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Strategic manufacturing priorities for South African manufacturers: the need to shift emphasis and improve on current performance levels

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The findings of an empirical research project show that the majority of so-called large South African manufacturers acknowledge that manufacturing-based strategies enhance the competitive capabilities and advantages of their firms and that this contributes to long-term, superior business performance and success. They also recognize that superior manufacturing capabilities will be prerequisites for the improvement on both their national and international competitive positions in the future. To better their positions in these markets, the manufacturers need to shift their emphasis (in order of priority) to: (1) high quality, low cost and high dependability, all of priority number (1); (2) high speed; and (3) high flexibility. They also need to improve on their current performance levels in all of these strategic manufacturing priorities by an average of between 20% and 30%.

Introduction

South African businesses will face unprecedented opportunities (as well as threats) in the future. Following this country's most remarkable political transformation, which culminated in its first non-racial, democratic election being held towards the end of April 1994, since then its businesses have unequivocally entered the international competitive arena as fully normalized players. South African businesses should (or probably have already) realize(d) that it is one thing to compete against known local competitors in familiar regions but quite another to succeed against unknown international challengers from unfamiliar territories. It is not simply a question of how South African businesses will manage to compete with their products and services in various international markets, but also (and perhaps even more difficult to answer), how these businesses will deal with the unpredictable impact of international businesses entering the South African marketplace. Thus South African businesses – whether they voluntarily choose to enter the global competitive marketplace directly, or are involuntarily exposed to the presence of international competitors in their traditional domestic markets – all have to re-examine their business (or corporate) strategies if they are to defend and improve on their current business performance.

In a research project conducted by Krüger during 1996, which limited its focus to South African businesses currently operating in the manufacturing sector, it was argued that *the way to deal with the competitive forces emerging from their new exposure to and participation in the international business environment, was to increase the use of manufacturing-based strategies*¹ (those emphasizing certain strategic manufacturing priorities such as low cost, high quality, greater flexibility, speed and dependability). This, it was further argued, would enhance their competitive capabilities and advantages, which are essential ingredients for achieving long-term, superior business performance and success.

This article, which reports some of the empirical findings of the above-mentioned research project, first describes the theoretical background and then gives details of the research design and methodology. After the presentation of the research results, a number of conclusions are drawn and recom-

mendations made for South African manufacturers concerning what the proposed future emphasis and performance levels should be in terms of their strategic manufacturing priorities.

Theoretical background

Introduction

In this section, the author reviews the emergence of manufacturing-based strategies and their potential to enhance the competitive capabilities of a business for achieving long-term, superior business performance and success, the terminology or different 'labels' used to describe strategic manufacturing priorities and the wide range or the many different types of such priorities.

Emergence of manufacturing-based strategies and their potential to enhance the competitive capabilities of a business

Hayes & Wheelwright (1984: 396) proposed a four-stage model which illustrates the evolution of manufacturing's strategic role. These stages, according to Slack, Chambers, Harland, Harrison & Johnston (1995: 50–52), highlight the increased competitive role and progressive contribution of the manufacturing function in a business. The stages range from the largely negative stage one of internal neutrality (captioned by the phrase 'avoid or stop making mistakes'), to stage two of external neutrality (phrased 'being among the best'), to the more positively oriented stage three of being internally supportive (phrased 'to be clearly the best'), and finally, to stage four of being externally supportive (phrased 'sustain superiority through manufacturing-based advantages'). In stage four, where manufacturing is a central element in the competitive strategy of the business, it not only develops appropriate resources and implements the competitive strategy, but also becomes the long-term driver of the overall business strategy.

Crowe & Nuño (1991: 88) also refer to the progressive contribution of manufacturing strategies. They argue that for many years, the traditional role of manufacturing was simply to manufacture products in response to orders from the marketplace. This independent-market, dependent-manufacturing view (typically Hayes & Wheelwright's [1984] stages one or

two), however, did not provide the opportunity for the adoption of manufacturing-based strategies through which competitive advantages could be sought for enhancing the competitive position of a business. These authors then observe that over the last two decades consensus has been reached that the manufacturing function of a business must play an even larger role in the development of the overall business strategy. It should move from a position of merely reacting or seeking alignment with the market to one of helping to create the market by adding competitive advantages to the business (strategies operating at stage three and ultimately, at stage four of Hayes & Wheelwright's [1984] model).

