

# The Taxonomy of International Manufacturing Strategies

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**Abstract** There are varieties of strategies for manufacturing, and this diversification is increasing to match the ever-increasing demand complexities in international markets. Many manufacturing companies employ multiple manufacturing strategies simultaneously. Although developing new manufacturing strategies to deal with new circumstances in the global market is unavoidable, the volume and variety of manufacturing strategies have become confusing and unmanageable for operations managers. This study aims to manage current strategies, suggest some novel strategies, and guide in developing newly required strategies in the future by proposing the *taxonomy of international manufacturing strategies*. A systematic literature review was conducted to identify and analyze any publications regarding manufacturing strategies at the top five academic journals. Among 349 identified publications, ninety-one papers or books had been found to have new discussions relevant to the topic of this paper. As a result of the analysis, two major themes for categorizing manufacturing strategies emerged that shaped a new taxonomy for international manufacturing strategies with 12 sets of strategies.

**Keywords** Manufacturing strategy • Taxonomy of international manufacturing strategies • Strategy selection process • Onshore strategies • Reshore strategies • Cross-shore strategies • Near-shore strategies • Offshore strategies • In-house strategies • In & Out strategies • Outsourcing strategies

## 1 Introduction

Attention to manufacturing strategies started from the late 1960s by a few pioneer scholars such as Skinner (1969), and the volume of publications in this area reached its peak in the 1990s. While hundreds of papers or books have been published about manufacturing strategies since the 1960s, a handful of these publications proposed

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new strategies for manufacturing or production. As correctly stated by Ho (1996, p. 74), “The phenomenon of manufacturing strategy is only beginning to be understood and its development is still in its infancy”. Among the different manufacturing strategies, the international manufacturing strategy is one of the least discussed topics in this field, probably because of its complexity. It is evident that the term ‘manufacturing strategy’ has been defined and used loosely and incorrectly by many researchers to refer to a basic schedule, a short-term plan, a mathematical formula, a manufacturing technique, a computer simulation, or a measurement tool.

Reasons for misunderstanding or misuse of the term ‘manufacturing strategy’ can be understood by exploring two interrelated issues, including the nature of manufacturing and the educational backgrounds of manufacturing researchers. In terms of nature, manufacturing is a multidimensional phenomenon with links to management science, production management, engineering, finance, strategic management, supply chain management, marketing, and partly, environment science and social science. Thus, the same issue can be perceived from different and sometimes contrasting perspectives. Regarding the backgrounds of the researchers in this field, three major specialties can be found. There are many engineers with little or no understanding of management in general and strategic management in particular. The second dominant group of researchers are those management specialists that are barely familiar with the design and engineering sides of the manufacturing. The third batch of scholars are those from relatively unrelated fields, such as social science, or environments that are unfamiliar with management and engineering facets of manufacturing. The first and the third groups of manufacturing researchers, engineers and non-manufacturing specialists, respectively, are more likely to be faced with difficulties in the appropriate use of the notion of manufacturing strategies.

Manufacturing strategy is defined by pioneer scholars in this field with some variations. Skinner (1969) states that manufacturing strategy is a function that creates competitive advantage in terms of production. Hill (1989) believes manufacturing strategy is an organized approach to production in order to achieve higher performance. In a recent publication and with a different opinion, Shavarini et al. (2013, p. 1109) perceive that manufacturing strategy is “a competitive weapon and is of the utmost value.” In this paper, manufacturing strategy is defined as “a long-term plan, action, and direction for manufacturing to enhance the production performance and the overall position of the company in the market”. Based on this definition, international manufacturing strategy is considered to be “a long-term transnational plan, action, and direction for manufacturing to enhance the production performance and the overall position of the company in its prospect or current foreign markets”. The terms ‘manufacturing’ and ‘production’ are used interchangeably in this paper. Also, the words ‘taxonomy’ and ‘typology’ are employed interchangeably with almost similar meaning.

In the remainder of the chapter, first the current literature is reviewed to identify possible gaps and shortcomings that are followed by a brief description of the research methodology employed in this study. Then, outputs of the systematic literature review are discussed, leading to the new taxonomy, which is presented in

this section. The next section discusses the limitations, as well as theoretical and empirical implications of the proposed taxonomy. Finally, a conclusion completes the chapter.

## 2 Literature Review

### 2.1 *Evolution of the Research Regarding Manufacturing Strategies*

The *manufacturing strategy* was born in 1969. Skinner (1969) is considered to be the father of this new born subject. In the 1970s, manufacturing strategy was ignored by scholars in operations management. It can be claimed that this strategy was abandoned even by its own father, Skinner, because his only publication in this period was “the focused factory” in 1974 with little or no connection to the manufacturing strategy (Skinner 1974).

The first publications concerning production or manufacturing strategies were started slowly and gradually from the 1980s. Due to the fact that the concept of manufacturing strategy was brand new and mainly unclear, the pioneering scholars took an exploratory approach to research this phenomenon. Researchers in this decade tried to establish basics and fundamentals of this new field of study. The scope and nature of manufacturing strategy were still a barely familiar territory. Thereby, the opportunities to explore this strategy were widely available.

Three attempts were made to develop a taxonomy for manufacturing strategies (Stobaugh and Telesio 1983; Wheelwright and Hayes 1985; Kotha and Orne 1989). The very first taxonomy of manufacturing strategies was proposed by Stobaugh and Telesio (1983). Although this first typology is a primitive and incomplete classification of manufacturing strategies, it is highly valuable for initiating categorization of production strategies. One of these taxonomies was suggested by Wheelwright and Hayes in 1985. Their taxonomy includes only four basic strategies that are shaped based on two continuums; neutral-supportive and internal-external. Even in the 1980s, Wheelwright and Hayes’s taxonomy was considered a good try, but not a useful insight into understanding the manufacturing strategies. The major topics in association with manufacturing strategies that were covered in the publications are these.

