a different impact depending on different market and product characteristics in subsidiaries. These studies confirm that the balance between adaptation and adoption of the practice is essential. Thus, companies must understand and respect heterogeneity in the balance to achieve the maximum competitive advantage in the global network. This view is supported by Nair *et al.* (2011), who propose that adaptations of standardised six sigma methods better allow for openness, curiosity and learning in the process, which again lead to greater psychological safety and success.

These studies highlight one of the most central discussions in the multi-plant improvement programme literature: the role of adaptation. While the fundamental rationale for company-wide improvement programmes is based on cross-plant sharing of uniform best practices, most authors—but not all—would argue that adaptation is required for institutionalised implementation. The literature to date suggests two solutions to this: either, as Yu and Zaheer (2010) advocate, companies should carefully select programme practices that easily render themselves to standardisation or, as Nair *et al.* (2011) encourage, companies should allow wide adaptations from the local business environment. Both solutions will complicate the management of multi-plant improvement programmes. We can only conclude that the extent of adaptation remains disputed in the literature and need further investigation in future research.

5.3.3 The phenomenon of acting in subsidiaries

In this third category, we include studies that discuss the phenomenon of superficial adoption of multi-plant improvement programmes. This category includes three significant contributions. Baxter and Hirschhauser (2004) performed a longitudinal study of an improvement programme in a multi-plant network of an automobile supplier. They found a hollow management exercise of sustaining and communicating on-going improvement programmes that were fully detached from actual operations on the shop floor: ‘The dominant community of practice was not that of performance improvement but creating the impression of doing so’ (p. 207). They label such sites ‘pink factories’ (in reference to the expression of seeing the world through rose-tinted glasses). According to the authors, a pink factory has

four main characteristics: first, it emphasises visual effects in the factory more than actual improvements; second, it makes superficial use of simple standard tools and techniques; third, it reorganises into new teams to show the world that the company ‘operates teamwork’; and fourth, it engages in training that does not really transfer into real improvement on the shop floor. The authors strongly recommend that corporations drop the ‘pink factory community of practice’, but they recognise that apparent implementation—even if superficial—can (1) boost managers’ internal careers and (2) create the perception of a quality product or service to customers.

Kostova and Roth (2002) suggest that multinational enterprises run a particular risk of ceremonial adoption of practices in subsidiaries because of considerable uncertainty about the real value of the practice alongside institutional pressure from the MNC headquarters to implement the practice. Because social and cultural understandings differ across the world, some in the subsidiary might well consider such practices non-value adding, inefficient and faddish, while those in the parent company consider the practices to be of superior worth. Still, the subsidiary will superficially adopt the practice—leading to ceremonial adoption—to achieve legitimacy with the parent. In a similar vein, Jun *et al.* (2006) discuss TQM as a source of legitimacy in the market using institutional theory. Thus, *acting* TQM has value because customers perceive the adopters to be high-quality suppliers and this may influence them to place orders or pay a premium. However, in practice, it has none or even negative effects on operational competitive priorities.

This phenomenon of acting is interesting in itself because we need to understand why it occurs and how to minimise it. Of course, all programme managers have a strong bias towards reporting programme success. Acting therefore presents difficulty from a practical point of view because it is difficult to uncover when plant managers celebrate the programme in public settings. It seems reasonable to explain the occurrence of acting from under-communication of programme benefits, as Kostova and Roth (2002) do, but as Jun *et al.* (2006) argue, any number of other explanations can arise. The studies mentioned above hint to a prevalence of ceremonial adoption in reality but more research is required to measure how widespread the phenomenon is and why it occurs.

5.3.4 How to succeed with practice transfer and institutionalisation

In this fourth and final category, we summarise what the reviewed literature suggests corporations do to avoid ‘business as usual’ in subsidiaries. Hence, we do not discuss the avoidance in subsidiaries per se—which is very rarely studied—but rather what managers should do to succeed with the multi-plant improvement programme. Most authors provide guidelines for how to successfully implement and manage improvement programmes (e.g. Bessant and Francis, 1999; Kostova, 1999; Gupta and Govindarajan, 2000; Lapré and Wassenhove, 2001; Kostova and Roth, 2002; Maritan and Brush, 2003; Jun *et al.*, 2006; Collins and Schmenner, 2007; Aoki, 2008). Common grounds for the roadmaps involve urging the following four key strategies:

1. Fostering a dedicated management.
2. Building a deeply rooted improvement culture.
3. Creating suitable channels for knowledge and practice transfer.
4. Involving empowered teams in the on-going improvement process.

