Integrated Approach for Developing Agile Strategies: Appendices

Thesis submitted in accordance with requirements of the University of Liverpool for the degree of Doctor of Philosophy by Mark Hetherington

September 2008

Chapter 11

Comparison With Traditional Strategy Schools

The tables used in stage four of the BIZ model have come from examining traditional schools of thought in business and manufacturing strategy and how these fit with agility and the strategy behind agility. These schools have been compared with some of the key texts surrounding agility and the drivers behind it. This has also been combined with work from the agility centre, incorporating the pillars of agility (ACI) into the examination. More traditional manufacturing output strategies, such as Miltenbergs manufacturing outputs have also been cross examined in the development of the BIZ system.

Summarised below are some of the traditional schools of manufacturing competitive advantage and how strategy effects them. It is proposed that the outputs of agility paradigms examination should be compared with the more traditional schools of strategy thought to identify shared ground and commonality of theory. This is done in chapter 11 where traditional strategy schools are mapped to agility and provide the contradictions table.

Firstly Hayes and Wheelwright stages of competitive manufacturing have been examined. The four stages have been outlined below:

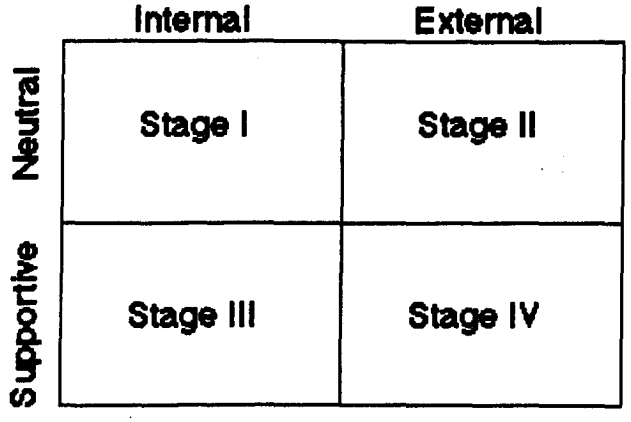


Figure39: Hayes and Wheelwright stages of competitive manufacturing (Hayes and Wheelwright 1984)

Stage I

Stage I companies consider their manufacturing organisation to be internally neutral, in that its role is simply to "make the stuff", without any surprises. Such companies believe that their product designs are so unusual or their marketing organisation so powerful that if the product can simply be delivered to customers, as advertised, the company will be successful.

Stage II

Stage II companies look outward and ask their manufacturing organisation to be externally neutral, that is, able to meet the standards imposed by their major competitors. Such companies tend to adhere to industry practice and industry standards. They buy their parts, materials and production equipment from the same suppliers that their competitors use, follow similar approaches to quality and inventory control, establish similar relationships with their workforce, and regard technicians and managers as interchangeable parts - hiring both, as needed, from other companies in the industry.

Stage III

Stage III companies have a manufacturing organisation that is internally supportive of other parts of the company, with a co-ordinated set of manufacturing structural and infrastructural decisions tailored to their specific competitive strategy.

Stage IV

Stage IV companies regard their manufacturing organisation as externally supportive, that is, playing a key role in helping the whole company achieve an edge over its competitors. Such companies are not content simply to copy their competitors, or even to be the "toughest kid on the block" in their own neighbourhood. They seek to be as good as anybody in the world at the things they have chosen to be good at - that is, world-class.

The grid below has been developed by Porter to show generic strategies for manufacturing businesses. It shows a split of scope and competitive advantage. It is proposed that agile companies or agility fits in stage four of the Hayes and wheelwright model and section 2 and 3b of Porters generic strategies model. The three sectors are related in that each is driving a niche for agility. In all three

sectors each create solution products for customers and thrive on driving innovation to push the company forward.

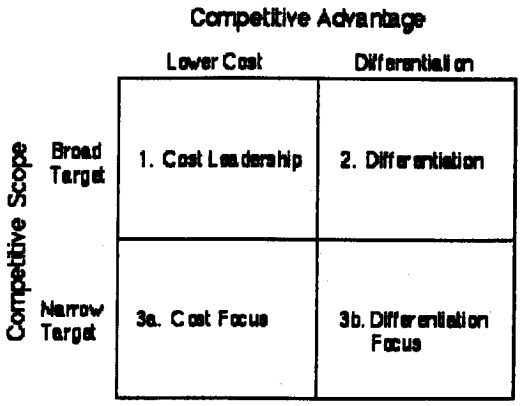


Figure 40: Porters Generic strategies for competing (Porter 1980)