Zahra & Das (1993: 90) further elucidate on this relatively new idea that manufacturing strategies should contribute to the competitive advantage of a business (which Feurer & Chaharbaghi [1995: 15] define as 'a factor or a combination of factors which make an organization more successful than other organizations in a competitive environment') in order to achieve superiority in the marketplace. They note that a manufacturing-based strategy

'... creates and adds value by helping a firm establish and sustain a defensible competitive advantage which is the unique position an organization develops *vis à vis* its competitors'.

The emergence of manufacturing-based strategies as a separate but related functional component of an overall business strategy (Miller & Roth, 1994: 285) is thus now generally accepted as an indispensable tool for both sustaining current and creating new markets by enhancing the competitive position of and adding competitive advantages to a business. The importance of such strategies for businesses primarily operating in the manufacturing sector (which is the focus of this article) is thus even more pronounced.

Strategic manufacturing priorities

Vickery, Droge & Markland (1993: 437) note that a multiplicity of 'labels' have been applied to items such as product, volume and process flexibility, low production cost, delivery speed and dependability, reliability, durability and quality. They view these items as competitive abilities that a business should seek to acquire, sustain or improve on. Other labels or terminology often used in the literature to describe these competitive abilities include: competitive devices or methods, strategic choice attributes, competitive strategy variables, manufacturing competitive priorities, performance objectives and customer requirements. In the afore-mentioned research project and this article, the term 'strategic manufacturing priorities' is used, partly because of the inherent strategic nature of the items and also to emphasize that the focus is on manufacturing businesses.

Not only do many authors use various 'labels' or different terms to describe strategic manufacturing priorities, but they also identify many different types. For example, Miller & Roth (1994: 289) use the term 'competitive capabilities' and identify the following eleven: low price, design flexibility, volume flexibility, conformance, performance, speed, dependability, after sales service, advertising, broad distribution and broad line. Schlie & Goldhar (1995: 105) use the term 'generic competitive advantages which can create customer value' and identify the following eight: low price, higher

quality (higher reliability and level of performance), sooner availability, better customer service, greater attractiveness, greater awareness, long-term relationships and socio-psychological-political-cultural factors. Garvin (1993: 94-96) uses the term 'disaggregated strategic priorities' and lists items in both their aggregated and disaggregated format. His list is the most comprehensive but the following examples illustrate why so many different types of strategic manufacturing priorities appear in the literature. 'Quality' is disaggregated to performance, features, reliability, conformance, durability, serviceability, aesthetics, and little variability while 'delivery' is disaggregated to accuracy, completeness, dependability, availability, speed, ease of ordering, ordering flexibility, shipment flexibility and ease of return.

Slack *et al.* (1995: 53) argue that for any organization to succeed in the long term, it needs operations-based (or manufacturing-based) advantages. They identify a set of five performance objectives (also elsewhere referred to as competitive factors) which operations (or manufacturing) management should try to achieve for the business to gain an operations-based advantage, and further, for it to contribute to its competitiveness. These performance objectives are: 'doing things right' (for a quality advantage), 'doing things fast' (for a speed advantage), 'doing things on time' (for a dependability advantage), 'being able to change what is done' (for a flexibility advantage) and 'doing things cheaply' (for a cost advantage).

It should be clear that a wide range or many different types of strategic manufacturing priorities appear in the literature. To meaningfully determine on which strategic manufacturing priorities South African manufacturers placed their current, and should place future emphasis, it was necessary to narrow down the potential number of items considerably. This was not done before the issue of trade-offs between the items had first been considered in conjunction with the earlier discussed notion of stages three or four (Hayes & Wheelwright, 1984) manufacturing strategies.