First, management support, leadership and active policy deployment is absolutely critical for any success of the improvement programme (Bessant and Francis, 1999; Bond, 1999; Kostova and Roth, 2002; Maritan and Brush, 2003; Collins and Schmenner, 2007; Aoki, 2008; Witcher *et al.*, 2008). Describing the six sigma programmes of LG, Samsung, POSCO, 3M, GE and Honeywell, Yu and Zaheer (2010) argue that the cases confirm that change requires commitment and endurance over time. Kerrin (1999) found CI to be a top-down management-led process in the case company, as opposed to the involvement strategy that the literature strongly depicts.

Second, all studies emphasise the importance of culture- and mindset-building mechanisms rather than heavy reliance on technical tools and techniques. However, industry does not necessarily understand this (McAdam and Lafferty, 2004). The key conclusion of Collins and Schmenner (2007) is that ‘system’ initiatives, such as improvement programmes, automation and technology, have far less impact on performance than soft issues, such as mentality and morale. Most authors would argue, however, that improvement programmes are exactly about building a deeply rooted CI culture where everybody takes part (Witcher *et al.*, 2008).

Third, successful knowledge and practice transfer remains essential to multi-plant improvement programmes. In her seminal paper on practice transfer, Kostova (1999) proposes

an analytical model for the successful transfer and institutionalisation of strategic organisational practices, emphasising that the transfer is embedded in contextual elements at the individual, organisational and cultural levels. Ferdows (2006) discusses how different types of know-how require different modes of transfer. He suggests that CI initiatives are best transferred 'fast and codified', meaning that proven process improvements should quickly be put into updated standards and shared with sister plants. Codification of written rules into manuals does not exclude the need for people to travel and share related tacit knowledge. In support of this, Kostova and Roth (2002) advise managers of multinational enterprises to create an appropriate relational context for the transfer of practices. Moreover, Noorderhaven and Harzing (2009) find that social interaction represents more than just a transfer mechanism; it also produces knowledge. Other authors express the importance of ICT and the Internet as modern channels for efficient knowledge storage and transfer of lean practices (Delbridge and Barton, 2002; Bruun and Mefford, 2004; Henriksen and Rolstadås, 2010). The case study of Henriksen and Rolstadås (2010) warns, however, that ICT is necessary but not sufficient, because it overemphasises codified knowledge.

Fourth, establishing and empowering shop floor teams is essential for successful internalisation of a practice according to the following studies: the case study of Seagate Technology of McAdam and Lafferty's (2004), the study of *kaizen* transfer to Chinese plants of Aoki (2008), the Baekert case described by Lapré and van Wassenhove (2001), and the study of TQM transfer to Mexican maquiladoras of Jun *et al.* (2006). McAdam and Lafferty (2004) suggest that the early involvement of the human resources department in communication, empowerment and involvement—not just training—is a success factor for six sigma implementation.

This final category assesses a broad range of factors that facilitates the implementation of multi-plant improvement programmes. The studies present managerial implications very well through different proposed roadmaps. A gap in this literature appears to involve its limited focus on the international multi-plant perspective: typical factors from international management, such as communication barriers and differences in culture, local management practices, politics and law, are rarely addressed. These are factors are often brought forward as major hurdles in the popular literature.

6 Discussion and Research Agenda

This study has reviewed the recent literature on multi-plant improvement programmes. It seems clear from the covered literature that a new field is in the making and will establish itself with a continuous flow of high-quality studies, in high-level journals, using a variety of methodological approaches and theoretical perspectives. Future research should address the several gaps and shortcomings in the literature.

We identified only 30 studies over a fourteen-year period, and just nine of these took the MNC headquarters perspective. This is in stark contrast to the abundant attention and investment that goes into such programmes in industry (Netland, 2013). From this perspective, the current scholarly literature largely fails to fulfil its role to synthesise and guide practitioners who implement and manage such programmes. This, in general, calls for much more research on multi-plant improvement programmes, which echoes the general call for more research on international aspects of operations strategy (Barnes, 2008; Ferdows, 2008).