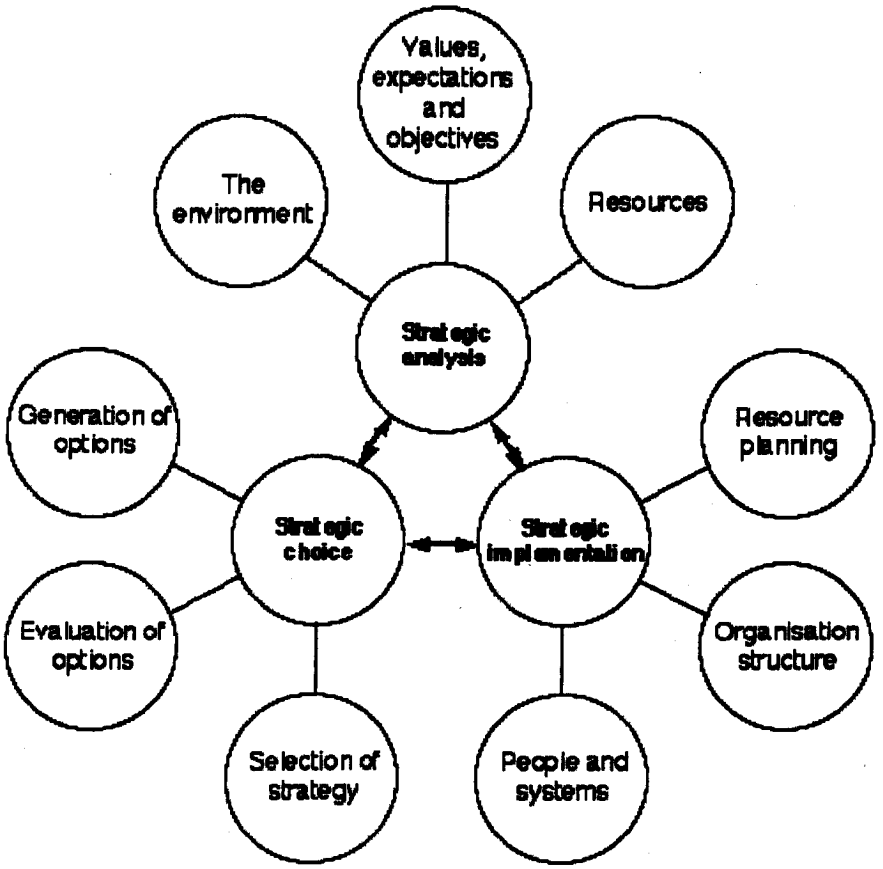


Figure 39: Cambridge manufacturing institute: Elements of strategy (Cambridge Manufacturing Institute)

The final diagram shown above, is briefly examined here as the elements considered in strategy, this output is generated from the Cambridge

Manufacturing Institute. Again it will be interesting to see if the focus of agile paradigms fits with this view of the strategy elements that have been highlighted.

The traditional schools of thought have come from 10 schools of strategy described by Mintzburg, Ahlstrand and Lampel [11]. The classification of these schools of thought is as follows:

The Design school
The Planning school
The Positioning school
The Entrepreneurial school
The Cognitive school
The Learning school
The Power school
The Cultural school
The Environmental school
The Configuration school

Each of these different schools of thought has advantages and disadvantages in terms of Agility. Some such as planning learning and environmental do not lend themselves easily to the proactive stage of the Agility cycle. These are more reactive and emergent to market forces. Others such as entrepreneurial, cultural and configuration, lend themselves more easily to a proactive stance and aim to take on market inertia and provide different types of products services and solutions. If these views are compared to the proactive reactive cycle discussed earlier in the project it can be seen that some types of strategy formulation techniques lend themselves to agility more than others.

Following are comparison tables of schools of strategy thought and their drivers, and a table that maps strategy to agile capability and core agile values extracted from some key research papers.

	Design School	Planning School	Positioning School	Entrepreneurial School	Cognitive School	Learning School	Power school	Cultural School	Environmental School	Configuration School		
Ehme of the schools	Mapping capabilities to possibilities	Follow prescribed steps and crunch the numbers	Generic strategies to apply	Visionary process to attack a niche	Emergent perspectives of the world, interpretation	Action feedback cycle, again emergent	Political and emergent. Negotiation (conflict)	Collective interaction and reasoning (collaboration)	Reactive process to forces 'out there'	Structure and power merge. Process of transformation / step change		
Objective/ Subjective	Objective	Objective	Objective	Objective	Objective / Subjective	Subjective	Subjective	Subjective	Subjective	Subjective		
Prescription / Description	Prescription	Prescription	Prescription	Prescription	Prescription	Description	Description	Description	Description	Description		
Agility paradigm that it could	Using Leverage (Goldman)	x	Using Leverage (Goldman), Solution Product (Hetherington)	Niche Creation (Hetherington), Solution Products (Hetherington), Possibly utilises others too	Change and uncertainty mastering [hindsight view however] (Goldman)	Change and uncertainty mastering [hindsight view however] (Goldman)	x	Co-operating (Goldman)	x	Niche creation, Solution Products (Hetherington)		
Taylorism	Y	Y	Some	X	X	Some	Y	X	Some	Some		
Generic Strategy Ideas. Dcery apply	Porter: generic strats for competing	Mckinsey generic stratts, Porter generic strates for competing	Porter, Five forces, generic strats, Portfolio anayals, Ansoff	N	N	N	N	Poss some may apply	Yes: Porter, Mckinsey,Portfolio analysis	Poss Mckinsey strats		
Positive(1) / Radical(10)	P (3)	R (5)	R (4)	P (2)	R (7)	R (8)	R (6)	R (9)	R (10)	P (1)		
6 Principles -dcery apply	1,3,4,5	6	Poss 1, 3	1, Poss 3, Poss 6	3 Poss	3,5	3,6	Poss 1, 2,6	5	All and None		

6 Strategic Principles (Costantinos Markides LBS)

1 Unique Position
2 Generate Large Nos of Options
3 Make Clear Choices
4 Combine to Reinforce
5 Achieve Fit With Environment But Not Compromise Flexability
6 Appropriate Organisational Support

Generic Strategies
Included here are some examples of generic strategies which may fit with the schools of throught, they are not exhaustive but give backgroumnd to where the schools of throught are coming from

Ranking Systems
Ranking systems used are qualitative and subjective, they do not indicate a quantitative number and some may be closer together on the cycle of Robust - Responsive - Proactive than others

Taylorism
Included here to see which schools of throught are born from the 20th century thinking that drove the Taylor theories. These are very much lean and cost focused and can be argued to not be sufficient for Agile practices in turbulent markets

Paradigm Allocation
Paradigms from the research have been inserted where the author deems appropriate. These have come from the authors own research and some have been taken from Goldmans research into Agility.
These do not have a quantitative value and are for indication purposes as to where strategy schools are fulfilling percieved paradigms of agility

Table 13: Schools of strategy mapped to key strategic principles (Hetherington)