- Proposing a taxonomy of manufacturing strategies (Stobaugh and Telesio 1983; Wheelwright and Hayes 1985)
- Describing characteristics of competitive advantage in manufacturing firms (Wheelwright 1984)
- Exploring impacts of different production strategies on product structures (Guerrero 1985)
- Suggesting a method to assess manufacturing strategies of an organization (Swamidass 1986)

- An empirical study of the content of the manufacturing strategy (Schroeder et al. 1986)
- Evaluation of main manufacturing strategy variable (Swamidass and Newell 1987)
- An attempt to propose generic manufacturing strategies (Kotha and Orne 1989)

Manufacturing strategy was started to attract the attention of more researchers in the 1990s. During these 10 years, many scholars tried to come up with new manufacturing strategies. Consequently, the largest number of studies was carried out in this decade. The results were an introduction of some new strategies and a few taxonomies of production strategies. That is to say, among the large number of the studies in this period, many of them claimed that they proposed new manufacturing strategies, but only a limited number of these claims are valid.

De Toni et al. (1992) chose an eye-catching title for their paper “Manufacturing Strategy in Global Markets: An Operations Management Model”; however, they ended up talking about anything but global manufacturing strategies. Instead of manufacturing strategies, they discussed the importance of ‘organization and management’, ‘management systems’, and ‘technology’ in the four stages of the operation value chain.

Tunalv (1992) conducted a research study to find suitable manufacturing strategies for the four major manufacturing objectives. He proposed ‘low prices’, ‘consistent quality’, ‘rapid design change or rapid product introduction’, and ‘dependable deliveries’ strategies to cover ‘cost’, ‘quality’, ‘flexibility’, and ‘dependability’ objectives, respectively. The recommended strategies are acceptable but very basic. Tunalv (1992) made no attempt to suggest any advanced manufacturing strategies or any international production strategies.

Voss (1995, p. 6) claimed that proposed strategies in manufacturing have shaped three paradigms. “The first of these can be characterized as competing through capability. This is achieved through aligning the capabilities of manufacturing with the competitive requirements of the marketplace. The second is the approach based on internal and external consistency between the business and product context and the choices in the content of the manufacturing strategy. This is effectively a contingency-based approach. Finally, there are approaches based on the need to adopt Best Practice”. The mentioned paradigms by Voss (1995) are general approaches to studying operations management. They are barely relevant to manufacturing strategies. Swink and Way (1995) intended to propose a typology for manufacturing strategies, though they just categorized studies about manufacturing strategies without discussing the manufacturing strategies.

One simple, but useful suggestion about manufacturing strategies was mentioned by Dellaert and Melo (1996). They considered the degrees of predictability of demands that can be low or high to propose make-to-order strategy or make-to-stock strategy respectively. In common with many other scholars, Dellaert and Melo (1996) made no attempt to consider internationalization of manufacturing as worthy of having its own strategies. Dominant research themes in this period are as follow.

- Correlating the marketing and manufacturing strategies to choice of technology (Kleindorfer and Partovi 1990)
- Reasons for failure of manufacturing strategies (Kinnie et al. 1992)
- A process approach to studying manufacturing strategy (Platts 1993)
- Correlation between manufacturing strategies with cost, quality, flexibility, and dependability (Minor et al. 1994)
- Introducing a categorization of manufacturers as a taxonomy of manufacturing strategies (Miller and Roth 1994)
- Production process focus (Wathen 1995)
- Defining boundaries of the manufacturing strategy (Leong and Ward 1995)
- Examining competition in dynamic product markets from the resource-base and flexibility perspectives (Sanchez 1995)
- Considering environmental uncertainty and the managerial choice (Ho 1996)
- The multi-focused manufacturing paradigm for flexible production (Spina et al. 1996)
- Exploring reasons behind absent of research paradigm (Kim and Arnold 1996)
- Assessing one of the theoretical frameworks regarding manufacturing strategies (Spring and Boaden 1997)
- Process of formulating the manufacturing strategy (Menda and Dilts 1997)
- Identifying and documenting manufacturing strategies inside of an organization (Mills et al. 1998)
- Strategizing manufacturing based on resource-based view instead of market-based one (Gagnon 1999)

A reduction in the number of research studies and subsequent lower number of new manufacturing strategies can be seen in the 2000s. Prasad et al. (2001) unsuccessfully tried to identify and categorize publications about international operations strategies. The vast majority of their discussed publications have little or no connection to international strategies. Almost all of these publications are about operations activities in one country only. In common with many other researchers in this field, Prasad et al. (2001) did not have accurate understanding of strategy, so on many occasions they incorrectly considered some of the organizational capabilities or production systems as strategies. Main research themes concerning manufacturing strategies in this decade are as follow.

- Product customization process (Spring and Dalrymple 2000)
- Testing the correlation among environment, competitive strategy, manufacturing strategy, and performance (Ward and Duray 2000)
- Alternative forms of manufacturing strategy processes (Kathuria 2000; Swamidass et al. 2001)
- The status of literature in manufacturing strategy (Dangayach and Deshmukh 2001)
- Suggesting a configuration for project management based on operations strategies (Oltra et al. 2005)
- Process of operations strategies (Lowson 2002)