Arguments against or for trade-offs

Collins & Schmenner (1993: 443), Schonberger & Knod (1991: 67) and others, argue that no trade-offs can or should be made between different strategic manufacturing priorities. They note that world-class manufacturers are recognized for their excellence in providing customers with good quality products at low cost, delivering both rapidly and frequently, and being flexible. These attributes are thus regarded as 'givens' without which businesses cannot hope to compete.

Crowe and Nuño (1991: 89), Garvin (1993: 87) and others, however, argue that some form of a trade-off between different strategic manufacturing priorities is a necessary step. More specifically, Hayes & Pisano (1994: 78) argue that in turbulent environments, the goal of strategies is not the same as in stable environments. In these environments the goal should rather be strategic flexibility. Their concept follows in the footsteps of the idea of focussed factories where it is argued that no single organization can do all things equally well. For example, one plant cannot provide equally well for a price-driven market and for a market where a premium is paid for high quality and customized features. Because of the existence of the product-process life cycle, the relative

importance of competitive priorities will automatically shift and this will have important implications for manufacturing. These authors thus argue that the manufacturing function of a business should have the capability to 'switch gears'.

Referring back to the notion of 'operations-based' advantages, Slack *et al.* (1995:86) point out that in certain circumstances some of the performance objectives (or priorities of the different competitive factors) may be more or less important to a particular business. According to them, a useful way of determining the relative importance, is to distinguish between what Hill (1985: 49-51) refers to as 'order-winning' and 'qualifying' factors. While the latter refers to factors which are not seen as major determinants for winning business as the first are, they do represent aspects of competitiveness where the performance of the business must be above a particular level to even be considered by a customer. Both these two sets of factors, according to Russell & Taylor (1995: 16), form part of a stage three or four manufacturing strategy (Hayes & Wheelwright, 1984), which is also seen by them as the 'ideal' manufacturing strategy stages. Apart from the influence of the initial strategic focus in terms of 'order-winning' of 'qualifying' factors, Slack *et al.* (1995) also argue that the relative priority of the business' performance objectives will further be influenced by (1) its customers' requirements, (2) what its competitors are doing, and (3), as pointed out earlier, the stage of its products in their life cycle.

However, while not ignoring the criticism's warning against trade-offs, the view advocated by Slack *et al.* (1995) and others was followed. In this regard the perceived value of their identified performance objectives (referred to as strategic manufacturing priorities in the research) was determined for the different businesses included in the research population. Not only were they asked to indicate their current strengths and/or weaknesses in each of the strategic manufacturing priorities, but they were also asked to predict the future importance of these priorities, first, for competing against local (or national) competitors, and secondly, for competing against international competitors.

Research design and methodology

Conceptual research framework

Figure 1 illustrates the conceptual research framework, which was designed to examine the use of strategic manufacturing priorities by South African manufacturers for enhancing their competitive capabilities and advantages to achieve long-term, superior business performance and success. As indicated, the framework has four major decision points which entail determining:

1. The present (and future potential) contribution of manufacturing strategies to achieve long-term, superior business performance and success and the future importance of superior manufacturing capabilities to better compete against national and international competitors.
2. The current strengths and/or weaknesses of South African manufacturers in terms of strategic manufacturing priorities such as high quality, low cost, high speed, flexibility and dependability.
3. The future importance of the listed strategic manufacturing priorities to better compete against both national and international competitors.

Strategic manufacturing priorities

Major decision points 1 to 4

Contribution	Current strength/weakness	Future importance
1	2	3
Presently:	Quality Cost Speed Dependability Flexibility	Nationally
		Quality
		Cost
		Speed
		Dependability
In future:		Internationally
		Quality
		Cost
		Speed
		Dependability
Flexibility		
3-point scale:	5-point scale	5-point scale
(Yes/Not sure/No)	from very weak to very strong	from not important to very important
4		
Areas for change in emphasis and/or improvement (Compare 2 with 3)		

Figure 1 Conceptual research framework

4. The areas in which these businesses need to shift their emphasis and/or improve on their current performance to better compete against national and international competitors.