Agility Capability / Core Values

Ref No	Strategy Safari	Six Principles of Strategy	Four strategic dimensions for Agile	Six P's of Mnfg strat	Miltonburg	Driver of the Pillar	ACI
1	Design School	1,3,4,10	4,10 Enriching the customer	1,2,8,10 Planning	1,6,10 Cost	1,3,4,10 **Product**	Degree of customisation
2	Planning School	Unique Position	8 Co-operating to achieve effectiveness				Component flexability
3	Positioning School		1,4,9 Organising to master change and uncertainty	1,4,10 Proactiveness	6 Quality		Process similarity
4	Entrepreneurial School	1,8,10 Generate large No of options	8 Leveraging the impact of people and information				Process replaceability
5	Cognitive School		**Agile paradigms**	2,3,6 Pattern of actions	1,6,10 Performnace		Structure adaptability
6	Learning School	3,4,7 Make Clear Choices	1,4,6 Solution Product				Component adaptability
7	Power school		2,3 Niche Creation	1 Portfolio of mnfg capabilities	Delivery	1 **Process**	Scalability
8	Cultural School	8,10 Combine to re-enforce	4,3 Individual serving of customer	3,1,10 Programs of improvement	10,1 Flexability		Re-configurability
9	Environmental School	10 Achieve fit with environment but not compramise flexability	**Framework for agility**				Usability
10	Configuration School	1,4,7,10 Appropriate organisational support	1,4,10 Solutions	1,6,10 Performance measurement	4,10 Innovativeness	1,6,8,10 **People**	Replaceability
			8,10 Cooperatives		4,10 *Service*		Utilisation
			All Change			10,8,7,1 **Operational**	Robustness
			1,8,10 People / Information				Effectiveness
							Employee skills flexability
							Re-placeability
							Employee skill utilisation
							Customer quality
							Customer Delivery
							Customer volume
							Supply chain ACI matrix
						10,8,7 **Organisational**	*TBC*

Table 14: Mapping strategy flow: Step 4 of BIZ (Hetherington)

Table Development

Table 13 was included here to show how strategy schools and principles fit with each other and key agility concepts. The paradigms of agility are included to show where they agree and cross impact with these traditional strategic schools of thought. It is not suggesting that the paradigms are superseding the schools of thought but they are taking aspects of each and developing the core concepts to map into a new paradigm of agility. The table also gives some ranking of the traditional schools of strategic thought by examining where the paradigms fit and which parts of these schools become relevant in agile strategic formulation. From the tables it can be seen that the most relevant areas of traditional strategy are 1 Design School, 2 Planning School, 3 Positioning School, 4 Entrepreneurial School, 6 Learning School.

The table mapped out also provided a key step in developing Step 4 of the BIZ process, it created a starting point to gather thoughts and ideas on this stage of the process. Stage 4 of the BIZ process utilises the map here so that capabilities and pillars can be mapped to paradigms and strategies. This is where the strategy formulation and the paradigm application is carried out. It forms a relationship between the bottom up operations strengthening and the top down application of a strategy. This is a critical part of the BIZ application.

The map also demonstrates how paradigms fit with other key areas of research that are deemed important in the application of a strategy to a business. It is proposed that as the paradigms are developed then these could be rationalised or removed. However they are currently left in to ensure that the paradigm work is relent to strategy formulation and application in a traditional sense. With the development of a larger number of paradigms this comparison to traditional strategy thinking may not be necessary.

The schools of strategy often describe how a company is set up and so the processes that it will go through in developing strategy and formulating business plans. This is important information to retain as companies will be starting from one of these positions. Therefore the mapping of these schools through to agility

principles and the pillars gives an idea of how the thought processes work and enables the system to match a company 'style'

In this table schools are mapped against Markides '6 principles of strategy', agility paradigms, Miltenberg and pillars of agility. The last two give link to the operation focus of the system and back to the tools used in the BEA and the output that this gives. The first two steps show paradigm relevant to tradition thinking behind strategy formulation and base these principles on sound foundation. With expansion the paradigms will be able to stand alone as in the TRIZ system and become a list of paradigms and contradiction as a reference look up type system. However during development the paradigms must show how they impact business in relation to current tested systems and thought processes.

The table shows that some traditional schools of strategy do not currently fit with the paradigms developed through the content analysis. It may be that as more paradigms are developed more schools of strategy are brought into play, maybe by applying caveats the majority will. This is an area for development in the future. The use at the moment is that paradigms and strategies can be mapped to capabilities and matched up to the most appropriate for the company.

In summary the development needed to take this system further would be an expansion of the material coded, a bigger dictionary to code against, more coders and development of the initial maps in table 14 to populate the agile paradigms in more detail.

Discussion:

From the above work it can be seen that the business process TRIZ system is not ready to roll out on a company. However, the framework is there to allow further development to take place. With development of some more principles and contradictions there will be enough material to roll out a pilot study of the system. This pilot study should look at companies who are already considered to be agile and test how the results match up to what is in place already. There should also be a company who is on the route to Agility and again the results examined by a number of people to inspect what feedback comes from the system.

The final system could also be placed into a software type model, as has been done with TRIZ, which would enable a certain amount of automation to take place. The BEA system and the tool selection framework developed earlier in the project have also been placed into a software package. The final system aims to give an insight into what practical measures a company can undertake to ensure that its strategic goals are met and in an Agile manner. The system is not designed to produce a strategy for each company as this may end up producing out similar strategies for each user. The real value is gained from making a chosen strategy fit to an agile pattern. It should provoke thought and suggest practical measures to enable strategies to perform in an agile manner.

The suggestion for further work here would be to build a more complex and larger model in NVIVO to assist in making content analysis and grounded theory more robust. This should also generate more paradigms and contradictions. It would also be beneficial to aid validation if a case study is passed through the system. This may also highlight areas which have been missed through the content analysis process.