- Sophistication of formulating the manufacturing strategy in practice (Barnes 2002)
- A resource-based assessment of manufacturing strategy (Schroeder et al. 2002)
- Introducing other's work regarding trend in operations strategy and performance management (Bourne et al. 2003)
- Impact of flexibility on service operations strategy (Aranda 2003)
- Claiming his suggested paradigms are still valid (Voss 2005)
- Changes of manufacturing strategies inside of a company (Cagliano et al. 2005)
- Proposing a Chinese taxonomy of manufacturing strategies (Zhao et al. 2006)
- A typology of factories in the international manufacturing network (Vereecke et al. 2006)
- Assessing usefulness of organization theory for supply chain management (Ketchen and Hult 2007)
- Strategies for managing a portfolio of alliances (Hoffmann 2007)
- Capacity development based on postponement strategies (Anupindi and Li 2008)
- Suggesting a classification based on competitive priorities relating to cost, quality, flexibility, delivery, service and environmental protection (Martin-Pena and Diaz-Garrido 2008).
- Importance of considering innovation in formulation of manufacturing strategies (Nair and Boulton 2008)
- A knowledge-based approach to the manufacturing strategy process (Paiva et al. 2008)
- Operations strategy for product-centric servitization (Baines et al. 2009)
- Strategic decisions regarding resource allocation in manufacturing companies (Jayanthi et al. 2009)
- Investigating the profit advantage of pioneering firms with a broad product line strategy (Boulding and Christen 2009)

Although the number of operations-related journals and their papers have increased substantially in the 2010s, compared to other decades, the least number of directly relevant publications regarding manufacturing strategies can be seen in recent times. Many of the publications are partly connected to the manufacturing strategy. Yang et al. (2011) suggested five operations strategies. Each strategy is in fact a combination of investments or lack of it, either in flexible capacity or in flexible technology. These five strategies are (A) no investment in capacity or technology, (B) investment only in technology, (C) investment only in capacity, (D) investment in technology followed by investment in capacity, and (E) investment in capacity followed by investment in technology. These strategies are relatively basic and they do not take into account the international aspect of manufacturing strategies.

Jayaswal et al. (2011, p. 717) focused only on the capacity aspect of manufacturing and suggested two capacity strategies, including “dedicated capacities for each customer segment or shared capacity for all segments”. Although manufacturing capacity is one of the most influential on choice of manufacturing strategies,

Jayaswal et al. (2011) did not try to suggest any new strategies for manufacturing as a whole in general and international manufacturing in specific.

In one of the most recent papers, Briskorn et al. (2016, p. 1) introduce ‘cyclic production schemes’, “where each product may occur more than once in the production sequence”. While this scheme is interesting, it is not a strategy because it does not provide any long-term direction for the manufacturing. These are the prime topics related to manufacturing strategies in the 2010s.

- The effect of manufacturing offshore on technology competitiveness (Fuchs and Kirchain 2010)
- Tailored base-surge allocation to near-shore and offshore production (Allon and Van-Mieghem 2010)
- The role of operational flexibility in the development of international product networks (Fisch and Zschoche 2012)
- Decentralized operation strategies (Hu et al. 2012)
- Services and income generation in product companies (Suarez et al. 2013)
- Importance of alignment between business strategy and operations strategy (Shavarini et al. 2013)
- An integrative approach to formation of the operations strategy (Kim et al. 2014)
- Exploring reasons behind recent trends of onshoring and vertical integration (Gao 2015)
- Integrating manufacturing and distribution location and capacity decisions with transfer pricing decisions (De Matta and Miller 2015)
- Integration of operations and finance (Zhao and Huchzermeier 2015)
- Evaluating connectivity of carbon emission reduction mechanisms and manufacturing optimisation (Wang and Choi 2015)
- Strategy of being nice in contrast to strategy of being mean for knowledge exchange in supply chain innovation (Nasr et al. 2015)
- Research paradigms in manufacturing strategy (Chatha and Butt 2015)
- Structuring a make-to-forecast production strategy (Meredith and Akinc 2007; Meredith et al. 2015)
- Assessing the effect of managerial controls on deployment of corporate-lean strategies (Netland et al. 2015)
- Evaluating the optimal pricing of new and remanufactured products (Abbey et al. 2015)
- Effect of service design and process management on quality (Ding 2015)
- Importance of considering pollution accumulation in manufacturing and supply strategies (Ouardighi et al. 2016)
- Breaking down of the global production network into sub-networks (Ferdows et al. 2016)
- Examining the usefulness of resource-based view to operations management (Bromiley and Rau 2016)
- Resource-based view in operations management (Hitt et al. 2016)

The systematic literature review in this research divulged that the vast majority of publications regarding manufacturing strategies have been about assessing contents or process of formulating strategies. Topics such as barriers to strategy implementation (Aboutaleb 2016a) or failure-avoidance in the implementation of the strategy (Aboutaleb 2016b) are ignored. Some publications recommended a new manufacturing strategy. Just a handful of the studies tried to propose relevant taxonomies of manufacturing strategies. In the next section, the existing taxonomies of manufacturing strategies will be explored briefly.

## 2.2 *Relevant Taxonomies to Manufacturing Strategies*

Developing taxonomies has helped theory building and structuring of future research. According to Martin-Pena and Diaz-Garrido (2008, p. 455), “The development of configurations, typologies and taxonomies is fundamental to strategy research and particularly useful when the research goal is to determine the dominant patterns in organizations”. In a similar vein, Zhao et al. (2006, p. 621) state that “A taxonomy not only provides a parsimonious description of strategic groups that is useful in discussion and research, but also aids theory building”. Thus, “Taxonomic research is extremely useful for identifying which strategies enable business organizations to be more competitive” (Martin-Pena and Diaz-Garrido 2008, p. 456).