Here we propose an agenda for future research on multi-plant improvement programmes by summarising (1) what the current research has insufficiently addressed and (2) what it inconclusively answers. We derive the first and the fourth topics from apparent gaps in the current literature. The second and the third topics are directly linked to the two axes of the proposed 4A model. We call for more research addressing the following four topics:

- First, we find a lack of studies exploring and explaining when and where a multi-plant improvement programme is useful at all.
- Second, the literature is inconclusive about where an MNC should seek adaptation and where it should enforce adoption.
- Third, there is clearly inadequate knowledge about the phenomenon of acting.
- Fourth, there is a lack of research on how to manage multi-plant programmes from a headquarters perspective.

6.1 *When should firms use multi-plant improvement programmes?*

The first question we recommend for further exploration deals with the overarching objective of building global capabilities with multi-plant improvement programmes: Under what circumstances should managers invest in multi-plant improvement programmes and when

should they allow complete local plant autonomy? Our literature review reveals that very little research effort has gone into investigating this fundamental question. In general, we do not know much about managing *multi-plant* improvement programmes specifically.

The literature largely remains inconclusive in the debate between the universalistic and contingent approaches (Rungtusanatham *et al.*, 2005; Jayaram *et al.*, 2010). What appears to be a powerful managerial tool to build competitiveness through global production capabilities stands at risk of becoming a managerial fad due to widespread implementation that includes instances where no such programme is needed—or where the associated costs exceed the expected benefits. This discussion ties directly to the broader theme of multi-plant coordination (Porter, 1986; Buckley and Casson, 1998), in which the existing literature has affirmed that using global resources to support or manage local operations can improve the competitiveness of the MNC as a whole. However, to what extent it is rational remains an open question. As multinationals continue to consolidate and coordinate their increasingly global operations, we expect to see far more research within this stream in the future.

A specific question for research will be what the actual performance gains of improvement programmes are. Even though some studies establish positive links between improvement programmes and performance, their calculations rarely include the cost of establishing and managing such a programme. Recently, we have seen a few attempts to address this question (Anand *et al.*, 2009; Ferdows and Thurnheer, 2011; Swink and Jacobs, 2012; Netland and Aspelund, 2013), but we still find a scarcity of empirical studies to determine when integration through multi-plant improvement programmes outcompetes local autonomy. The design and implementation of multi-plant improvement programmes are indeed expensive because they require human, organisational and financial investments over a long period before and while they provide significant benefits. Hence, cost considerations remain important. While often demanding from a methodological point of view, researchers should not shun performance research that use real company data.

6.2 How should firms balance adoption and adaptation?

Our second question regards when and where one should encourage adaptation and where one should enforce full adoption of the multi-plant improvement programme. The balance between adaptation and adoption is not clear-cut. While most researchers stress the

advantages of adaptation, some argue that adaptation increases stickiness and complicates the global management of a multi-plant improvement programme. Pursuing research similar to the in-depth case study of multi-plant improvement programme implementation by Maritan *et al.* (2004), could provide better answers to this unsolved contradiction.

A related issue that also needs further investigation is whether different types of process improvement programmes, such as lean, six sigma and TQM, have different requirements for adaptation, as suggested by Yu and Zaheer (2010). Answers to this question will be a good contribution to the on-going discussion on best practices (Voss, 1995; Schonberger, 2007) in operations management research. In this respect, the concept from Winter and Szulanski (2000) of an ‘arrow core’—a subset of practices within a practice that constitute the heart and soul of the practice—may offer a promising perspective. As long as the arrow core is transferred, they argue, a partial transfer of practices will give the anticipated and desirable results.

6.3 How can firms avoid superficial implementation?

The third question we raise deals with acting. Most researchers neglect this phenomenon. The few existing studies establish that such behaviour occurs and give theoretical reasons for why it occurs (Kostova and Roth, 2002; Ketokivi and Schroeder, 2004). Ceremonial adoption undermines the overall objectives and function of the multi-plant improvement programme, and research should be able to predict when and where it will occur so that appropriate action can be taken before costs are incurred. Total avoidance, as described by the fourth quadrant in our theoretical framework in Figure 1, is not a desired state either. In contrast to acting, however, it does not cause the subsidiary unproductive costs and it is far easier to observe and, hence, manage. From an operational point of view, acting should be avoided, but it is largely unclear how this can be achieved because acting also brings along positive market effects for individual managers and plants. This is a major weakness of the research field, and the answers to this question might provide us with better answers about how to achieve institutionalised adoption.

