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Manufacturing strategy in SMEs and its performance implications

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Abstract

Purpose – West European manufacturing has been going through challenging times after the global financial crisis of 2008-2009. Some countries (e.g. Sweden and Germany) have recovered from the crisis, while in others problems and job loss still persist. One of these problem countries is Finland. The purpose of this paper is to examine manufacturing strategy priorities and their performance implications in this country.

Design/methodology/approach – During the spring of 2014, a web-based survey was conducted, targeting Finnish manufacturing companies. In this study we focus on small- and medium-sized (SMEs) companies and link survey responses to financial performance data, which is available in audited annual reports.

Findings – Research results indicate that SME manufacturers in Finland put less emphasis in new product development, broadness of product line and after sales service, while showing high priority in delivery speed and punctuality. As the manufacturing strategy dimensions are connected to audited financial data, regression analyses reveal that superior quality is at central place for achieving higher revenues and profits. After sales service has a positive impact on revenues and new product development ability is connected to higher profits. Managing quality to meet specifications (minimum quality level), leads only into higher employment. Some evidence is shown in support of flexibility in terms of product changes having negative impact on revenue, while volume flexibility is connected to lower profits.

Research limitations/implications – This research is limited to a single country, and is cross-sectional in nature. The primary data were combined with profit and loss statements in order to reduce common method bias.

Practical implications – It is evident that SMEs may adapt their manufacturing strategy, with emphasis on superior quality together with properly managed after sales service and new product development activity. However, it is worrying that head count in manufacturing SMEs is not connected to same factors, as are revenue and profit. It is suggested that flexibility in labour contracts and other regulatory support measures are needed to support flexible manufacturing.

Originality/value – Advanced economies and their remaining manufacturing companies have been receiving minor levels of interest in research. This is especially the case with SMEs, where this research tries to fill important research gap.

Keywords Strategy, Financial performance, Finland, Manufacturing, Survey
Paper type Research paper

1. Introduction

The role of small- and medium-sized enterprises (SMEs) has increased during the recent decades as large corporations have reduced their basic research budgets, while applied product development and business acquisitions have been used instead as basis for

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growth. In other words, SMEs are no longer just a source of raw materials, components or semi-finished items, but they increasingly serve as sources of new ideas, new products and "complete package" subcontractors, with the original equipment manufacturers' (OEM) brand put into the product. Therefore, requirements for price, quality, delivery and flexibility have increased, and SMEs have to provide these with advanced IT systems (Haug *et al.*, 2011), development resources (Arrunada and Vázquez, 2006; Hilmola *et al.*, 2005) and financing ability (Ma and Hilmola, 2007). In the recent decades, it has been difficult for pure manufacturing companies to make significant profits, as services have taken a considerable share of the market growth and final product prices for manufacturers have been weak due to price inflation (Marquis and Trehan, 2010). Therefore, OEMs have been forced to use suppliers for global delivery and concentrate on value capture, and service offerings (like Apple; Haslam *et al.*, 2013).

Based on recent empirical research conducted in Spain on companies of various size (Minguela-Rata *et al.*, 2014), it was shown that medium sized companies are the most innovative, and that innovation takes place in a mode of collaboration with customers, which are typically larger corporations. Also age appears to play an important role as innovation is present most often in younger companies. It could be said that large corporations are increasingly talking about innovation and seeking opportunities, but these are sought after at stakeholders and through active technology licensing, business acquisition and divestment activity. The phenomenon of open innovation is one of the hottest topics within innovation discipline, and it does not only emphasize collaboration between companies, but also with universities, research laboratories and government (Naqshbandi and Kaur, 2014).

For the initiation of new companies, it is important that risk finance, as well as markets for products and research and development funding (and organizations) are available. Therefore, it is justified that growing GDP results in good environment for establishing and sustaining SME (Kshetri, 2014). With SME serving manufacturing sector or large tangible projects, it is important that share of imports and exports is having high share out of GDP and imports and exports is growing (Kshetri, 2014). This ensures manufacturing SMEs to have legislative (coupled together with low bureaucracy) and financial support from government as well as from surrounding financial sector. The supply of competence and resources from pool of labour is also assured in such environment (as sub-sector grows).

Global financial crisis (GFC) was a tipping point for many advanced economies, and continuing decline has been at the agenda in many economies, particularly in Europe. Before the GFC, these countries were models for emerging economies, and the country serving as the research context, Finland, was one of them. Finland has been continuously at TOP10 positions in global competitiveness rankings of World Economic Forum (Schwab and Porter, 2008; Schwab, 2011, 2013), and in the most recent ranking it was as high as the fourth place (Schwab, 2014). However, development of the manufacturing environment has been extremely sluggish in Finland after the GFC, and is the weak part of the economy. Both export (Finnish Customs, 2014a) and GDP (Statistics Finland, 2014a) were at the end of 2013 at the level of year 2006, and showing significant decline from the pre-crisis peak level of 2008 (export declined nearly 15 per cent and GDP declined more than 5 per cent). During the years, employment at the manufacturing sector has also been severely hurt: based on official statistics the decline has been some 15 per cent since year 2008, and nearly one-fourth after year 2000 (Statistics Finland, 2014b). This all translates into significant challenges