In this section, the focus is on manufacturing taxonomies, so the taxonomies of other related topics such as supply chains (Aboutaleb 2016c) are disregarded. There have been a few attempts to develop a taxonomy for manufacturing strategies. It seems the first taxonomy of production strategies was developed by Stobaugh and Telesio in 1983. Although their typology is shaped by only three primitive strategies, including low-cost, technology-driven, and marketing-intensive, they will always be remembered for pioneering classification of manufacturing strategies. One of the first taxonomies was suggested by Kotha and Orne (1989). They recommended the ‘generic manufacturing strategies’ with eight strategies. However, they borrowed too much from ‘generic strategies’ by Porter (1980). Therefore, it is hard to distinguish Kotha and Orne’s (1989) typology from Porter’s one that has almost nothing to do with manufacturing. Probably the most known typology was suggested by Miller and Roth (1994). That is a numerical taxonomy with only three groups of producers (caretakers, marketers, and innovators). In fact, the recommended issues are not strategies, they are categorization of manufacturers. Furthermore, this taxonomy disregards widely international and many national level manufacturing strategies. Replication of this research by Frohlich and Dixon (2001) questioned the validity and the majority of the findings of Miller and Roth’s (1994) study. An attempt by Sanchez and Perez (2001) fell short and ended with preparing a ‘check-list’ instead of a taxonomy.

Table 1 illustrates the typology of manufacturing/production strategies in a chronological order. Five issues that shape the main parts of the majority of the taxonomies of manufacturing strategies are cost, delivery, quality, innovation and flexibility.



**Table 1** Existing taxonomies of manufacturing strategies

Scholars	Suggested strategies	Main shortcomings
Stobaugh and Telesio (1983)	Low-cost Technology-driven Marketing-intensive	The strategies are primitives and the taxonomy is basic
Wheelwright and Hayes (1985)	Internally neutral Externally neutral Internally supportive Externally supportive	These are general strategies with partial relevance to the manufacturing
Kotha and Orne (1989)	Segment, neither cost nor differentiation Segment, differentiation Segment, cost leadership Segment, mixed Industry-wide, mixed Industry-wide, differentiation Industry-wide, cost leadership Industry-wide, cost and differentiation	These strategies are different combinations of Porter's generic strategies They are barely related to production
De Meyer (1992)	High-performance products group Manufacturing innovators Marketing-oriented group	None of the mentioned issues are strategies. They are categorizations of organizational groups
Akhtar and Tabucanon (1993)	Defensive Aggressive Innovators	These are general strategies with partial relevance to the manufacturing
Kim and Lee (1993)	Pure differentiation Pure cost leadership Cost and differentiation	These are repetition of Porter's generic strategies
Miller and Roth (1994)	Caretakers Marketers Innovators	These are types of producers, not strategies
Ward et al. (1996)	Niche differentiator Broad market differentiator Cost leader Lean competitor	These are types of producers not strategies These are almost a repetition of Porter's generic strategies

(continued)

**Table 1** (continued)

Scholars	Suggested strategies	Main shortcomings
Avella et al. (1996)	Flexible manufactures focused on the market Low-cost-quality manufacturers Manufacturers focused on delivery	The strategies are basic and non-comprehensive
Sweeney and Szwejczewski (1996)	Variant producers Innovators Mass producers Mass customizers	These are types of producers, not strategies
Christiansen et al. (2003)	Low price Quality deliverers Speedy deliverers Aesthetic designers	The strategies are minor alterations of Porter's (1980) and Avella et al. (1996) strategies
Sum et al. (2004)	All-rounders Efficient innovators Differentiators	These are types of producers, not strategies
Lei and Slocum (2005)	Consolidator Concept Learner Concept Drivers Pioneer	These are types of producers, not strategies
Zhao et al. (2006)	Quality customizers Low emphasize Mass servers Specialized contractors	These are types of producers, not strategies
Martin-Pena and Diaz-Garrido (2008)	Pursuing excellence Focusing on quality and delivery	This taxonomy with two strategies is the least comprehensive typology

The common weakness of all of the 15 taxonomies is disregarding international aspects of manufacturing strategies. It seems the scholars who proposed these taxonomies assumed that their recommended strategies can be used nationally or internationally. The degree of complexity of international markets and the increased number of factors that influence formulation and implementation of strategies in general and manufacturing strategies in particular in global market are just two of the reasons for having exclusive strategies for manufacturing at international level.

Another relatively common difficulty in these taxonomies is confusing types of manufacturers with types of manufacturing strategies. A lack of familiarity with the notion and nature of strategy among some scholars in the field of operations and manufacturing management has led to inappropriate use of the term 'strategy' to describe issues that are not strategy in any sense. The employed methodology in this study is discussed in the next section.

### 3 Research Methodology

A systematic literature review was conducted to identify and analyze any publications regarding manufacturing strategies. As stated by Boland et al. (2013), the review question was defined and inclusion and exclusion criteria were identified. By considering the scope and aim of this paper, eight keywords were prepared, including ‘manufacturing strategy’, ‘production strategy’, ‘operations strategy’, ‘typology of strategies’, ‘strategy taxonomy’, ‘strategy classification’, ‘strategy categorization’, and ‘types of strategies’. The top five journals were chosen for literature review based on their ranking and the relevance to the manufacturing strategies. These journals are *Management Science* (MS), *Journal of Operations Management* (JOM), *European Journal of Operational Research* (EJOR), *International Journal of Operations & Production Management* (IJOPM), and *Strategic Management Journal* (SMJ).

The ‘inclusion criteria’ in this study were all papers from the top five journals (MS, JOM, EJOR, IJOPM, and SMJ) that include at least one of the eight keywords. In addition to the papers of these top five journals, when in the papers of the five journals a reference was made to good publications in other journals or books, these publications are considered and analyzed too. As stated by research methodologists, it is often the case that many of the included publications, after deployment of the inclusion criteria, may have little or no information about the intended keywords (Petticrew and Roberts 2005; Booth et al. 2012; Gough et al. 2012; Boland et al. 2013). Thereby, the next necessary step has been to define and use suitable ‘exclusion criteria’ to screen the shortlisted papers that fulfilled the requirements of the inclusion criteria; however, they may not have anything useful for this research (Booth et al. 2012; Gough et al. 2012). The exclusion criteria in this research were a lack of discussion regarding relatively new manufacturing/operations strategies or new typology of manufacturing strategies. In other words, it was decided to exclude any of the included papers or books that did not suggest any relatively new manufacturing/operations strategies or novel taxonomies of manufacturing strategies.