Research population

The research population encompassed individuals who (1) held managerial posts in a South African-based manufacturing business; (2) where the company or business employed more than 500 people; (3) was located or situated in all geographical regions in South Africa; and (4) in any one of all the SIC (Standard Industry Code) category manufacturers (that is food and beverages, textiles and clothing, wood products and furniture, paper and printing, chemical and plastic products, pottery and glass, iron and steel, fabricated metal products).

The names and addresses of 639 companies/business, that complied with the above definition of the research population, was identified through the industrial database of the Bureau of Marketing Research (BMR) of the University of South Africa (Unisa).

Data-collection procedures

On the basis of the major decision points of the conceptual research framework (see the first part of this section), a questionnaire was compiled and posted to all the businesses of the research population. Each questionnaire had a covering letter addressed to the Managing Director in which further details of the purpose and nature of the research project were given. One hundred and thirty four completed questionnaires were

returned, which represented a response rate of 20.8%. This response rate is similar to other reported survey research by mail questionnaires where returns of less than 40% are common (Kerlinger, 1986: 380). While the response rate that was obtained is lower than what was hoped for and could limit the extent of valid generalizations, there is no reason to believe that a particular bias occurred. Rather it was a question of time (note that the respondents work in private companies where time is normally at a premium) and/or respondent fatigue (due to the many mail surveys being conducted at the same time) and/or genuine non-interest in the topic of the research.

The research strategy selected was the survey method. Because of the relatively simple nature of the questions, the questionnaire was not subjected to a formal pretest. Instead an informal pretest was done by consulting fellow colleagues on the clarity of questions and ease of use for later statistical analysis. On the basis of feedback obtained through the informal pretest, the original questionnaire was revised and included changes to its structure, wording and general appearance. In this case, the purpose of the informal pretest was thus to improve on the eventual accuracy of responses (or reliability of the questionnaire) (Kerlinger, 1986: 405, 415) and on the construct validity of the measuring instrument, the questionnaire itself (Kerlinger, 1986: 420).

Research results

a. Present contribution of manufacturing strategy towards long-term, superior business performance and success

The results, which reflect the present contribution of the manufacturing strategy to achieving long-term, superior business performance and success, are presented in Table 1. A total of 81% of the respondents believed that the manufacturing strategy of their company definitely contributed to its long-term business performance and success. A small percentage (8%) of the respondents completely disagreed with this view while 11% were unsure.

b. Future importance of superior manufacturing capabilities to improve the national and international competitive position of business

The results, which reflect the future importance of superior manufacturing capabilities to improve the national and international competitive position of the businesses, are presented in Table 2. A large majority of the respondents (98%) believed that the manufacturing capabilities of their company would become more important to better compete against

Table 1 Frequency table of contribution of manufacturing strategy to enhance long-term, business performance and success

Contribution	Yes	Not sure	No	Total N
N	107	15	10	132
%T	81.1%	11.4%	7.5%	100%
\bar{x} s				1.270 0.590

N = frequency; %T = percentage of total;
 \bar{x} = average; S = standard deviation

Table 2 Frequency table of future importance of superior manufacturing capabilities to compete nationally and internationally

Future importance	Yes	Not sure	No	Total N
N	127	1	2	130
%T	97.7%	0.8%	1.5%	100%
\bar{x} s				1.040 0.260

N = frequency; %T = percentage of total;
 \bar{x} = average; S = standard deviation

national and international competitors in the future. Only about 1% of respondents disagreed completely, while 1% were also unsure.

It should be noted that a higher proportion of respondents supported the belief that superior manufacturing capabilities would become more important in the future than those who supported the idea that their company's manufacturing strategy did contribute to its long-term, superior business performance and success. This movement towards higher support was confirmed as statistically significant with the aid of the non-parametric Wilcoxon matched-pairs signed ranks test (see Table 9).

c. Current strength and/or weakness of strategic manufacturing priorities

The results, which reflect the current strength and/or weakness of the strategic manufacturing priorities listed, are presented in Table 3.