for manufacturing companies as they are export oriented and the size of domestic market is very limited. On the positive side, the amount of manufacturing companies, and particularly that of SMEs, has not changed at all during the previous decade. Of course employment and revenue has been hit, but companies mostly still try to survive in the difficult environment. There is no major change in sight even during the data collection year of 2014, as exports and imports are nearly the same in comparison to the situation in the previous year (Finnish Customs, 2014b). Foreign trade will show a fourth consecutive year of deficit for Finland in year 2014. Manufacturing and foreign trade malaise is a result of number of issues, but surely offshoring as well as outsourcing after the IT bubble burst in year 2001 and the GFC in year 2009, have influenced the trend, combined with the lower demand for paper in Europe due to digitalization and emergence of smartphones based on the platforms of Android and Apple. In international comparisons, Finland is also one of the highest labour cost countries in the world, if direct and indirect costs (sick leave, maternity leave, vacations and part of the healthcare) are included (Bureau of Labour Statistics, 2012).

As economies change and advance so should the leading sub-branches of it do as well. This change should be mostly present among SME companies as they are typically the innovation engines and represent the future growth of any economy. This is equally true in developed European economies as it is now in China (currently under transformation from secondary and tertiary industry dominated manufacturing country to knowledge economy). In this research, we are concentrating on SME manufacturing companies in Finland, as they represent a possible leading decision group, and as they have been forced to transform their practices lately. This situation has persisted for years, and therefore remaining companies in manufacturing must have carefully developed their strategies to survive. Also increasing competition from emerging markets (Low, 2007; Lorentz *et al.*, 2007; Shah and Jolly, 2011; Laisi *et al.*, 2012; Sodhi and Tang, 2013), such as the ones in Eastern Europe and Asia, are adding further pressure together with the relatively strong currency of euro. Based on the above discussion, it is interesting to consider the following research questions:

RQ1. What dimensions of manufacturing strategy companies prioritize?

RQ2. What is the relationship of manufacturing strategy prioritization and key performance measures such as revenue, profits and employment?

These research questions are addressed in this manuscript with a survey of Finnish manufacturing companies, which was conducted in early 2014. These data are connected to audited financial statements from each respondent, allowing us to combine two datasets and mitigate common method bias.

The paper is structured as follows: In the following Section 2, the manufacturing strategy literature is reviewed. Description of research methodology follows in Section 3. Empirical data analysis is elaborated in Section 4, while in Section 5 results are discussed by taking the perspective of a single firm, as well as by considering wider industry and society impacts implied by this research. Finally in Section 6 we conclude our work and provide avenues for further research in this area.

2. Literature review on manufacturing strategy

Manufacturing firms can only outperform competitors, if they can create a competitive advantage that they can sustain. Advantage can be created by offering customers superior value, either by providing the same benefits as competitors at a lower cost

(cost advantage), or by providing benefits that exceed those of the competing offerings (value advantage) or both (Porter, 1996). The source of advantage is found in the ability to differentiate from competition with regard to products and customer service, and in the ability to operate at lower cost with fewer resources (Christopher, 1998). This is achieved by organizing the firm around how customer value is created efficiently, how customer value is delivered efficiently, and how these processes can be coordinated and managed (Hilletofth, 2011).

Depending on the nature of competitive advantage pursued, the manufacturing firm may focus either on the value creation processes, the value delivery processes or both (Porter, 1996). Thus different business models can be distinguished in the manufacturing industry (Hilletofth and Lättilä, 2012). Some firms use a value-oriented model by focusing on the management of the value creation processes. This enables them to increase revenues by developing and selling desirable products (Jüttner *et al.*, 2007). The competitive advantage is created by providing higher product value (value advantage). Other firms use a cost-oriented model by focusing on the management of the value delivery processes. This enables them to reduce lead-times and costs in the manufacturing and supply chain, as well as improve asset turnover (Jüttner *et al.*, 2007). The competitive advantage is created by providing comparable product value at a lower cost (cost advantage). A final group of firms uses a customer-oriented model by focusing on the management of both the value creation and the value delivery processes. This enables them to increase revenues and reduce costs by developing and selling desirable products and delivering them cost-efficiently (Hilletofth, 2011). The competitive advantage is created by providing higher product value at a lower cost (value and cost advantage).

The competitive advantage is formulated in the business strategy and should later be transferred to the functional manufacturing strategy (Hayes and Wheelwright, 1984; Hill, 1995; Flynn *et al.*, 1999; Frohlich and Dixon, 2001). Two core elements are central to the definition of a manufacturing strategy (Dangayach and Deshmukh, 2001; Leong *et al.*, 1990; Platts *et al.*, 1998). The first is a statement of what the manufacturing function must accomplish (referred to as the manufacturing tasks, objectives or priorities) and can be defined as the capabilities the manufacturing unit must have to compete, given its overall business strategy (Hayes and Wheelwright, 1984; Miller and Roth, 1994; Platts *et al.*, 1998). In other words, emphasis should be placed in the future on these desired capabilities. The second element of a manufacturing strategy is a pattern of decisions that a company makes, which determine the actual capabilities of the manufacturing system (Hayes and Wheelwright, 1984; Miller and Roth, 1994; Platts *et al.*, 1998). The company makes decisions in terms of manufacturing, given the specified priorities, available resources and this result in some manufacturing (or competitive) capabilities (Anderson *et al.*, 1989; Größler and Grübner, 2006). The manufacturing capabilities form the basis for organizational (e.g. revenue, profit and asset turnover) and operational (e.g. lead-time, unit cost and set-up cost) performance (Figure 1). The notion that top-down alignment of business strategy and competitive capabilities drives performance is well established (Frohlich and Dixon, 2001).