Another interesting proposition may be to form a team of researchers who each examine a number of papers. This group could then meet to compare the type of paradigms being discovered and search for more 'root cause' type answers in a larger and more in depth manner.

Proposals for system development:

In the next chapter two companies have been examined through the BIZ system process to show how the growth of a company fits into this structure proposed. The companies examined have come from very different market segments and this helps to show how the system developed can be applied to a wide variety of companies.

The two case studies also highlight the need for a classification system for companies as it is proposed that this can tie in neatly with the proposed system. It is proposed that companies with similar classifications will take similar paths through the tables and similar patterns will be shown.

This will help to exhibit the types of capabilities needed for certain types of strategic growth or movement, and will be very easy to tie in with the lifecycle of a company. It is clear from the case studies that as a company moves through its lifecycle it is harder to change direction and move into a new strategic position.

This classification ties into the work of McCarthy who proposed a classification system or companies based on cladistics. The diagram below shows how it is proposed that lifecycle and strategy are linked with each other along with factors such as potential attractiveness to being acquired, or invested in, the types of controls that companies will exhibit at certain levels and the way in which the strategic thinking will be focused depending on where in the life cycle and size cycle the company is. Strategic thinking ties in closely with the table used at step 4.

It is proposed that companies lifecycle, their classification into a biological type school, and the types of strategy they use are inextricably linked.

The BIZ / TRIZ system looks at the types of behaviours displayed and follows through the types of capabilities needed to implement strategy with these types of behaviour. Incidentally the theory of Katz and Kahn [1978] also ties in neatly with BIZ relating that company decisions are made around the core principle of survival. This can help to explain the movement through the decision areas and the rate of movement of companies at different points in lifecycle, size and structure.

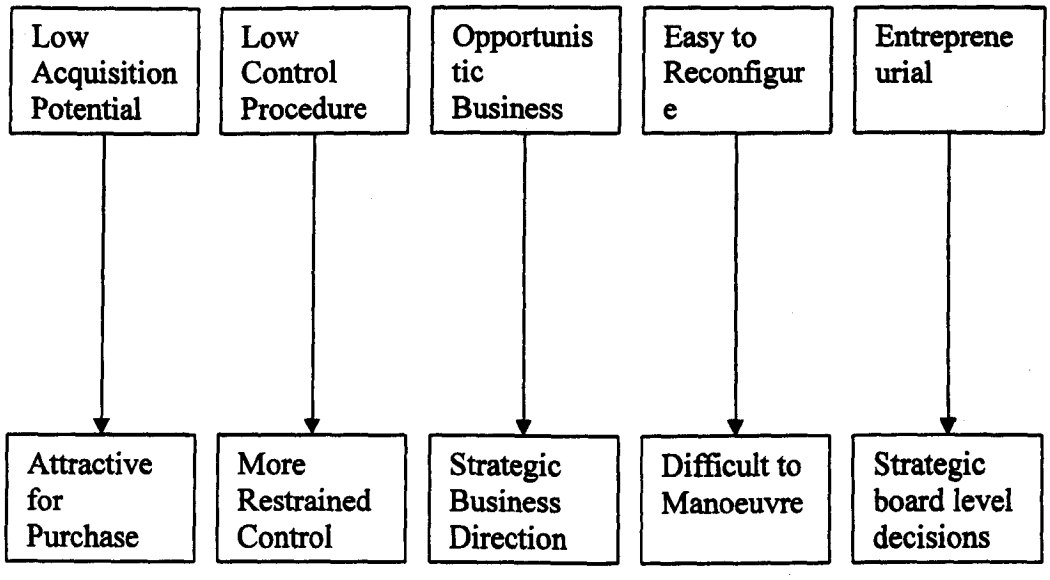


Figure 44: Lifecycle characteristics of companies (McCarthy)

The diagram above shows a link between the following:

Acquisition potential of a company: The control procedures in place: The type of strategic thinking the company undertakes: The ease in which a company may re-direct itself: The type of leadership demonstrated in the business.

It is also proposed that in the main the size of the company will increase from top to bottom, and as the size of the company increases it moves further down the scale in each of these areas towards the bottom box in the diagram.

McCarthy has also proposed that there is a classification possible of companies by the type of industrial behaviours, features and systems they display.

Firstly McCarthy covers why classification methods are constructed and quotes Carper and Snizek:

'the most important step in conducting any form of scientific enquiry involves the ordering, classification or other grouping of the objects or phenomena under investigation' [Carper WB, Snizek WE., 1980]

Classification also has importance in strategic areas and for refining a hypothesis about a company or outcome to situation. This also forms part of research into predicting how organisations behave to change, and behave to survive. This part in particular ties into the research in agility and the reaction of organisations to change.

'classification serves as a basis for predicting organisational decisions or change' [Haas J, Hall R, and Johnson N, 1966].

With this in mind it is proposed that organisational change and change to drive agility will happen in a proven and predictable manner. This manner is shown in the table, strategy to agility capability / core values, as used in step 4 of BIZ. [Table 14]

For any type of system predicting how a company will behave and suggesting a route forwards for the future it is important to be able to see where a company has come from. If companies evolve then they must have ancestors, what they have learnt from these ancestors and the traits that they display are useful in giving direction for future evolution.

It is proposed that strategy is part of the evolution of a manufacturing company. Agile strategy puts a company in a unique niche position with competition left behind. However the competition, as in all evolving systems, will emulate the behaviour of a system performing well. Therefore the agile company must continue through its lifecycle at a rate that keeps it supplying differently and ahead of the competition.

Chapter 12 Case Study

BIZ System

In this section the BIZ system is applied to two companies in case study format. This is to demonstrate the BIZ system format and its application to companies in different market sectors. The results demonstrate how agility can be gained through the use of the paradigm system proposed in the previous chapter.