On the basis of the calculated weighted average scores, the rank order for the current strength and/or weakness of the

Table 3 Current strength and/or weakness of strategic manufacturing priorities

Current strength	Quality N %T	Cost N %T	Speed N %T	Dependability N %T	Flexibility N %T
V.Weak	0 0.0%	6 4.5%	2 1.5%	0 0.0%	2 1.5%
w1					
Weak	5 3.7%	29 21.6%	28 21.2%	7 5.2%	27 20.5%
w2					
Neutral	16 12.0%	54 40.3%	48 36.4%	38 28.4%	42 31.8%
w3					
Strong	82 61.7%	37 27.6%	47 35.6%	65 48.5%	51 38.6%
w4					
V.Strong	30 22.6%	8 6.0%	7 5.3%	24 17.9%	10 7.6%
w5					
Total	130 100%	134 100%	132 100%	134 100%	132 100%
#Average	4.032	3.090	3.220	3.790	3.303
S	0.710	0.950	0.890	0.800	0.930
Rank*	(1)	(5)	(4)	(2)	(3)

N = frequency; %T = percentage of total; w_{1-5} = weight; V.Weak = very weak; Rank = rank order, S = standard deviation; V.Strong = Very strong; #Average = weighted average

* A pure mathematically derived rank order and is not necessarily statistically significant. Such a rank order can be deduced from the Wilcoxon matched-pairs signed rank test shown in Table 4.

Table 4 Wilcoxon matched-pairs signed ranks test: movement within a decision point

Comparison	Mean rank	-Ranks	+Ranks	Ties	N Z-Value	2-Tail p
S4(c) (QLTY)	53.6	87	14	32	133	0.0000*
←S4(c) (COST)	34.6				-7.085	
S4(c) (QLTY)	49.4	81	13	37	131	0.0000*
←S4(c) (SPED)	35.9				-6.658	
S4(c) (QLTY)	35.8	49	22	62	133	0.0066*
←S4(c) (DPDB)	36.6				-2.716	
S4(c) (QLTY)	47.8	75	15	41	131	0.0000*
←S4(c) (FXBT)	34.1				-6.184	
S4(c) (COST)	44.8	35	51	46	132	0.1949
←S4(c) (SPED)	42.6				-1.296	
S4(c) (COST)	40.0	19	80	35	134	0.0000*
←S4(c) (DPDB)	52.5				-5.986	
S4(c) (COST)	49.5	36	59	37	132	0.0648
←S4(c) (FXBT)	47.1				-1.845	
S4(c) (SPED)	31.5	13	69	50	132	0.0000*
←S4(c) (DPDB)	43.4				-5.973	
S4(c) (SPED)	36.3	33	39	59	131	0.5115
←S4(c) (FXBT)	36.7				-0.657	
S4(c) (DPDB)	42.3	67	16	49	132	0.0000*
←S4(c) (FXBT)	40.6				-4.965	

N = total number; p = probability of chance occurrence; $S_x \leftarrow S_y$ = movement of y to x; QLTQ = quality; COST = cost; SPED = speed; DPDB = dependability; FXBT = flexibility

* Result statistically significant at 0.05 level.

listed strategic manufacturing priorities (in order of greater strength) was: (1) high quality, (2) high dependability, (3) high flexibility, (4) high speed, and (5) low cost. Note this

rank order is purely mathematically derived and is not necessarily statistically significant. The Wilcoxon matched-pairs signed rank test, indicated the following statistically significant rank order (see Table 4): (1) high quality, (2) high dependability, and (3) high flexibility, high speed and low cost, all ranked as number (3).

d. Future importance of strategic manufacturing priorities to better compete against national competitors

The results, which reflect the future importance of the strategic manufacturing priorities listed to better compete against national competitors, are presented in Table 5.

On the basis of the calculated weighted average scores, the rank order for the future importance that was placed on the listed strategic manufacturing priorities (in order of greater importance) was: (1) low cost, (2) high quality, (3) high dependability, (4) high speed, and (5) high flexibility. Note this rank order is purely mathematically derived and is not necessarily statistically significant. The Wilcoxon matched-pairs signed rank test indicated the following statistically significant rank order (see Table 6): (1) low cost, high quality and dependability, all ranked as number (1), (2) high speed, and (3) high flexibility.