Miller and Roth (1994) proposed taxonomy for competitive capabilities. This taxonomy has become one of the most influential frameworks for manufacturing strategy literature and has been used and improved in many later studies (e.g. Frohlich and Dixon, 2001). Typical dimensions of competitive capabilities commonly used and also included in the initial taxonomy of Miller and Roth (1994) include price, quality, flexibility, delivery and service (Table I). Even if some studies also suggest innovation and sustainability as critical dimensions of competitive capabilities, most of the research stresses the five dimensions mentioned above.

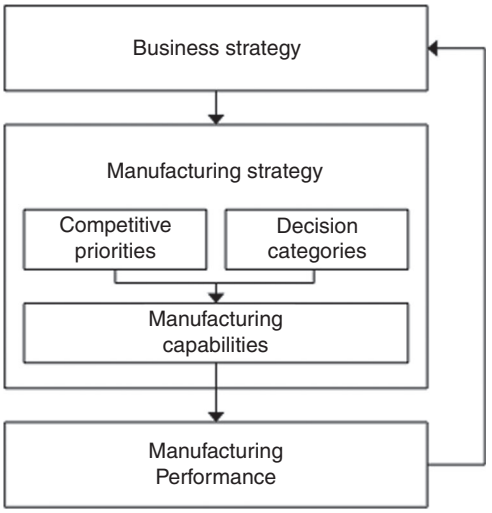


Figure 1.
Manufacturing strategy, capabilities and performance

Sources: Based on Frohlich and Dixon (2001), Leong *et al*. (1990), Größler and Grübner (2006)

Competitive capabilities		Defined as the capability to
Price	1. Low price	Compete on price
Flexibility	2. Design flexibility	Make rapid design changes and/or introduce new product quickly
	3. Volume flexibility	Respond to swings in volume
	4. Broad product line	Deliver a broad product line
Quality	5. Conformance	Offer consistent quality
	6. Performance	Provide high-performance products
Delivery	7. Delivery speed	Deliver products quickly
	8. Dependability	Deliver on time (as promised)
Service	9. After sale service	Provide after sale service
	10. Broad distribution	Distribute the product broadly
	11. Advertising	Advertise and promote the product

Table I.
Dimensions of manufacturing strategy

Sources: Frohlich and Dixon (2001) and Miller and Roth (1994)

As can be seen in Table I, each dimension includes one or more defined capabilities.

The quality dimension includes the capabilities to offer consistent quality (conformance) and to provide high performance products (performance). The flexibility dimensions includes the capabilities to make rapid design changes and/or introduce new products quickly (design flexibility), to respond to swings in demand (volume flexibility) and to deliver a broad product line. The delivery dimension includes the capabilities to deliver products quickly (delivery speed), and to deliver on time (delivery dependability). The service dimension includes the capabilities to provide after sales service (after sales service), to distribute the product broadly (broad distribution) and to advertise and promote the product (advertising). The price dimension includes the capability to compete on price (low price).

The targeted competitive capabilities differ to certain extent depending on used business model. European manufacturing firms should recognize that competition

through solely a value or cost advantage, in many situations, is unsuitable (Al-Mudimigh *et al.*, 2004; Hilletofth, 2011; Walters, 2008). They should instead pursue a competitive advantage based on both value and cost, and focus on coordinating the value creation and the value delivery processes. This will generate opportunities to avoid price competition from low-cost countries, maintain profit margins and, at the same time, keep production in high-cost Europe (Hilletofth, 2011). Still, it is costly to implement and these costs must be deducted from somewhere else. Thus, SMEs could have financial difficulties implementing it completely and need to find the right components and competitive capabilities to focus on (Hilletofth *et al.*, 2012). The current research reported in the literature is mostly based on large manufacturing and service firms (e.g. Hilletofth, 2011; Walters and Rainbird, 2004; Williams *et al.*, 2002), however, research also exists with regard to SMEs (e.g. Hilletofth *et al.*, 2012; Wynn and Olubanjo, 2012). It can be argued that SMEs are following the larger companies and their management system implementations. For example, Wynn and Olubanjo (2012) reported implementation of ERP system at packaging company and it shared characteristics with the large ERP implementation wave taken place in the early 2000 in larger companies. Similarly, Hilletofth *et al.* (2012) reported transformation of furniture wholesaler to sustain in extremely difficult north European market, where it changed its production as China based, redesigned its products to favour demand postponement and mass customization as well as outsourced many distribution operations. This was the typical transformation story in larger company a decade earlier.