The eight keywords were used in the five journals to find relevant publications for review and analyzes. The following table (Table 2) illustrates the number of found papers or books by using each of the keywords in each of the journals.

Initial counting of the publications indicates 529 papers or books that fulfil ‘inclusion criteria’, having at least one of the eight keywords in one of the five journals or other top publications mentioned in these five journals. As it was expected that some of the papers or books would include more than one of the keywords, these were repeated in the initial counting. After disregarding the repetitions, the remaining papers or books were 349. The defined ‘exclusion criteria’ were used to eliminate those papers or books with no new strategies or typologies. Consequently, in these five journals, ninety-one papers or books had been found to have new and relevant discussions to the topic of this paper. Distribution of the reviewed publications from each journal and other sources can be found in Table 3.

**Table 2** Number of initially identified publications

Keywords	Name of journals					Other publications
	MS	JOM	EJOR	IJOPM	SMJ	
Manufacturing strategy	42	33	7	48	34	8
Production strategy	25	11	32	24	5	5
Operations strategy	20	54	22	15	7	3
Strategy typology	1	9	0	6	10	1
Strategy taxonomy	1	6	0	2	3	2
Strategy classification	0	1	0	4	9	0
Strategy categorization	1	1	0	1	2	0
Strategy types	14	14	6	11	29	0

**Table 3** Distribution of the reviewed publications

Name of journals	Number of papers from each journal	Percentage of papers from each journal (%)
Management Science	9	10
Journal of Operations Management	19	21
European Journal of Operational Research	13	14
International Journal of Operations & Production Management	35	38.5
Strategic Management Journal	6	6.5
Other relevant publications	9	10
Total	91	100

As evident from the table, *International Journal of Operations & Production Management* has been the richest source for manufacturing strategies.

Although the only intended information in these papers was their suggested new or relatively new manufacturing strategies or taxonomies, their utilized methodologies to come up with these new strategies or typologies were considered and analyzed, too. The next section is dedicated to the outputs of this study that used the systematic literature review to examine the publications regarding manufacturing strategies.

## 4 Findings and Discussions

### 4.1 Papers' Background

Ninety-one out of 349 papers or books, initially identified, were analyzed due to their relevance in the search for manufacturing strategies or any typologies of these strategies. In this section, the research designs used in the analyzed papers will be

**Table 4** Employed research designs in the publications

Research designs	Number of publications that used each research design	Percentage of publications that used each research design (%)
Conceptual qualitative	31	34
Conceptual quantitative	22	24
Empirical qualitative	16	17.5
Empirical quantitative	17	19
Empirical mixed method	5	5.5

mentioned briefly. In terms of research designs, according to Chatha and Butt (2015), there are five common research designs for operations management papers in general, and papers regarding manufacturing strategies in particular. These research designs are conceptual qualitative, conceptual quantitative, empirical qualitative, empirical quantitative, and empirical mixed method. As suggested by Minor et al. (1994), empirical papers are those that include primary or secondary data collection and analysis. On the other hand, conceptual papers tend to analyze notions and theoretical frameworks instead of data. Almost all of the top five chosen journals in the field of operations or production management give high publication priorities to those papers with quantitative research design. It was, therefore, intriguing to see that nearly half of the publications that contained some discussions about manufacturing strategies utilized qualitative research design, either conceptual or empirical. Table 4 indicates the utilized research designs in these ninety-one papers.

As was expected, conceptual papers have been identified as having more contributions to development of new manufacturing strategies. While mixed method research design has gained some popularity among the researchers recently, it is the least commonly used method in these ninety-one papers or books. It is worth mentioning that although empirical papers may not contain as many manufacturing strategies as the conceptual ones, they have been of great help in testing the validity and reliability of the conceptual strategies and taxonomies in real-world organizations.

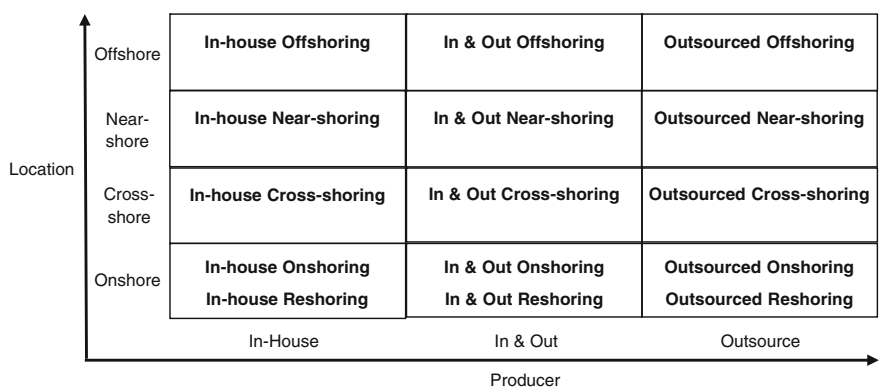
## 4.2 Emergent of the Taxonomy

Although a typology can be built on any two suitable and interrelated continuums, it may not be able to accommodate major existing or required strategies (Verter and Dincer 1992). The employed systematic literature review in this study revealed that two crucial factors in formulating or organizing manufacturing strategies are

‘location of production’ and the ‘type of producers’. Location of production can be *onshore* (inside of border of the home country), *cross-shore* (partly in the home country and partly in other countries), *near-shore* (in nearby foreign countries), or *offshore* (in distant foreign countries). Manufacturing in terms of its producers can be *in-house* (fully produced inside of the organization), *in and out* (partly produced by the company and partly produced by other companies), or *outsource* (fully manufactured by other companies).