The best strategy to avoid superficial implementation is arguably to take managerial actions that lead to a profound implementation of the multi-plant improvement programme. Our review shows an abundance of roadmaps and advices, but most of these are at such a high-

level description that practitioners find them useless. For example, one critical success factor commonly referred to as ‘management commitment’ often carries no further explanation of what that commitment actually involve. Hence, we see a need to better assist global managers in their efforts to bring about change through multi-plant improvement programmes. It is not a given that the critical success factors that apply to process improvement in single factories apply to networks of factories. The reviewed literature is inconclusive on the best way to achieve change; while some authors argue for a top-down, management-led approach, others argue for a more subtle communities-of-practice approach with focus on socialisation mechanisms.

In addition, the manufacturing industry has arguably become far more international than at the time of writing of Prasad and Babbar’s review in the year 2000. The importance of understanding global and cultural factors has only increased and continues to do so—especially as we witness the rise of the BRIC countries as major players in the international business arena. We would therefore like to see more research studying the link between multi-plant improvement programmes and international aspects such as politics, economics and culture.

6.4 How should firms manage the programme per se?

Our final question—and one becoming increasingly important for modern managers of MNCs—involves the capacity for change in an increasingly competitive environment. We can view a multi-plant improvement programme as a strategic tool for building capabilities to exploit the firm’s resources. If the programme remains static, however, it can become a liability in itself, leading to organisational inertia at times when the firm needs to respond to rapid changes in the environment. A number of questions arise: How does one design multi-plant improvement programmes so that they do not turn into competitive liabilities in the long term? How does one improve the improvement programme itself? Who is responsible for this and what is the best way to do it? These are fundamental questions that global managers face; unfortunately, they find little guidance in the scholarly literature to date. These questions are far from trivial and deserve attention in future research.

6.5 What research methods work best?

It remains to discuss what methodologies to employ in future research on multi-plant improvement programmes. In general, we find that the maturity level of this research has evolved beyond its infancy. Definitions and concepts now describe the phenomenon, and as the field moves to a more mature phase, we believe it will profit from further empirical tests of earlier proposed theories, roadmaps and models regarding design and implementation of the programmes. An impressive amount of research has gone into the development of these roadmaps, and they deserve thorough empirical testing to determine their applicability from both theoretical and managerial perspectives. Given the popularity of the phenomenon in industry, researchers should have access to an abundant supply of empirical cases to investigate.

We would hence like to see the ratio of qualitative versus quantitative research become more balanced—especially in the operations management literature, which is predominantly populated by qualitative research. We call for more quantitative cross-industry studies and more longitudinal case studies focusing on performance indicators. Researchers should be extremely careful when undertaking quantitative survey research using perceptual data so as not to reinforce an overly positive picture of improvement programmes. A major weakness with perception-based surveys is that they fall victim to acting: it is very difficult to measure institutionalisation of practices correctly. Therefore, as far as possible, quantitative research should rely on factual data, such as rigid audits, operational performance indicators and financial results. When these numbers are hard to obtain—which unfortunately they often are—qualitative research based on longitudinal case studies offers a good alternative. Due to limited generalisability, however, we would need a high number of such contributions to answer—with certainty—the questions outlined above.

7 Conclusions

The past decade has seen an on-going trend among multinational manufacturing companies to implement multi-plant improvement programmes. Despite the evident popularity of such programmes among practitioners, the corresponding literature remains scarce and no coherent stream of literature has emerged to this date on this widespread phenomenon. Instead, research from several areas offers theoretical explanations and normative roadmaps for aspects of such efforts. This paper has brought together this research on multi-plant

improvement programmes from fifteen leading management journals to describe the current research frontier and suggest a research agenda for the future. We found a scattered interest across journals, where *IJOPM* still stands out as a primary professional journal for research on multi-plant improvement programmes.

7.1 Contribution to research

By synthesising the current conceptual and empirical literature, this review provides an original and better understanding of the phenomenon of multi-plant improvement programmes and its potential outcome in different subsidiaries. Appendix 1 offers a full overview and summary of the reviewed papers. We suggest four research topics that deserve further attention—two derived from inconclusive research to date and two derived from apparent gaps in the research.

We argue that multi-plant improvement programmes aim to build dynamic isomorphism into a global network, where best practices are continuously updated, shared and *adopted* in all plants. Importantly, heterogeneity of local contingencies in the network enforces a degree of local *adaptation* of the practices that improve institutionalisation and, hence, value creation but hampers sharing of the practice to sister plants. The unwanted effect of *acting* characterises a superficial and rhetoric-based implementation without institutionalisation of the practice. This effect continues to prevail in industry despite the many normative roadmaps offered by research. A further alternative, and one that is much easier to relate to, is the total *avoidance* of the programme in a subsidiary, leading to business as usual and no substantial change. These four possible outcomes are summarised in the proposed 4A framework for subsidiary response to a multi-plant improvement programme.