3. Research methodology

Operationalization and measurement

To operationalize the manufacturing strategy construct, we draw on selected extant research on the topic, namely on the work of Miller and Roth (1994). Table II shows evolution of their items, and the reliance of the current study on the revised set of items as suggested by Zhao *et al.* (2006), in which the original design flexibility of Miller and

No.	Competitive capabilities	Miller and Roth (1994)	Frohlich and Dixon (2001)	Zhao *et al.* (2006)	Current study
1	Low price	X	X	X	X
2	Design flexibility	X	X	–	–
2a	Ability to make rapid changes to products/services	–	–	X	X
2b	Ability to introduce new products/ services	–	–	X	X
3	Broad product line	X	X	X	X
4	Volume flexibility	X	X	X	X
5	Conformance quality	X	X	X	X
6	Performance quality	X	X	X	X[a]
7	Delivery speed	X	X	X	X[b]
8	Delivery dependability	X	X	X	X[c]
9	After sales service	X	X	X	X
10	Broad distribution	X	–	–	–
11	Advertising	X	–	–	–

Notes: [a]Exact back-translation "superior quality"; [b]exact back-translation "short delivery time"; [c]exact back-translation "correct timing of deliveries"
Source: cf. Zhao *et al.* (2006)

Table II. Comparison of manufacturing strategy operationalizations

Roth (1994) is broken down into two separate items, and the marketing related broad distribution and advertising are deleted.

In our study, each of the dimensions, and the corresponding item variables, are measured in a 1-7 Likert scale. To the general question: "Please assess the current significance of the following factors to the company", the response options ranged from "No significance" to "Critical significance", and an eighth response option was provided as the "No response" alternative, eliminating the possibility of forced assessments.

Data collection

The empirical data for this study was gathered by using a survey method by the means of an www-based questionnaire in March to April 2014, the design of which was considered earlier (the question set-up, as it appeared in the questionnaire, is presented in Appendix). The population for this study comprised of SMEs and large companies in Finland from 24 industry groups in manufacturing (SIC codes 10-33). Essentially, non-manufacturing and micro-sized companies were excluded from the scope of this research. According to the data of Statistics Finland (2014c), there were 2,541 SMEs and large firms in the manufacturing sector in Finland in 2013 (population).

Contact information of companies was obtained from a commercial database (i.e. a database containing information over 450,000 companies operating in Finland). The chosen database was the preeminent possibility to get contact information comprehensively about the whole population. The eventual distribution list created by the means of the database for the questionnaire included 3,751 personal e-mail addresses of CEOs, production and purchasing managers in 1,945 different companies (i.e. covering 77 per cent of the population).

An internet-based survey was determined to be an appropriate and cost-effective method in order to achieve the objectives of this study. A web-based questionnaire was initially tested with a small group of practitioners. An invitation to participate in the questionnaire was sent to all the email addresses in the list followed a week later by a first reminder message. On the whole, reminder messages were provided to participants, who did not respond, four times. For the eventual data set, if more than one response were received from the same company, the most complete response was chosen. In total, 244 valid questionnaires were collected, with a response rate of 12.6 per cent. However, due to our focus on SME manufacturing strategies, we limit our analysis only to the SMEs in the sample. The number of SMEs among the respondents was 191 enterprises. Table III presents the main characteristics of the sample companies.

The sample firms represent all manufacturing industries in Finland. Comparing respondent frequencies as per industry with the population of manufacturing firms, we observe our sample to be slightly biased towards the machine building (21 per cent of sample) and electronic appliance manufacturing (13 per cent of sample), whereas metal products manufacturing (18 per cent of sample) is underrepresented. In addition to

Table III. Frequency distributions of the respondents (SMEs)

Turnover 2013 (M€)	%	No. of employees	%
2-5	35	10-25	27
5-10	20	26-50	36
10-20	22	51-100	20
20-50	23	101-250	17
Total	100	Total	100

those previously mentioned, the well represented industries in our sample are food and drink processing (9 per cent of sample), and timber and wood products manufacturing (7 per cent of sample). Considering the Finnish industrial landscape, the sample appears therefore to represent it adequately. All SME respondents of the survey and their distribution within Finnish industrial classification system is shown in Table IV.

Assessing nonresponse bias is an essential part of the survey process. Non-response bias refers to the bias that exists in the data as respondents are different from non-respondents with regards to important characteristics, and therefore generalization is problematic. In this study the representativeness of the sample is based on comparison between respondents and non-respondents on characteristics known a priori, which is a technique to detect the existence of nonresponse bias (Wagner and Kemmerling, 2010).

Prominent differences between respondent and non-respondents, in terms of known economic information, were not found. In the present study, the non-response bias was approached via *t*-tests comparing key ratios (collected from the database prior to the survey, e.g. turnover, operational profit, profit margin), between respondents and non-respondents. Statistical significance was based on two-sided tests evaluated at the 0.05 level of significance. The results suggest that respondents tend to be at the larger end of the SME size scale, both in terms of personnel and turnover.