The notions of ‘cross-shore’ strategies and ‘in and out’ strategies have been introduced for the first time in this paper in this taxonomy. While apart from the concepts of ‘cross-shoring’ and ‘in and out’, the remaining elements of the two continuums of this research (onshore, reshore, near-shore, offshore, in-house, in and out, and outsource) are mentioned in the literature, the fifteen stated strategies in the taxonomy are new to the literature but may not be new to experienced manufacturing or operations managers. The systematic literature review indicated that current proposed strategies for manufacturing in international or even national levels in the literature do not reflect the real-world manufacturing strategies that are more complex and diversified. The introduction of the taxonomy is an attempt to get closer to the real-world manufacturing strategies.

All manufacturing strategies can be categorized into twelve groups based on the extent of two factors: location and producer. The *Taxonomy of International Manufacturing Strategies* has emerged as a result of a systematic combination of four possible locations with the three types of producers. The taxonomy of international manufacturing strategies has twelve sets of strategies. The fifteen major manufacturing strategies in the form of twelve groups of strategies in the taxonomy are ‘In-house Onshoring’, ‘In-house Reshoring’, ‘In-house Cross-shoring’, ‘In-house Near-shoring’, ‘In-house Offshoring’, ‘In and Out Onshoring’, ‘In and Out Reshoring’, ‘In and Out Cross-shoring’, ‘In and Out Near-shoring’, ‘In and Out Offshoring’, ‘Outsourced Onshoring’, ‘Outsourced Reshoring’, ‘Outsourced Cross-shoring’, ‘Outsourced Near-shoring’, and ‘Outsourced Offshoring’. Figure 1 illustrates the taxonomy of international manufacturing strategies.



**Fig. 1** The taxonomy of international manufacturing strategies

All of the stated strategies in the taxonomy are hybrid due to combining two separate but interrelated sets of strategies, location-related strategies and producer-related strategies. Brief definitions of these strategies are as follows. In-house onshoring strategy is about manufacturing all of the products and preferably their components inside of the company and only within the home country. In-house reshoring strategy indicates the company's decision to restart production in the home country by the company alone after closure of its foreign manufacturing activities in part or totally. Simultaneous manufacturing of products by the company in the home country and in its overseas' facilities is called in-house cross-shoring strategy. In-house near-shoring strategy refers to moving manufacturing operations to the company's factories abroad that are located in the nearby countries. In-house offshoring strategy is defined as establishing manufacturing facilities by the company only in distant foreign countries.

In and out onshoring strategy is considered to be concurrent manufacturing of products by the company and other contracted firms for the company in the home country. In and out reshoring strategy refers to returning manufacturing activities from abroad to the home country and then dividing manufacturing jobs between the company and its contractors in the home country. In and out cross-shoring strategy is about simultaneous production in the home country and other countries by the company and its external contractors. In and out near-shoring strategy proposes concomitant manufacturing in nearby countries by the company and other contracted producers for the company. In and out offshoring strategy can be defined as concurrent production in distant countries by the firm and its contractors.

Allocation of all production activities to other contracted companies in the home country is called outsourced onshoring. Outsourced reshoring strategy focuses on resuming manufacturing activities only in the homeland by other companies for the firm. Outsourced cross-shoring strategy is defined as concurrent manufacturing of products in the home country and overseas solely by other companies for the firm. Outsourced near-shoring strategy is about transferring manufacturing responsibilities to other contracted companies in nearby countries. Outsourced offshoring strategy refers to relying on foreign manufacturers that are located in distant countries for the production of the intended products for the company.

### ***4.3 Connectivity of the Taxonomy to Corporate-Level Strategies***

While manufacturing strategies are generally considered to be functional-level strategies within strategic business units, international manufacturing strategies have some noticeable overlaps with business and even corporate-level strategies, due to their corporate-wide impacts. "The primary function of a manufacturing strategy is providing consistency between the manufacturing strategy and the overall business strategy," (Ho 1996, p. 74). Manufacturing strategies are expected

to be aligned with the business and corporate-level strategies (Ho 1996; Hoffmann 2007; Kim et al. 2014). Growth strategies are some of the major corporate-level strategies that have considerable effects on choice of manufacturing strategies. Growth strategies can be categorized into organic, semi-organic, and inorganic strategies, depending on the extent to which an organization relies on its internally generated resources or externally acquired ones for growth.

*In-house* manufacturing strategies (in-house onshoring, in-house reshoring, in-house cross-shoring, in-house near-shoring, and in-house offshoring) correspond to the ‘organic growth’ strategies that encourage natural growth via internally resourced and produced products. In contrast, *outsourced* manufacturing strategies (outsourced onshoring, outsourced reshoring, outsourced cross-shoring, outsourced near-shoring, and outsourced offshoring) are supported by ‘inorganic growth’ strategies that are in favor of speedy growth by utilizing resources and capabilities of other companies. *In and out* manufacturing strategies (in and out onshoring, in and out reshoring, in and out cross-shoring, in and out near-shoring, and in and out offshoring), which match with ‘semi-organic growth’ strategies, are mixed strategies with equal reliance on internal and external resources and capabilities for balance growth.