The chapter following this demonstrates a full case study application pre BIZ showing where the ideas came from to automate the system and create the BIZ framework. It runs the full ARM process with the strategy section as 1st developed by the author. This strategy section developed the thoughts around the BIZ paradigm principles.

Background to the company:

1988 - The company was formed to supply pre-packed rice and flour to the food service markets.
1999 – The company acquired a noodle and Chinese pastry business also supplying prawn crackers.
2000 – Acquisition of specialist Indian flour business
2001 – Retort technology brought into business
2003 – Launch of labeled chef products to mainstream retailers
2003/2004 – Mills own rice products at own manufacturing site
2005/2006 – Acquires edible oils business, also acquires bought in goods business which distributes to the ethnic food wholesale markets.
2008-2009 – Acquires a premium brand ethnic food provider to the mainstream supermarkets

BIZ Application:

1) Define Market:

Company started as a MTO supplying to the foodservice industries, it has since moved to an MTS and is transitioning at the present time to an ATO.

2) Define strategy:

The company aims to 'specialise in authentic premium products for the ethnic food trade'.
The strategy of the company here relates to the fact that they are moving form a company which started as an MTO to a company which is essentially ATO. At the formation of the company, foodstuffs were packed to order to provide the foodservice industry. The positioning of the company now is one of supplying a large range of products to a large customer base. These products can be configured in anyway that the customer wants and each order or customer interaction will be essentially a unique offering assembled to the customer's demands. However, as products are coming from two divisions of the company (Manufacturing and Bought in) they are stocked items, assembled to one order.

3) Contradictions: MTO to MTS to ATO

The contradictions between the above types of organization for a company highlight the challenges of moving a business forward and providing a different type of service to the customers of the company. These changes, although challenging, provide a strategic change for the company and move it into a niche position.

The company used to make to order providing essentially an ingredients service to other food companies. The meant a set up and focus on manufacturing operations for fast turn around of orders and minimum lead-time through manufacturing efficiencies.

Moving to an MTS company means a slightly different focus and it also means a different service on offer to the customers. It is important to note that there has also been a change in the type of customers focused upon when this transition happened. The company moved from a small product range to a greater range and focusing more towards a wholesale market than other manufacturers. The level and type of service has to change as the number of potential customers increase and the value of each order decreases. This essentially means processing more orders of increasing complexity to increasing number of customers. However at this stage the product offering was still relatively small and essentially each customer was taking one type of product from the company.

In moving to ATO, the company has increased is product offering by a large factor. This means not only is the company manufacturing but it is buying in goods which are being combined into one customer order. Offering the customer a large range of products from one single point of supply means that they are again increasing complexity, and having these products in stock and then assembling them in the right combination is now the main focus of the company. The manufacturing sites are run at separate locations with independent management providing service into the assembly operation.

4) Apply Agile Paradigms:

This is done using the table called: Mapping of strategy to agility capability / core values. By applying the table format it is possible to see how the company has been moving forward; from the choice of strategy schools the type of paradigms, positioning, manufacturing outputs and capability pillars can be tracked. This is mapped for the company as follows:

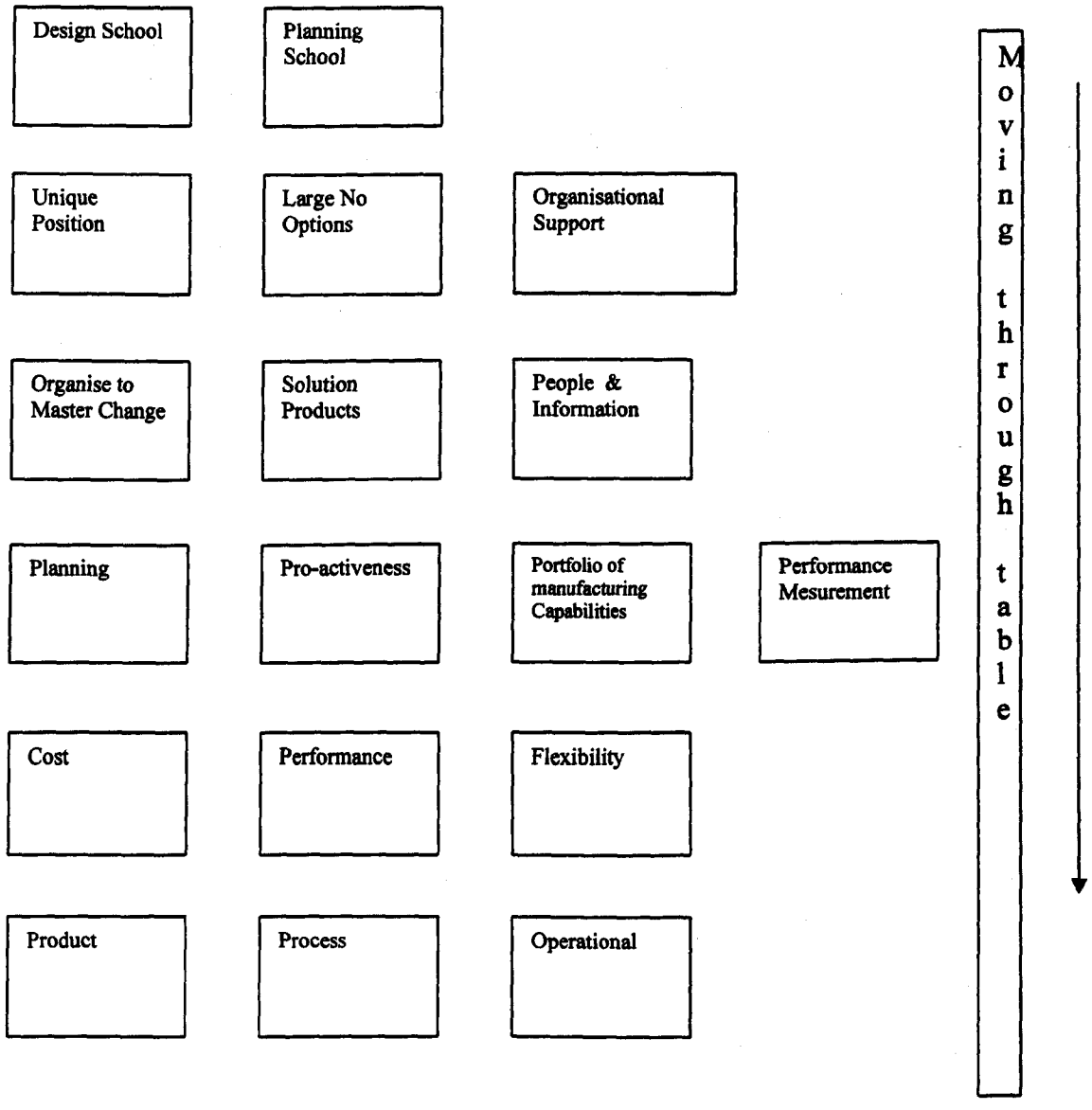


Figure 44: lifecycle characteristics of companies-extended (Hetherington)

Each row of boxes represents a stage in the table. The first is the strategy school that the company belongs to, is planning by or has shown behaviours relating to. The second is the principles of strategy that are being used, thirdly the agile paradigms that tie in with the two previous stages are highlighted. After this the characteristics of the manufacturing strategy, the manufacturing outputs, as denoted by Miltenberg and the ACI pillars related to the outputs are shown

5) Evaluation:

The evaluation that has taken place at the company has focused on the feasibility of changing the offerings of the company so radically, what the alternatives have been and how mature the markets are it was operating in and planned to move into.

The feasibility study has shown requirement that the company has new capabilities and is structured in a different manner. This restructuring has taken place and to move along with this facilities have been upgraded and purchased to allow a separation of manufacturing sites to storage, collation and distribution sites.

The maturity of the markets has played an important part in why the company has moved in such a direction. The ethnic trade has become a larger and larger business in recent years and no single offering was being made to the trade to source majority of products through one company. By offering this unique service or solution the workload of the wholesalers is reduced and the amount of trade through the company is maximized. The wholesale markets to manufacturers requiring rice and flour has been moved to other companies who specialize in this type of product, thereby consolidating core activities. By entering into the market with a solution offering, there has essentially been a niche created and this has lead to the company being highly successful and having revenue to reinvest as is demonstrated by the history of acquisition.

6) New Solution:

The offerings from the company at the present point offer the 'new solution'. However, this will remain new for only a period of time. The company will continue to operate at it current position, squeezing efficiencies and making sure measures are in place to ensure agility. Importance here for the company must focus on the distribution of all the products requested by the customer at the right time, there must also be a price or cost measure as large numbers of the items are price sensitive and will loose market share if offered at too high a price. There is however core products which are relatively price insensitive and are market leaders in their sector, the company must capitalise on these brands to drive revenue growth. The cycle of agility / strategy implementation must also start again to ensure the next offerings from the company fulfil the same criteria.

Supplier to OEM of medical equipment for operating theatre

Background to the company:

The company formed around 1949 and supplied cushioning and pillows to hospitals and the medical trade. From here the business remained in the family and moved into supplying birthing beds and mattresses for operating tables.

The company found a unique position by sourcing fabrics which were breathable and sonically welding the mattresses to stop the ingress of bodily fluids. This type of product lead the company to supply some of the leading manufacturers in the world with innovative products which helped to promote patient comfort, hygiene and looked aesthetically pleasing on top of very expensive operating tables.

However other companies started manufacturing this technology in the early 1990's and the company looked to develop the next generation of product. The company developed a moulding procedure which produced mattresses and supports for use in theatre which were completely sealed, (no stitching or welding required, and could be moulded into almost any shape and size that a customer could require. This allowed for even greater infection control, ease of cleaning and advanced patient positioning through the use of a number of supports on one table. To develop this further the company started to develop a moulded product to prevent pressure sores which can develop in theatre during long procedures. The use of memory foam in the mattresses greatly reduced the risk of these starting and so improved patient care and reduced the liability of the manufacturer and hospital to litigation if these type of sores developed. The memory foam was again developed to be completely sealed and moulded to proved infection control and this product became very popular amongst several large equipment manufacturers. The company now found itself in a situation where they were running two processes requiring different chemicals and moulds and running a molding system with a large number of units in to try and maintain the service levels to customers. There was a large creation of WIP and slow

throughput of a large volume due the variation in products. Each individual mattress / product was sold exclusively to one manufacturer.

1) Define market:

The company was operating in an ATO manner. They were processing large amounts of products and assembling the components into an order at the end of the production processes. There was a large amount of WIP in the system which was necessary to be able to put together the number of products that the customer required for an order. This system operated out of control.

The desire from the market place was to operate as an MTO, reducing the lead-time, the cost, and providing clear service advantages to traditional moulding operations.

The agility for this company came from the fact that the batch size could be reduced to minimum of one. This allowed a very different service to customers that a traditional moulding operation whereby the batch size could be very large. The products were also bespoke to each customer and would only be supplied to that customer. The main BOM for each product was exactly the same but the product differentiation came from the unique moulds each customers product came from.