7.2 Contribution to practice

This literature review offers a quick introduction and overview of the current research frontier in the specific field of multi-plant improvement programmes. As in the case of all literature reviews, this is helpful for time-conscious managers who do not have the time to track down all the available literature themselves. In particular, practitioners might find the proposed 4A framework in Section 3.3 useful when considering programme implementation in their own global production networks. In addition, the summary of the four critical success factors for

programme implementation in Section 5.3.4 should be of interest. It is our hope that the scholarly literature will provide even better managerial advice as the field matures.

7.3 Limitations

The much focused literature review of this paper has evident strengths and weaknesses. First, the inevitable manual search runs the risk of excluding papers that could be included; in any such case, the researchers have not intended this. Second, the authors acknowledge that the low number of articles (30) focusing on multi-plant improvement programmes is not ideal when general conclusions are being drawn. The low number corresponds well, however, to the numbers of Prasad and colleagues (Prasad *et al.*, 2000; Prasad *et al.*, 2001), who found 91 articles within the larger scope of international operations strategy between 1986 and 1997.

The main reason for the relatively low number of studies we found stems from our requirement for the papers to deal specifically with *multi-plant* improvement programmes in international settings. The literature on single-plant improvement projects is far richer and more mature. Multi-plant programmes are much more exposed to the challenges of balancing global standardisation versus local adaptation and ceremonial adoption versus profound implementation, however, which in our view justifies their study as a separate field. Undoubtedly, much single-plant research also applies to multi-plant improvement programmes, but not all. Moreover, the literature on coordination in supply chain management and international business literature can contribute to our understanding of multi-plant improvement programmes. Future research should confront the task of exploring these interfaces.

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Appendix 1: Papers included in the review (sorted alphabetically)

Reference	Improvement programme	Method and research focus	Key empirical finding and/or proposition
Aoki (2008) IJOPM	Continuous Improvement	Uses a multiple-case study to examine the transfer of kaizen from Japanese companies to nine overseas Chinese plants.	Successful kaizen transfer to Chinese plants does not occur based on a copy-exactly approach but on a balanced implementation of three types of kaizen capabilities: (1) team-based suggestion schemes, (2) supportive human resource practices, and (3) daily management shop-floor visits.
Baxter & Hirschhauser (2004) IJOPM	TQM	Uses a longitudinal case to explore the degree of superficiality in implementing improving programmes	Improvement programme implementations might be symbolic actions characterised by reification and representation. Main characteristics of such “pink factories” are: (1) emphasis on visual effects in the factory more than actual improvements, (2) superficial use of standard tools and techniques, (3) reorganisation into new teams and (4) untapped training.
Bessant & Francis (1999) IJOPM	Continuous Improvement	Uses a single-case study to explore the experiences with CI policy deployment through a Western MNC case compared to three anecdotal Japanese cases.	Most UK manufacturers pursue CI, but most often on a suboptimal stage where CI is not a strategic competitive advantage. The key enablers for the highest level of CI (double-loop learning stage) include (1) structured policy deployment, (2) measurement, (3) idea management and (4) reward and recognition systems.
Bond (1999) IJOPM	Continuous Improvement, BPR	Uses a single-case study to examine the role of performance measurement in fostering both a kaizen programme and a process reengineering project.	Undergoing improvement means going through four distinctive phases of the process life cycle where each stage requires a different approach to performance measurement and management.
Browning & Heath (2009) JOM	Lean	Uses a case study of two Lockheed Martin factories in the F22-jet airplane programme to explore the effects of lean on production cost in a high-tech production environment characterised by a high-degree of novelty and complexity.	Eleven research propositions for further research suggest that implementation of lean production costs more in high-tech environments characterised by complexity and novelty, and that contingencies in such firms lead to radical differences in subsidiaries’ lean journeys.
Bruun & Mefford (2004) IJPE	Lean	Uses case studies to explore whether internet facilitates the implementation of lean or if it serves as a substitute for lean.	There are synergies between lean and ICT, and the Internet can be a facilitator to lean implementation (“e-lean”). This potential is especially large beyond the company’s border when building the lean supply chain.
Collins & Schmenner (2007) IJOPM	Practices (e.g. Lean, WCM, Theory of Constraints)	Uses mixed methods (survey and interviews) to examine the reasons for differences in relative performance between sister plants occurring over time.	“System” initiatives such as improvement programmes, benchmarking, automation and technology have far less impact on performance than soft issues such as mentality, culture and morale. Management support is absolutely critical for any success of improvement.