In addition to comparison between respondents and non-respondents, we used extrapolation to examine non-response bias (Armstrong and Overton, 1977; Wagner and Kemmerling, 2010). Extrapolation is one of the most widely used techniques, and it is based on the assumption that late respondents are similar to non-respondents and if there is no difference between early and late respondents, generalization is possible. By using this method, we conclude that there are no differences between early and late respondents. Overall, however, we conclude that our sample is slightly biased (contains

Classification (TOL2008)	Industry	Frequency	%-share of total
25	Metal products	39	20
28	Other machines and equipment	38	20
10	Food	17	9
16	Timber and wood products	15	8
26	Computers and electronic/optical products	13	7
22	Rubber and plastic products	11	6
27	Electrical equipment	11	6
23	Other non-metallic mineral products	8	4
31	Furniture	8	4
29	Motorized vehicles and trailers	6	3
32	Other	6	3
20	Chemicals and chemical products	5	3
18	Printing	3	2
30	Other vehicles	3	2
15	Leather and leather products	2	1
17	Paper and paper products	2	1
13	Textiles	1	1
14	Clothing and apparel	1	1
21	Pharmaceuticals	1	1
24	Metal refining	1	1
	Total	191	100

Note: $n = 191$

Table IV. Respondents (SME manufacturers) of the manufacturing strategy survey and their respective industrial classification

more of the larger SMEs, as well as SMEs from technology-intensive manufacturing industries), and that interpretation and comparison of results with other research results should take this into account.

In addition to the collection of a primary data set by the means of a survey, we collected corresponding financial data from commercial secondary sources, including full income statements and balance sheets of Finnish firms. The contact list acquired from the database contained additional firm specific data, such as the official identification codes of the firms. As each respondent was given an individual response link to the survey, we were able to control response as per each firm, and finally establish a connection between the responses in the primary data set (survey-based) and the firms' financial data for year 2013.

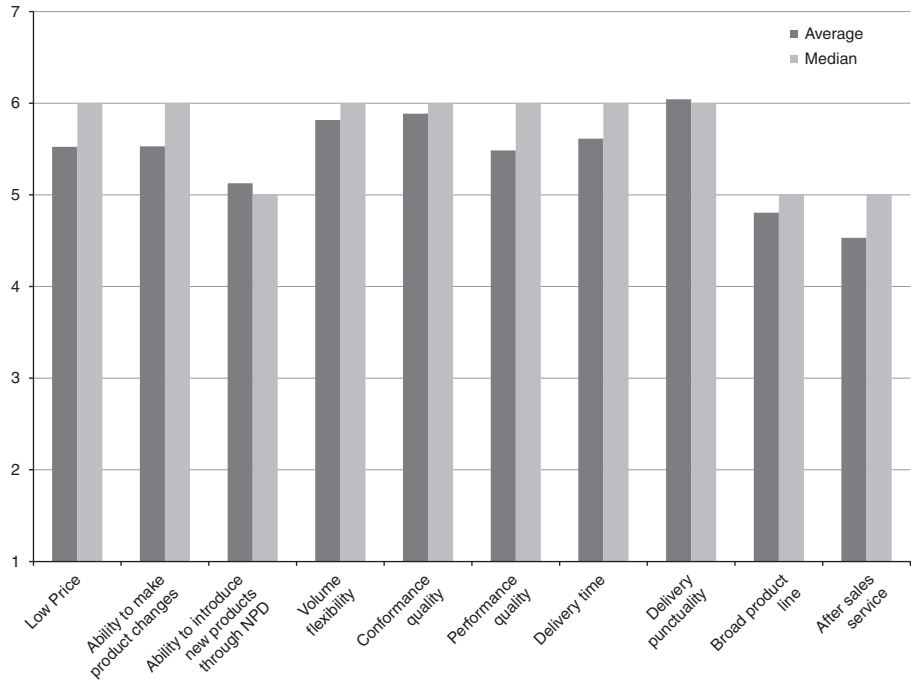
In terms of data analysis, regressions analyses were completed with a backward elimination procedure, starting with all possible independent variables (see Appendix). Alternative dependent variables include revenue, profit and loss and employment. Revenue and employment are typically followed performance measures in European Commission (2015) based company classification system and to evaluate company growth. This classification is commonly agreed and used throughout this continent, including Finland. In turn within accounting and management discourse, revenue growth and profits achieved are followed closely as performance objective at company level (Mabin and Balderstone, 2003; Gupta, 2012; Haslam *et al.*, 2013). If an independent variable was detected to be statistically significant in the initial model, or very close to the limit of 0.05 level p-value, then it was included in the consecutive regression model. The objective was to specify as small as possible models. In addition, intercept was tested, in order to determine whether or not it would be significant. In all models, fixed intercept was not taken to be a part of the final regression model and all accepted and statistically significant models were forced to start from zero.

4. Empirical findings

Key findings from the manufacturing survey

Manufacturing strategy prioritizations or importance among Finnish SMEs was consistently high in some dimensions, whereas in others, differences could be detected. The importance of some items was unexpectedly low. As shown in Figure 2, volume flexibility, conformance quality and delivery punctuality are all prioritized to have high importance, with both average as well as median values close to each other. In other words, respondents feel that these particular dimensions are important, and furthermore, the distribution is not heavily skewed. Similarly, to these three dimensions, low price, ability to make product changes, performance quality and delivery time are indicated to have high importance for the respondents. However, the response is not consistent, as the averages appear to be so considerably below the median values. This suggests that some companies value these much less.