2) Define Strategy:

The company aims to move to the MTO market and truly manufacture only what the customer requires and assemble this as an order at the end of the process and ship one complete order every time a shipment is manufactured. This means transitioning from an ATO – whereby large amounts of WIP are being used to service a small number of clients with bespoke products, to a company with minimal WIP as each product is for a customer order. Agility is gained from the fact that lot sizes are small and each product manufactured is bespoke only to that customer. The true agility comes from the process being able to be set up to produce one item in the same efficient manner as it produces 30 or 100. Here the operational capabilities had to be aligned with the strategy of the company to allow quick change over of tools. The agility would come from the fact that the BOM is the same for all products but the mould is unique creating a unique product offering to the customer. There was also a rationalization needed to use one source of raw material to enable the change over to be as efficient as possible.

Contradictions:

ATO to MTO

The company was driving agility from the fact that it assembled some of the WIP together to create the orders for the customers. The contradiction would be the reducing in WIP, from an ATO system, to a system which truly was MTO and processed only those required products, yet still provided the service levels to the customers that they required, i.e. batch sizes of one.

In moving to an MTO it means a different focus mainly amongst the set up of operations. The strategy was already aligned to provide this kind of service. The manufacturing operations were aligned to process large amounts of WIP and use a sorting technique at the point of dispatch. Now the point of manufacture would be used to make the decision on what would be shipped, and the support processes & operational capabilities would be aligned.

3) Apply Agile Paradigms:

This is mapped for this company as follows:

The schools of thought that has prevailed in setting the strategy objectives for the company are: [These also tie in with the family owned business structure for SME type companies]

Positioning school: The position or strategy that is viable in the marketplace is one that can be defended against existing an d future competitors. Ease of defence means that higher profits than others in the industry are possible.

Entrepreneurial school: 'here, however, the strategic perspective is not so much collective or cultural, as in some other schools to be discussed, as personal, the contract of the leader. Consequently, in this school the organisation becomes responsive to the dictates of that individual – subservient to his or her leadership. And the environment, if not exactly subservient, becomes terrain on which the leader manoeuvres with some ease, at least in terms of directing the organization into a protective niche.' [Mintzburg H, et al 1998].

These two schools map on to the principles of strategy as follows:

Create a unique position, make clear choices, have appropriate organizational support.
The paradigms of agility proposed for these mappings are:

Solution products: The products that the company provides are solutions to the design needs of the customer and created unique for the individual needs of each customer. These are then sold exclusively to that customer allowing the product to be truly unique.
Niche Creation: The market for moulded operating theatre mattresses which are pressure reducing is occupied by only one company.

Individual Serving of the Customer: The customer is served individually by supplying unique, bespoke service to each customer and collaborating at the design stage of the product development lifecycle. This ensures the customer is receiving individual attention from the company.

Manufacturing strategies highlighted are pro-activeness, patterns of actions, and programs of improvement. These tie into Miltenbergs manufacturing outputs of innovativeness and service.

The driver of the pillar of Agility comes out from both schools of strategy as the Product.

4) Evaluation:

Moving to the new system of true MTO means that the strength of position within the market place is truly cemented for a further period of time by providing a slick unique offering. However this will not drive agility and uniqueness for ever and the next product to provide a unique offering needs to be sought. There should also be some expansion of range here and utilization of the techniques employed for other markets possibly not related to the medical equipment market.

5) New Solution:

Solutions are to investigate ancillary products that compliment the product being sold. (For example cleaning agents, other accessories.) Also the techniques being used to drive sales in this market can be transferred to many sectors and the technology used is being investigated in other markets to drive agility in a similar manner. The change of operational capabilities has also sealed some customer relations although has been hard to drive through due to the nature of the strategic school the business is operating in. The entrepreneurial school must understand the changes behind the drive and push these through in the same way the vision and strategy for the company are pushed through the rest of the business.

Appendix 5 shows a full implementation pre BIZ for comparison to the above explanation of the BIZ system.

Case Study Discussion

The BIZ model is an add on for the existing BEA model to replace the as yet undeveloped section of strategy on the ARM diagram. In Appendix 5 there is a detailed model of how the system works without the BIZ model as compared to the case study above where the BIZ model has been applied. It can be seen from the detailed study in appendix 5 that the process is quite lengthy and cumbersome without the application of the framework. There is also no point at which the strategy can be focused or passed through and agility model. The BIZ system enables a point at which the strategy selection / discussion can be put through a paradigm of agility check. However, more than that, the BIZ model can provide strategy suggestion from the pillars of capability identified and enhanced through the initial process. This means there can be a bottom up approach to strategy looking at where the company's capabilities can lead it in terms of strategy.

Conversely if there is a need the BIZ model can be worked in reverse, although there was not an original intention for this to be the case and there is some more work required to make this a robust and tested process.

The bottom up process can take the capabilities and pillars of agility and map paradigms to the outputs, then map these paradigms to traditional schools os strategy thought and selection.