Reference	Improvement programme	Method and research focus	Key empirical finding and/or proposition
Colotla, Shi & Gregory (2003) IJOPM	Lean, TPS, JIT	Uses a case study in two MNCs to study how capabilities dispersed in multi-plant manufacturing networks interplay, are managed and impact performance.	Interdependence between factory capabilities and multi-plant networks capabilities mutually affects the overall performance of both the plant and the network. Propose the Factory-Network Capability Matrix.
Delbridge & Barton (2002) IJOPM	Continuous Improvement	Uses mixed methods (survey and 18 case studies) to study the management of CI towards the learning factory among first-tier automotive suppliers in the US and UK.	A trend toward the learning factory: Managers seek to empower cross-functional shop-floor teams in problem-solving and CI and facilitate intra-firm knowledge sharing. However, mostly non-substantial data on products, quality and cost are shared today.
Ferdows (2006) POM	Procedural knowledge	Conceptually proposes a framework for the sharing of changing production know-how in production networks, and illustrates with the four case examples McDonalds, Club Med, Intel and AOL.	Four classification zones for sharing production know-how are suggested based on the speed and tacitness of the practice. For each zone a primary sharing mechanism and an absorptive capacity template is suggested. The “fast and codified” zone is best suited for continuous improvement.
Ferdows & Thurnheer (2011) IJOPM	Factory fitness programme	Uses a single-case study of Hydro Aluminium to investigate the effects of a factory fitness programme as something different than a lean production programme.	A factory fitness programme—aiming at building cumulative capabilities in line with the sandcone model—showed above industry-average rates of return in the case company. A muscle-building factory fitness regimen is conceptually different from a fat-reducing lean production programme.
Freknel (2008) AMR	Best practice	Conceptually builds on Homi Bhabha’s theories of post-colonization to propose a new analytical perspective to study power-relations between the HQ colonizer and the colonized subsidiary in an MNC.	The current international management literature is blind for geo-political forces that characterise and influence the practice transfer process in multinationals. To make use of all global resources, managers should not be limited by their own national, ethnic or racial systems of beliefs.
Goel & Chen (2008) IJPE	BPR	Uses action research at GE Wind Energy to study the risk of maintaining information security associated with implementing a global six sigma programme.	Security issues should be sought integrated in the business redesign process rather than as a patchwork of security fixes after problems occur. Proposes a three-step model for successful BPR implementation.
Gupta & Govindarajan (2000) SMJ	Procedural knowledge	Uses a survey to study the transfer of procedural knowledge in an MNC network and the factors influencing successful transfer.	Five major hindrances to knowledge transfer are: (1) value of source unit’s knowledge stock, (2) motivation of the source unit, (3) existence and richness of transmission channels, (4) motivational disposition of the target unit, and (5) absorptive capacity of the target unit.
Henriksen & Rolstadås (2010) IJPR	Lean, Mass production	Uses a single-case study to explore the different knowledge transfer mechanisms between lean and mass production.	Different manufacturing strategies have different implicit knowledge transfer mechanisms. ICT is necessary but overemphasises explicit knowledge. Efficient transfer requires social mechanisms such as communities of practice, rotation of personnel and knowledge brokers.