What is interesting to note in the responses is the overall low importance of after sales service activity as well as the low prioritization of broad product line and ability to introduce new products. These appear strikingly low in comparison to the other dimensions, although these have been argued to be among the key competitiveness attributes according to the literature as well as the leading management practice. New products and product lines may surely be suggested to improve sales and profitability, and after sales services business is often the most profitable in many companies. However, it could be so that SMEs are not able to significantly influence these dimensions of manufacturing strategy. Perhaps larger companies do this, as their



Note: Scale from one (no importance) to seven (critical significance)

Figure 2. Manufacturing strategy dimensions among SME respondents described with average and median values ($n = 191$)

customers operate on these dimensions, and what is left for SMEs is to fulfil the role of prompt, short lead time and high quality supplier. In addition, the lack of capital for enabling investment into these dimensions could be another reason for low prioritization.

All the manufacturing strategy dimensions were analysed with ANOVA single-factor analysis, showing that the dimensions do not form a single factor, suggesting that the responses differ across the ten dimensions. Also the manufacturing strategy dimensions ranked lower (i.e. ability to introduce new products, broad product line and after sales) differ between each other, so companies are not responding similarly in terms of these three items (in other words, companies value these factors differently). However, in terms of the three most highly ranked dimensions among the respondents (i.e. volume flexibility, conformance quality and delivery punctuality), ANOVA analysis shows these to be similarly prioritized to each other. This suggests that companies that rank volume flexibility high, will do so also regarding conformance quality and delivery punctuality.

Performance implications of manufacturing strategy

Influence of manufacturing strategy on financial performance was analysed by linking survey responses to the annual financial reports of respondent companies. For this analysis we used only those annual reports, which had been audited. For analysis we selected three basic indicators: revenues (absolute, EUR), profits/losses (absolute, EUR) and employment (absolute, head-count). As companies have accounting periods of different length (typically 12 months from January of each year to the end of December, but also six to nine months long as well as up to 18 months), revenue and profit/loss

data were converted to monthly amounts (by dividing the respective performance value with the number of months in the accounting period of each firm). The three performance measures were taken from the most recent audited annual reports, which in most cases were from 2013 (170 firms), while for a minority of companies we had to rely on data from 2012 (nine firms).

All the three financial data performance measures were run one-by-one first with all the ten manufacturing strategy dimension variables, and thereafter the backward elimination procedure was conducted to reduce model size to include only the variables, which were of statistical significance. After the procedure and some iteration, three models, one for each financial performance measure, were specified and selected as final models. These are shown in detail in Table V. The suggested cause and effect relationships of three regression models are shown in Figure 3.

		Coefficients	SE		
Revenue (dependent)					
$n = 184$	MANSTR_PRODCHANGE	−129.4*	57.6	R^2	0.587
	MANSTR_SUPERIORQUAL	208.6***	54.3	Adjusted R^2	0.577
	MANSTR_SERVICE	139.9**	47.7	SE	928.8
Profit and loss (dependent)					
$n = 184$	MANSTR_NPD	13.6*	6.0	R^2	0.165
	MANSTR_VOLFLEX	−23.0**	6.7	Adjusted R^2	0.150
	MANSTR_SUPERIORQUAL	18.2**	6.6	SE	106.4
Employment (dependent)					
$n = 184$	MANSTR_SPECQUAL	10.1***	0.6	R^2	0.580
				Adjusted R^2	0.575
				SE	51.5

Notes: *,**,***Statistically significant at 0.05, 0.01 and 0.001 levels, respectively

Table V.
Regression models for revenue, profits and loss, as well as employment

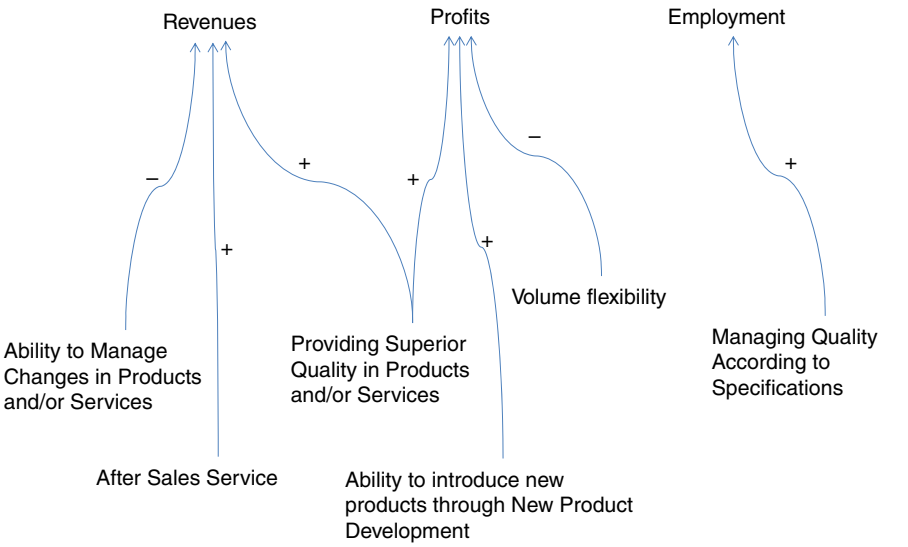


Figure 3.
Causes and effects as suggested by the three regression models

As is shown, after sales service has positive impact on revenues. What is interesting in Figure 3 is the apparently double positive effect we may detect from performance quality (superior quality). Furthermore, the ability to introduce new products through new product development process seems to be connected to higher profits among respondent companies. Rather unexpectedly, priority in introducing changes in products and services was analysed to have negative effect on revenue. Also profits appear to decline, if volume flexibility is increased among manufacturing SMEs. Socially and macro-economically important employment development was only found to be dependent on conformance quality, suggesting that companies meeting the specifications set by customers for products and services, are able to grow and maintain operations and employment.