It should be noted that when compared to the current strengths and/or weaknesses (see research results part [c]), high quality and high flexibility achieved the same statistically significant rankings (though higher scores) in terms of future important strategic manufacturing priorities. Two serious cases in terms of a shift in strategic focus was for (a) low cost, which was rated third in terms of current strength but was perceived to be one of three most important future strategic-manufacturing priorities, and (b) high dependability, which was rated second in terms of current strength but was also perceived to be one of three most important future strategic manufacturing priorities. In both these cases, the higher scores achieved also indicated the need for improved performance levels of these priorities. Another movement where

Table 5 Future importance of strategic manufacturing priorities to compete better nationally

Future importance	Quality N %T	Cost N %T	Speed N %T	Dependability N %T	Flexibility N %T
N.Important w1	0 0.0%	0 0.0%	1 0.8%	0 0.0%	2 1.5%
Good to have w2	1 0.8%	0 0.0%	4 3.1%	0 0.0%	11 8.7%
Necessary w3	11 8.5%	12 9.3%	26 20.5%	16 12.5%	34 26.8%
Important w4	43 33.3%	37 28.7%	60 47.2%	49 38.3%	45 35.4%
V.Important w5	74 57.4%	80 62.0%	36 28.4%	63 49.2%	35 27.6%
Total	129 100%	129 100%	127 100%	128 100%	127 100%
#Average	4.473	4.527	3.993	4.367	3.789
S	0.690	0.660	0.830	0.700	1.000
Rank*	(2)	(1)	(4)	(3)	(5)

N = frequency; %T = percentage of total; $w_{1,5}$ = weight; N.Important = not important; Rank = rank order; S = standard deviation; V.Important = very important; #Average = weighted average

* A pure mathematically derived rank order and is not necessarily statistically significant. Such a rank order can be deduced from the Wilcoxon matched-pairs signed rank test shown in Table 6.

Table 6 Wilcoxon matched-pairs signed ranks test: movement within a decision point

Comparison	Mean rank	-Ranks	+Ranks	Ties	N	Z-Value	2-Tail p
S4(d) (QLTY)	35.7	31	38	60	129		0.5439
←S4(d) (COST)	34.5					-0.6069	
S4(d) (QLTY)	35.0	60	10	57	127		0.0000*
←S4(d) (SPED)	38.4					-5.027	
S4(d) (QLTY)	25.8	32	19	77	128		0.1242
←S4(d) (DPDB)	26.3					-1.537	
S4(d) (QLTY)	42.2	69	12	46	127		0.0000*
←S4(d) (FXBT)	34.3					-5.878	
S4(d) (COST)	40.9	64	15	48	127		0.0000*
←S4(d) (SPED)	36.0					-5.083	
S4(d) (COST)	33.1	40	24	64	128		0.0575
←S4(d) (DPDB)	31.5					-1.899	
S4(d) (COST)	44.7	72	13	42	127		0.0000*
←S4(d) (FXBT)	33.6					-6.095	
S4(d) (SPED)	26.0	10	49	68	127		0.0000*
←S4(d) (DPDB)	30.8					-4.718	
S4(d) (SPED)	32.3	43	21	63	127		0.0198*
←S4(d) (FXBT)	32.9					-2.331	
S4(d) (DPDB)	39.6	66	10	51	127		0.0000*
←S4(d) (FXBT)	31.5					-5.944	

N = total number; p = probability of chance occurrence; $S_x \leftarrow S_y$ = movement of y to x; QLTY = quality; COST = cost; SPED = speed; DPDB = dependability; FXBT = flexibility

* Result statistically significant at 0.05 level.

a current strength held a lower ranking than its future perceived importance was for high speed.