Reference	Improvement programme	Method and research focus	Key empirical finding and/or proposition
Jensen & Szulanski (2004) JIBS	Best practice	Uses a survey to explore the stickiness of organisational best practices as they are adapted and sought transferred to other units.	Adaptation of practices significantly increases the stickiness of cross-border knowledge transfer and, hence, makes the transfer process more difficult.
Jun, Cai & Shin (2006) JOM	TQM	Uses a survey to investigate the transfer of TQM practice programmes to two Mexican maquiladora production plants.	Employee empowerment, teamwork and employee compensation positively influence employee satisfaction, and higher satisfaction leads to higher loyalty. In addition, sufficient employee training is needed.
Kerrin (1999) IJOPM	Continuous Improvement	Uses a single-case study to examine the application of Bessant and Caffyn's framework for implementation of CI in one UK company with a Japanese parent.	Bessant and Caffyn's five-stage implementation framework has explanatory power for CI implementation in the case company. CI was found to be a top-down management-led process in the case company.
Kostova (1999) AMR	Strategic organisational practices	Conceptually theorises around the transnational transfer of strategic organisational practices and proposes a model for the successful transfer and institutionalisation of such practices.	The success of a practice transfer can be measured by its degree of institutionalisation at the recipient unit, and is dependent on the country-level social context, the company-level organisational context and the individual-level relational context.
Kostova & Roth (2002) AMJ	Quality management	Uses a survey to examine the forces at play in the transfer and adoption of organisational practices in a subsidiary of an MNC using institutional theory.	Diffusion of practices regarded superior by the parent company is not easily institutionalised in subsidiaries due to partly competing institutional pressures from both the MNC and the host country environments. The result is often "ceremonial adoption".
Lapr�e & Wassenhove (2001) MS	Productivity improvement practice	Uses mixed methods (mathematical modelling and case study) to explore the transfer of a formal learning and experiment concept to three other plants in the same firm.	Lasting improvements and learning require both know-why and know-how. Management buy-in and cross-functional teams possessing knowledge diversity are two success factors for intra-firm transfer of learning by doing.
Lee & Jo (2007) IJPR	TPS, Hyundai Production System	Uses a single-case study of Hyundai in Korea to examine the mutation of the Toyota Production System into the Hyundai Production System.	The Hyundai Production System is a mutation of the TPS stemming from adaptation of TPS to Hyundai's unique setting. Such company-specific systems can differ sustainably from TPS and give positive results.
Maritan & Brush (2003) SMJ	Lean	Use a case study to examine differences in intra-firm sharing and implementation of flow manufacturing or lean in four US locations.	The implementation process of lean in multiple locations follows a process life-cycle model, where heterogeneity in context lead to important differences in a plant's starting point, strongly influencing the result.
McAdam & Lafferty (2004) IJOPM	Six sigma, TQM	Uses mixed methods (survey and interviews) to study the implementation of six sigma in a large organisation and to explore the role of organisation and people.	For six sigma to become embedded in the factory, people and organisational involvement and development play a critical role. This contrasts with the practice where six sigma usually takes a mechanistic top-down, technology-based approach.

Reference	Improvement programme	Method and research focus	Key empirical finding and/or proposition
Mefford & Bruun (1998) IJPE	Continuous Improvement	Conceptually discusses how multinational companies can turn their subsidiary plants in developing countries into world-class plants.	Proposes a conceptual roadmap for the selection of both hard and soft production technologies for facilities in developing countries based on a socio-technical systems perspective.
Nair, Malhotra & Ahire (2011) JOM	Six sigma	Uses an action research approach to explore and build a theory on how to manage local context in six sigma projects.	Twelve research propositions together suggest that a balance must be struck between structured known methods and local adaptations to complexity and uncertainty in six sigma projects.
Noorderhaven & Harzing (2009) JIBS	Procedural knowledge	Uses a survey to investigate the role social interaction plays in MNCs to support the transfer of procedural knowledge between units in the network.	(1) Social interaction positively influences knowledge transfer in MNCs and in fact also produces new knowledge and (2) subsidiary autonomy negatively affects knowledge transfer.
Wallace (2004) IJOPM	Lean	Uses a case study to investigate innovation tied to the implementation of lean manufacturing and Swedish work principles in a Brazilian Volvo plant.	Hybridisation of production systems to the local culture is pivotal for success. Success stems from an iterative process of implementation and learning that leads to hybridisation of the local and external systems.
Witcher, Chau & Harding (2008) IJOPM	Policy management	Uses a single-case study to examine the role and effects of the organisational practices of top-executive audits and policy management (Hoshin Kanri) at Nissan South Africa.	Management skills such as active listening, questioning, probing, coaching and visible involvement prove absolutely crucial for the success of a policy management programme and, hence, for the organisation's ability to continuously improve overall.
Yu & Zaheer (2010) JIBS	Six sigma	Uses case studies and a grounded theory approach to look at the adaptation process of Western six sigma practices into local settings in Koran and US firm.	A sequential and cascading adaptation model of the conceptual, social and technical dimensions of six sigma is suggested. Adaptation may be more suitable for practices with strong social dimensions such as quality management and HR practices than for technical practices.