Based on these three regression models, it can be stated that the revenue model in Table V, together with employment model, show quite good explanation level as R^2 value is approaching 60 per cent. Profit and loss regression model on the other hand is performing in somewhat lower R^2 level, i.e. below 20 per cent, suggesting that despite statistical significance of the model, it explains to a limited extent the variation in profit and loss. Another goodness of fit criteria used in statistically significant regression models is standard error. In the revenue and employment models, it is just roughly below 90 per cent from the entire respondent group average performance. This means that variation in sample exists in both directions, and good R^2 value could be result of high negative and positive values, which compensate each other. However, this standard error is somehow acceptable in these two models. However, in profit and loss regression model it is very high, i.e. above 300 per cent as compared to entire respondent group average. This makes profit and loss regression model questionable as R^2 value is also very low.

5. Discussion and implications

The period after the GFC of years 2008-2009 has been extremely difficult for Finnish manufacturers. Typical pre-crisis revenue levels have been affected by a 20-30 per cent drop in the time period of 2008-2013. It is quite surprising that so many companies have survived this severe crisis through downsizing and cost control. However, this is not the case in all companies. Even after our survey, conducted in March to April 2014, some respondent companies have faced bankruptcy or significant loan restructuring negotiations with banks and other creditors. Considering the case of a small manufacturing company, which ended up in bankruptcy, is good illustration of the earlier presented regression models, which were based on the entire SME manufacturing sample. In the following, this company is referred to as Beta.

In the media, Beta argued that the main reason for their bankruptcy was significant product development spending, which did not produce desired results, in terms of significant improvement of revenues and profits. This appears to be an accurate analysis as the company's revenues were significantly declining (from year 2010 by some 60 per cent), while other expenses in profit and loss statement continued to increase (by approximately 40 per cent from year 2008), and in terms of assets, the total amount of R&D expenditure increased significantly. In the final full accounting year, Beta brought in significantly less revenue and ended up making loss. This appears to have been too much for the cash reserves as well as in terms of the ability to continue operations. The case illustrates the danger of blindly trusting on the potential from the R&D spending, and that new products may not bring success and do not necessarily serve as the magic formula for recovery. It is very risky to invest heavily on tangible and intangible assets as the operating environment in terms of revenue is in significant

decline. This adds to previous research (Minguela-Rata *et al.*, 2014), with notions in support of the idea that R&D activity should be controlled (e.g. in terms of project size and scope) and done in collaboration with customers and other stakeholders. These ought to avoid over-spending on R&D as being compared to an organization acting alone (vs collaboration with numerous external bodies). This collaboration of course delays development activity, but gives proper focus and scale for work going to be accomplished (Naqshbandi and Kaur, 2014).

In its survey response, Beta emphasized all other manufacturing strategy aspects as important, but indicated that its prioritization and ability to introduce new products was considerably lower than average. It also did not perceive superior quality as priority in its strategy. It should be noted that these responses should be interpreted through failed R&D and big investment during several years. As size of this one product development effort was so significant, it constrained further development after the recently experienced new product introduction failure. Maybe because of this reason, capability in terms of superior in quality is not perceived as a priority either. This gives a further argumentation point to discussion of the earlier regression analyses. For example, revenue and profit/loss are affected by other different factors, and only superior quality has positive impact on both of the desired financial outcomes. Strategic moves in terms of only focusing on R&D or just concentrating on after sales services do not serve as recipes for success. However, taking all of these factors in to account in a balanced manner, good results can be achieved. This adds support for earlier discussion on value creation and delivery, as well as cost on competitiveness (Al-Mudimigh *et al.*, 2004; Jüttner *et al.*, 2007; Walters, 2008; Hilletofth, 2011), which suggests that all competitive dimensions should be emphasized simultaneously in order to have sustainable business performance.

The period after the 2008-2009 and caused changes in the economy has been extremely difficult for Finnish manufacturers, as they typically have served sizable engineering projects, which have been difficult to fund after GFC. In addition, cost competition has been harsh and high cost manufacturers have suffered in tenders. For these companies our research suggests an approach that balances a set of dimensions. In the forthcoming years, significant economic growth and investments may be improbable. Therefore, companies need to concentrate more on quality and particularly superior quality as valued by customers in terms of the offered products and services (to stay in the market), but also to assure that after sales services are offered and taken seriously. Based on our survey findings, this point a direction for higher revenues, and also with proper management, this suggests also an opportunity for profitable business. However, it should be emphasized that regression models did not identify profit increase, but every time there is revenue increase due to services, there is an opportunity for profits (if managed correctly). Also, based on our regression models, new product development activity should be maintained, giving further opportunities, if linked to superior quality experience of customers and the ease receiving after sales service later on in the product life-cycle. Also in terms of new product development activity, it should be ensured that the superior quality experience is being achieved as it has double impact on both revenues and profits.