Another key corporate-level strategy that shapes and guides manufacturing strategies markedly is internationalization strategy. Internationalization is a step-by-step process toward expansion into the foreign markets. Degree of internationalization can be easily ignored, limited, medium, or widespread in terms of the extent to which products are manufactured in the home country, cross-countries, nearby countries, or far countries. Thus, there are one-to-one connections between *onshore*, *cross-shore*, *near-shore*, and *offshore* manufacturing strategies with easily ignored, limited, medium, or widespread internationalization strategies respectively.

#### 4.4 Choosing Strategies from the Taxonomy

Considering the company’s strategic objectives and priorities at corporate and manufacturing (functional) levels would help managers to select the most appropriate manufacturing strategy or strategies that can fulfil these objectives. The *in-house* manufacturing strategies (in-house onshoring, in-house reshoring, in-house cross-shoring, in-house near-shoring, and in-house offshoring) can be the prime strategies for the company that values highly these eight strategic objectives. (A) Protecting the company’s unique core competencies such as a patented product, process, or system; (B) Maintaining an uncompromised ethos, such as good working conditions for all staff or being socially or environmentally responsible; (C) Consistency of the managerial styles that are known to be effective; (D) Organic and gradual growth of the organization; (E) More effective and clear communication and coordination; (F) Assuring quality products by quality staff; (G) Fostering loyalty and pride among the staff; and (H) Faster and more organized reactions to the changes in the market and customers’ expectations.



The *in and out* manufacturing strategies (in and out onshoring, in and out reshoring, in and out cross-shoring, in and out near-shoring, and in and out off-shoring) are good for those companies that have the following objectives or priorities: (A) Win-win collaboration with competitors; (B) Sharing costs of new facilities or technologies with other companies; (C) Sharing risks associated with new investments or technologies with allied companies; (D) Faster growth compared to an organic one with semi-organic growth strategy, due to access to external resources; (E) Exchanging experience and expertises with other companies; (F) Ease of covering periodic fluctuations in customer's demand; and (G) Possibility of growth with less or no new investment because of using other companies' facilities for growth.

The *outsourced* manufacturing strategies (outsourced onshoring, outsourced reshoring, outsourced cross-shoring, outsourced near-shoring, and outsourced off-shoring) would suit those companies whose ambitions and priorities are any of these five strategic objectives. (A) Fastest possible growth via inorganic growth strategy; (B) Least possible investment for growth by relying on other companies facilities; (C) Least risk taking in terms of investment for establishing manufacturing facilities; (D) Most flexible way to develop new product due to large variety of production partners; (E) Least expensive retrieval strategy if the new production development fails; (F) Easiest way for the related or unrelated diversification strategies because of not needing to have required resources and capabilities internally.

The *onshore* strategies (in-house onshoring, in-house reshoring, in and out onshoring, in and out reshoring, outsourced onshoring, and outsourced reshoring) are appropriate choices in these circumstances. (A) The home country is known for its quality products, so impact of 'country of origin' is high on the international consumer's decision to buy; (B) Main target customers are residents of the home country; (C) The home country has the best required resources and materials for production; (D) The home country has the most skilled staff; (E) The home country is the best country to run business in terms of tax, employment laws, currency value, and economic, social and political stability; and (F) Wanting to be socially responsible to create employment for fellow countrymen or countrywomen;

The *cross-shore* strategies (in-house cross-shoring, in and out cross-shoring, and outsourced cross-shoring) can be suitable for organizations that have one or more of the following objectives or priorities: (A) Initiating the internationalization process on a relatively limited scale; (B) Benefiting from exceptional opportunities for manufacturing abroad while maintaining home country production activities; (C) Having the chance of getting to know the international market; (D) Showcasing the company's brand to potential foreign customers even at a limited scale; (E) Getting to know or even work with foreign competitors; and (F) Distributing economic, political and security risks to more than one country or homeland.

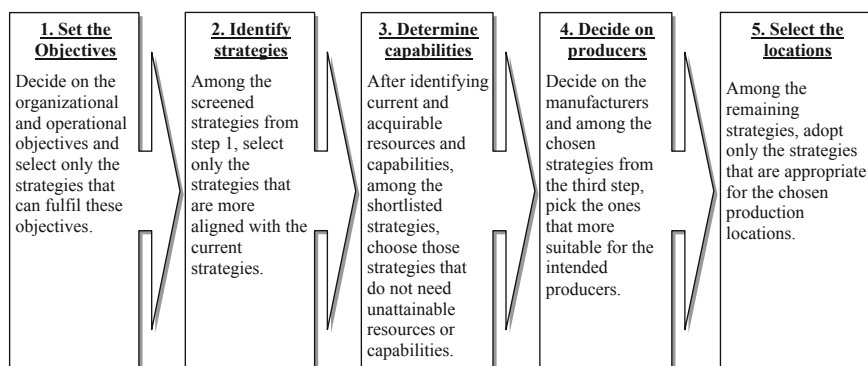
The *near-shore* strategies (in-house near-shoring, in and out near-shoring, and outsourced near-shoring) may be appealing for organizations with these objectives or intentions. (A) Internationalizing into neighbouring countries with close psychic distance; (B) Benefiting from country-specific advantages of the nearby countries;

(C) Exploiting better supply conditions of the close-by countries; (D) Market development by entering relatively familiar or similar markets on the doorstep countries; (E) Having acceptable transportation costs when sending the finished products to the home country; and (F) Less or no need for sophisticated and expensive information technology systems to facilitate communications and collaboration between the headquarters in the homeland and production facilities in neighbouring countries.

The *offshore* strategies (in-house offshoring, in and out offshoring, and out-sourced offshoring) work well for organizations with any of these priorities or objectives. (A) Going global by expanding production unites in far reach countries; (B) Taking advantage of economies of scale by being in populated counties in different continents; (C) Benefiting from good production opportunities anywhere in the world; (D) Reducing manufacturing risks by distributing the operations worldwide; (E) Making the company's brand globally known; and (F) Utilizing the best resources and most skilled staff that can be acquired in the world.