In all these cases, it appears (and this was confirmed as statistically significant with the aid of the non-parametric Wilcoxon matched-pairs signed ranks test – see Table 9) that South African manufacturers need to improve on their current performance in all of the listed strategic manufacturing priorities and increase their emphasis which is placed on low cost, high dependability and high speed to better compete against national competitors in the future.

e. Future importance of strategic manufacturing priorities to better compete against international competitors

The results, which reflect the future importance of the strategic manufacturing priorities listed to better compete against international competitors, are presented in Table 7.

On the basis of the calculated weighted average scores, the rank order for the future importance that was placed on the listed strategic manufacturing priorities (in order of greater importance) was: (1) high quality, (2) low cost, (3) high dependability, (4) high speed, and (5) high flexibility. Note this rank order is purely mathematically derived and is not necessarily statistically significant. The non-parametric Wilcoxon matched-pairs signed rank test indicated the following statistically significant rank order (see Table 8): (1) high quality, low cost and high dependability, all ranked as number (1), (2) high speed, and (3) high flexibility.

It should be noted that, when compared to the current strengths and/or weaknesses (see research results part [c]), similar outcomes for shifts in strategic focus and increased performance levels, were indicated for international competitors as in the case for national competitors (see research results part [d]). Furthermore, when directly comparing the two, the strategic manufacturing priorities achieved higher scores (indicating a greater importance) for future international competition than for national competition. This was also (with the exception of low cost) confirmed to be statistically significant with the aid of the non-parametric Wilcoxon matched-pairs signed ranks test – see Table 9).

Conclusions

Since the majority (81%) of the respondents believe that the manufacturing strategy of their company contributes to long-term, superior business performance and success and, moreover, that 98% of them believe that superior manufacturing capabilities will become more important in the future to better compete against both national and international competitors, it is recommended that South African manufacturers:

- observe the following focus in terms of strategic manufacturing priorities (in order of priority): (1) high quality, low cost and high dependability, all of equal priority number (1), (2) high speed, and (3) high flexibility;

Table 7 Future importance of strategic manufacturing priorities to compete better internationally

Future importance	Quality N %T	Cost N %T	Speed N %T	Dependability N %T	Flexibility N %T
N.Important w1	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2 1.6%
Good to have w2	0 0.0%	2 1.6%	3 2.4%	1 0.8%	9 7.2%
Necessary w3	6 4.8%	3 2.4%	26 20.8%	12 9.5%	28 22.4%
Important w4	23 18.3%	32 25.4%	41 32.8%	31 24.6%	37 29.6%
V.Important w5	97 76.9%	89 70.6%	55 44.0%	82 65.1%	49 39.2%
Total	126 100%	126 100%	125 100%	126 100%	125 100%
#Average	4.721	4.650	4.184	4.540	3.976
S	0.550	0.610	0.850	0.700	1.030
Rank*	(1)	(2)	(4)	(3)	(5)

N = frequency; %T = percentage of total; w_{1-5} = weight; N.Important = not important; Rank = rank order; S = Standard deviation; V.Important = very important; #Average = weighted average

*A pure mathematically derived rank order and is not necessarily statistically significant. Such a rank order can be deduced from the Wilcoxon matched-pairs signed rank test shown in Table 8.

Table 8 Wilcoxon matched-pairs signed ranks test: movement within a decision point

Comparison	Mean rank	-Ranks	+Ranks	Ties	N Z-Value	2-Tail p
S4(e) (QLTY)	25.6	28	21	77	126	0.2963
←S4(e) (COST)	24.2				-1.045	
S4(e) (QLTY)	34.0	56	9	60	125	0.0000*
←S4(e) (SPED)	26.5				-5.450	
S4(e) (QLTY)	23.2	26	14	86	126	0.0095*
←S4(e) (DPDB)	15.5				-2.5942	
S4(e) (QLTY)	37.9	63	8	54	125	0.0000*
←S4(e) (FXBT)	21.0				-6.360	
S4(e) (COST)	31.4	50	10	65	125	0.0000*
←S4(e) (SPED)	25.9				-4.829	
S4(e) (COST)	23.0	27	17	82	126	0.1399
←S4(e) (DPDB)	21.7				-1.476	
S4(e) (COST)	35.0	61	7	57	125	0.0000*
←S4(e) (FXBT)	31.2				-5.875	
S4(e) (SPED)	24.6	6	43	76	125	0.0000*
←S4(e) (DPDB)	25.1				-4.626	
S4(e) (SPED)	28.2	38	18	69	125	0.0260*
←S4(e) (FXBT)	29.2				-2.227	
S4(e) (DPDB)	31.0	56	6	63	125	0.0000*
←S4(e) (FXBT)	35.8				-5.342	