The operational flexibility and agility related dimensions of ability to make product changes and volume flexibility were identified in regression models independent variables with negative ones effects on the dependents (first one negative effect on revenue and second one on profit). This makes sense in the context of shrinking revenues and markets since the GFC. It may be on one hand being flexible and agile,

has meant for some companies that they have been able to continue operations and survive, but on the other hand, revenues and profits have declined. This suggests the challenges in managing flexible operations, as for example, making numerous product changes may lead to difficulties in the management of after sales function as product variants and amount of purchased items increases (over the service life-cycle of several decades). This without a doubt limits the ability to serve customers in after sales as inventories of spare part items cannot be used extensively.

From the larger society and macro-economic perspective, this research has several implications. First of all, it is worrying that employment is only connected to specification quality. Of course, employment after the GFC has decreased in manufacturing companies, but more dynamics and connection of employment to revenue and profits is needed. In developed economies inflexibility exist regarding employment, and more could be done in terms of enhancing weekly or monthly flexibility in working hours, as well as on lowering the vast responsibility of employer for health benefits, sick/parental leave and vacations. Also hiring people for shorter time periods should be made easier. Regression modelling shows that manufacturing SMEs with priority in volume flexibility demonstrate lower profits. This may suggest that the costs of flexibility in developed countries, such as Finland, are too high. Put simply, in order to maintain profitability, demand should be stable and not fluctuate, enabling longer-term planning and to pay all the obligations to society and employees. However, in the global manufacturing market, this is not a realistic demand, as countries operating with higher costs should be able to offer higher flexibility and quality in order to stay competitive. The constraints for flexibility should be addressed in order to facilitate the competitiveness equation and make it work for manufacturing SMEs in high-cost countries. In addition to operational issues, society should extend support for new product development that involves collaboration of different actors such as research institutes, universities and the public sector.

6. Conclusions

Manufacturing industry in advanced economies is in many cases undergoing significant transformation, and in the case of Finland, the economy is in the middle of continuous economic hardship. In the operating environment there also exists some hindering factors and additional costs as manufacturers are asked to pay for additional compensation for employees (sick leave, maternity leave, vacations and part of the healthcare) and society (in the form of various payments and taxes). However, these could be justified to belong to the social responsibility and external costs of any for-profit organization.

Based on our results, low prioritization is often given to after sales activity, broad product line and ability to introduce new products. Two of these three attributes are included in the regression models, after sales service seems to increase revenues and the ability to introduce new products improves profits. It is also interesting to note that our study emphasized the importance of quality: specification quality improves employment, whereas performance quality (superior product and/or service) improves both revenue and profit. Manufacturers should give further attention to achieving superior quality formation, as it appeared that the mean value was considerably below the median value. In other words, some manufacturers perceive superior quality to bring very small benefits for them, or superior quality is otherwise out of reach. In terms of the former, our study shows that this is not the case and among manufacturing SMEs, superior quality drives two important financial indicators.

There is perhaps a consensus on regarding SMEs having in earlier crises beat the difficult situation with bold investments in either tangible or intangible assets (or both). However, we find little evidence in our sample of this sort of success. As for revenue the low growth mode may persist for years, the priority will be given for survival and for developing long-term competence through balanced prioritization of developing new products, providing after sales service and offering superior quality. This has been reported to serve as a success recipe for German manufacturers, suggesting that other advanced country companies should follow this strategy.

As further research, we suggest replicating our research design in other advanced European countries. Some of these suffer from poorly performing manufacturing activity, such as France and Italy. Successful countries such as Germany and Sweden could also be targeted. Consequent enhanced understanding about other countries and their manufacturers would facilitate the increase of competitiveness of European manufacturing in the global market.

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Further reading

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Appendix

Please assess the current significance of the following factors to the company	No significance	Negligible	Somewhat negligible	Moderate	Somewhat considerable	Considerable	Critical significance	No response
Price based competition	☐	☐	☐	☐	☐	☐	☐	☐
Ability to make rapid changes to products/services	☐	☐	☐	☐	☐	☐	☐	☐
Ability to introduce new products/services to the market	☐	☐	☐	☐	☐	☐	☐	☐
Broad product line	☐	☐	☐	☐	☐	☐	☐	☐
Flexibility in terms of production volume	☐	☐	☐	☐	☐	☐	☐	☐
Quality in terms of conformance to specifications	☐	☐	☐	☐	☐	☐	☐	☐
Quality in terms of superior quality	☐	☐	☐	☐	☐	☐	☐	☐
Short delivery time	☐	☐	☐	☐	☐	☐	☐	☐
Timeliness of deliveries	☐	☐	☐	☐	☐	☐	☐	☐
Maintenance and product support services	☐	☐	☐	☐	☐	☐	☐	☐

Table AI. Questionnaire set-up in terms of the manufacturing strategy construct related question (translated from Finnish)