Suitable manufacturing strategy or strategies can be chosen by considering two interrelated factors of the company's capabilities and the company's priorities/objectives. For example, if cost leadership is not one of the company's capabilities, but one of its objectives is becoming the cost leader, it would be reasonable to consider outsourcing. The taxonomy has two dimensions that should be considered in the process of selecting appropriate manufacturing strategy or strategies.

The strategy selection process has five steps (see Fig. 2). The first step would be deciding on the organizational and operational objectives and priorities of the firm. Identifying current corporate-level and manufacturing strategies would be the second action toward choosing the right strategies. The third stage is determining existing and acquirable resources and capabilities in the organization. In the fourth step, it should be decided on who is going to produce the intended products, by considering the organization's objectives, corporate and manufacturing strategies, and capabilities. The last stage is identifying the location(s) of manufacturing, after considering results of all four previous steps.



**Fig. 2** The strategy selection process

Deployment of any of the fifteen manufacturing strategies can have long-term financial and non-financial consequences. Thus, it is highly recommended to employ the five-step process for strategy selection to have guidance in choosing the right manufacturing strategies. This research had some limitations and its findings have some implications that are mentioned in the next section.

## **5 Limitations and Implications**

### **5.1 *Limitations***

The major limitation of this research is the need to restrict its findings to the papers of only five top journals. Probably, some additional manufacturing strategies are discussed in other journals that have not been included in this study. The lack of primary data in this research may be perceived as a limitation by some researchers. Although there is no doubt in the value of having first-hand data from operations managers, the scope of research with primary data is often narrower than the scope of this research. Another limitation is the theoretical nature of the research, with no possibility of testing the proposed taxonomy in real-world companies. These limitations can be seen as opportunities for other researchers to test the practical side of the taxonomy.

### **5.2 *Theoretical Implications***

The taxonomy of international manufacturing strategies can be used as a theoretical framework in categorizing and analyzing current or future manufacturing strategies. The result of the systematic literature review revealed that the vast majority of studies regarding manufacturing strategies are limited to suggesting one or more production strategies for a specific situation or industry. The taxonomy would provide a chance for other researchers to classify these separate strategies based on the twelve sets of strategies in the taxonomy. Operations researchers can even re-categorize those strategies that are already grouped in the limited existing taxonomies. Furthermore, the taxonomy may contribute to the development of new manufacturing strategies by providing opportunities to synthesise different combinations of some of the existing strategies in the taxonomy.

### **5.3 *Empirical Implications***

The taxonomy can help managers make the right decisions in the selection of the intended manufacturing strategies, by considering the company's strategic objectives and priorities, as well as the advantages and disadvantages of selecting each

strategy. For example, relying on an 'in-house' manufacturing strategy has some important benefits such as protecting the organization's core competencies (e.g. patents), having better control over the quality of products, and faster responses to changes in market demands and trends. However, selecting any of the 'in-house' strategies requires a considerable amount of investment and acquiring competitive skills and capabilities. Mistakes in the chosen 'in-house' strategies can be fatal. The suggested five-step process for selecting suitable strategies among the mentioned ones in the taxonomy can be a useful tool to assist managers in adopting the right strategies.

## 6 Conclusions

While there have been some attempts by operations researchers to suggest new manufacturing strategies or even typologies of operations strategies, especially in the 1990s, there is a gap in the current literature regarding a relatively comprehensive taxonomy for international manufacturing strategies. This study aims to manage current strategies, suggest some novel strategies, and guide in developing new required strategies in the future by proposing the *taxonomy of international manufacturing strategies*. Instead of conducting another limited empirical research study, the researcher decided to review the existing literature systematically. The analysis indicated two major factors; location of production and type of producers used to develop the new taxonomy.

The *Taxonomy of International Manufacturing Strategies* has emerged as a result of a systematic combination of four possible locations (onshore, cross-shore, near-shore, and offshore) with the three types of producers (in-house, in and out, and outsource). The taxonomy of international manufacturing strategies has twelve sets of strategies that accommodate the fifteen major manufacturing strategies. The five international manufacturing strategies with emphasis on organic growth via production within the company are 'in-house onshoring', 'in-house reshoring', 'in-house cross-shoring', 'in-house near-shoring', and 'in-house offshoring' strategies. In contrast, there are five inorganic manufacturing strategies that favor complete allocation of manufacturing activities to other contracted companies. These outsourced-centered manufacturing strategies include 'outsourced onshoring', 'outsourced reshoring', 'outsourced cross-shoring', 'outsourced near-shoring', and 'outsourced offshoring'. The remaining five semi-organic strategies in the taxonomy encourage a balanced approach to manufacturing by concurrent production by the company and its external contractors. These balanced manufacturing strategies are 'in and out onshoring', 'in and out reshoring', 'in and out cross-shoring', 'in and out near-shoring', and 'in and out offshoring'.

Four major examples of evidence of originality and contribution of this study are the notions of 'cross-shore' and 'in and out', 'the taxonomy of international manufacturing strategies', and the 'process of selecting the strategy' that are introduced for the first time in this paper. The cross-shore strategy is the missing

link in the location-related literature. It reflects the real-world practice of many international manufacturers that have concurrent manufacturing activities in their home countries and abroad. The ‘in and out’ strategy would fill the gap in producer-related literature. The proposed taxonomy in this research is capable of accommodating current and future manufacturing strategies. Furthermore, the taxonomy can help in developing new strategies based on the company’s capabilities and the market’s requirements. By considering the fact that implementation of any of the fifteen manufacturing strategies would have lasting positive or negative financial and non-financial consequences, a five-step process for strategy selection was recommended to assist managers in choosing the most suitable strategies.

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