N = total number; p = probability of chance occurrence; $S_x \leftarrow S_y$ = movement of y to x; QLTQ = quality; COST = cost; SPED = speed; DPDB = dependability; FXBT = flexibility. * Result statistically significant at 0.05 level.

- maintain their current emphasis on high quality (as one of the three most important strategic manufacturing priorities) and high flexibility (as the third most important priority);
- immediately increase their emphasis on low cost and high dependability (as the other two of the three most important strategic manufacturing priorities) and high speed (as the second most important priority);

Table 9 Wilcoxon matched-pairs signed ranks test: movement between decision points

Comparison	Mean rank	-Ranks	+Ranks	Ties	N Z-Value	2-Tail p
S4(a)	13.9	25	2	101	128	0.0001*
←S4(b)	15.3				-3.808	
S4(c) (QLTY)	34.9	20	59	49	128	0.0000*
←S4(d) (QLTY)	41.7				-4.308	
S4(c) (COST)	21.5	5	101	23	129	0.0000*
←S4(d) (COST)	55.1				-8.598	
S4(c) (SPED)	38.3	16	75	35	126	0.0000*
←S4(d) (SPED)	47.7				-5.862	
S4(c) (DPDB)	32.0	20	64	44	128	0.0000*
←S4(d) (DPDB)	45.8				-5.106	
S4(c) (FXBT)	30.1	25	56	45	126	0.0000
←S4(d) (FXBT)	45.9				-4.273	
S4(c) (QLTY)	42.5	12	76	37	125	0.0000*
←S4(e) (QLTY)	44.8				-6.025	
S4(c) (COST)	21.0	3	106	17	126	0.0000*
←S4(e) (COST)	55.9				-8.872	
S4(c) (SPED)	29.8	15	79	30	124	0.0000*
←S4(e) (SPED)	50.9				-6.735	
S4(c) (DPDB)	29.5	16	72	38	126	0.0000*
←S4(e) (DPDB)	47.8				-6.183	
S4(c) (FXBT)	33.3	25	64	35	124	0.0000*
←S4(e) (FXBT)	49.6				-4.799	
S4(d) (QLTY)	24.5	8	33	82	123	0.0024*
←S4(e) (QLTY)	20.2				-3.039	
S4(d) (COST)	22.0	15	28	80	123	0.0842
←S4(e) (COST)	22.0				-1.727	
S4(d) (SPED)	29.8	16	39	66	121	0.0138*
←S4(e) (SPED)	27.3				-2.463	
S4(d) (DPDB)	22.5	11	33	78	122	0.0039*
←S4(e) (DPDB)	22.5				-2.888	
S4(d) (FXBT)	29.4	20	40	61	121	0.0161*
←S4(e) (FXBT)	31.1				-2.407	

N = total number; p = probability of chance occurrence; $S_x \leftarrow S_y$ = movement of y to x; QLTY = quality; COST = cost; SPED = speed; DPDB = dependability; FXBT = flexibility

* Result statistically significant at 0.05 level.

- improve on their current performance levels, between 20 and 30%, in all of these strategic manufacturing priorities to better compete against both national and international competitors in the future; and
- recognize that their current performance levels in all of the strategic manufacturing priorities should improve, on average by 5% more, for international competition than for national competition.

Note

1. The term 'manufacturing-based strategy' is used to refer to a manufacturing strategy which explicitly seeks to secure competi-

itive advantages for a business. Based on Hayes & Wheelwright's (1984) four-stage model in the development of manufacturing's strategic role, such a strategy ideally operates at their stage four of being 'externally supportive' meaning that superiority is sustained through manufacturing advantages.

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