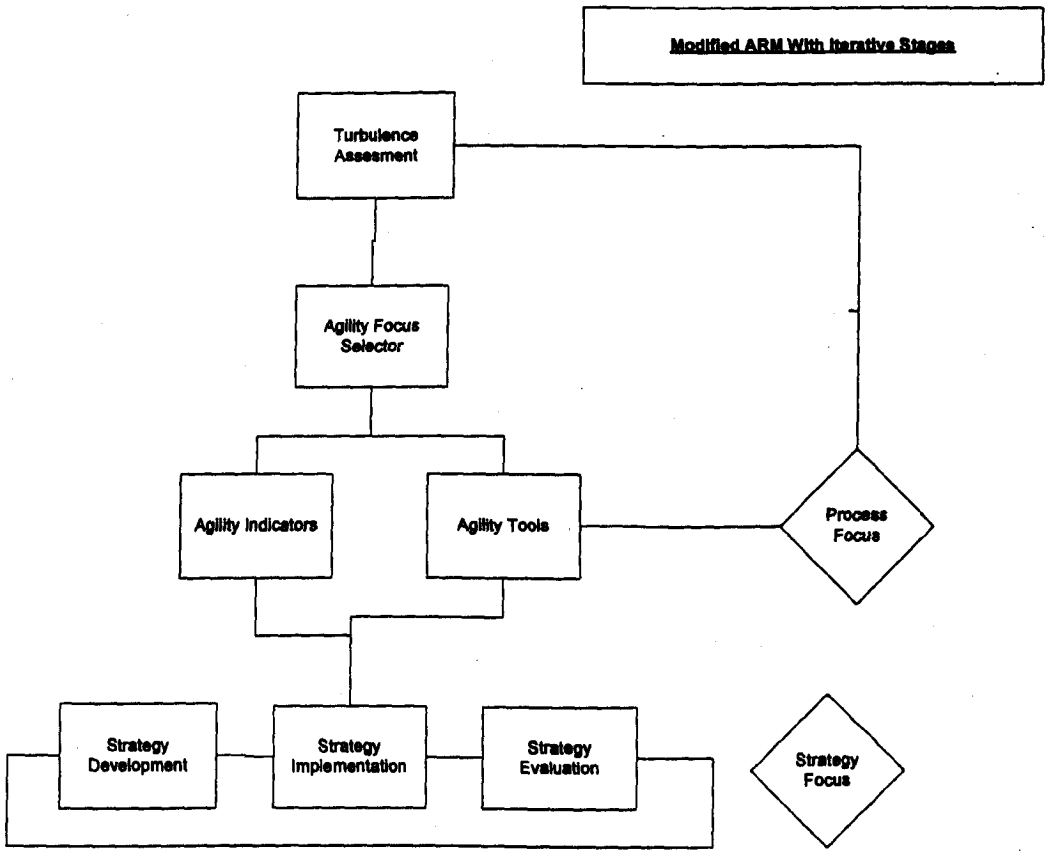


Figure 47: Modified ARM (Hetherington)

The diagram above shows a strategy focus area of the map – it is suggested that this is now replace with the BIZ model showing the indicators and tools feeding into the system, namely table 14 developed in earlier chapters.

The difference that the BIZ model makes is that it provides a framework where previously unknown paradigms can be utilised to drive strategy in an agile direction, rather than forcing agility onto an existing strategy which may constrain the company to non agile directions.

This advantage means there is now a complete system of bottom up approach to developing agility within a company rather than a bottom up approach to applying tools and then top down for strategy and trying to fit the two together. The research has aimed to identify some of the paradigms of agility that can be

used for this process. There are many more to be found and the process for doing this has been suggested in the discussion around content analysis.

The disadvantages of this system are that it does require a large amount of data gathering and that it is not a finished article. Until it is a finished article it has a limited application which will mean the output are very limited. The model may also be open to criticism of applying too tight a control on the formulation of strategy, particularly by the entrepreneurial school whereby large amounts of freedom are required to develop a company and the niche it operates in.

As well as the future work already discussed around development of the paradigms and the testing of a top down application there should be some development and link up with the practical outputs used in appendix 5 as these were deemed as very useful outputs by the participants in the case study discussed in appendix 5. Specifically the areas to develop would be the output of a table / form such as fig 55, current state strategic overview and the use of Fig 15 Extended Ansof Matrix to identify actions in the quadrants that the company will operate in. Once there has been more work on the paradigms the table developed in Table 14 should have the traditional strategy section taken out and mapped separately to the paradigms and the pillars enabling a simpler use of the table to look up paradigms versus the pillars of agility from the BEA.

Chapter 13

Summary and Conclusions

This section provides a summary of the work carried out in the project and looks at elements of the research to discuss the results that generated and their suitability for future use. The sections are broken down as follows:

The research methodology is examined for its suitability

The tool selection table and automation of the system – how successful this part of the development has been in generating output with reduced human intervention

Discussion of the case studies

Paradigms of agility; was the content analysis successful and how this section can be expanded

Research methodology:

Was the method and approach to the research suitable for the type of research being carried out and did it give robustness to the ideas suggested? Did the method fit with the objectives and learning?

The research methodology designed at the start of the project aimed to provide a framework to guide the project work through best practice techniques. It provided direction and clarity through the stages of the project which draw lots of data and cause the direction of the project to become unclear. The methodology was also used to guide how ideas would be developed in a systematic manner.

However, this framework needs to be flexible enough to allow freedom of research to create and form new theory and hypothesis. The format here examined the concept of agility from the operational level before moving to the strategy level. This format allowed the base elements of agility to be examined and linked into the strategy elements to form paradigms of agility. This bottom up and top down approach gives a balanced view of agility from both ends of the scale.

This approach also allows a view of the lifecycle of the manufacturing systems to be formed through the evaluation of paradigms, strategy and the TRIZ system itself.

Validation techniques are covered in the project research methodology, and the use of Toulmin in manufacturing research is quite unique. Because of the often qualitative nature of the data gathered and examined, tools have been borrowed from the social sciences which are more suitable to processing this kind of research data. This gives more robustness to the process being undertaken.

The Toulmin technique allows tacit data to be validated using a social science type technique for an engineering / business problem. The qualitative data that has been gathered through the use of grounded theory and content analysis and is put through a process to justify the choices, theories and ideas suggested. When Toulmin was combined with the comparison of output from case study examination a further robustness was generated. Here case studies already carried out with the successful implementation of tools and techniques were compared to a run through the automated system.

Grounded theory and content analysis were proven very beneficial in the analysis of agility by allowing the data to form theory and direct the research as hypothesis emerge in the duration of the research.

Grounded theory, through its nature provides large amounts of data to analyse and form hypothesis around. The grounded theory element of the project was enabled through the use of the software package NVIVO. This package helps to speed up the process of content analysis by storing and coding up data in situ on the computer, and allowing the quick access to the coded data, sorted and stored into the classifications and nodes desired by the researcher.

The use of the software package enabled the research to move forward at a much faster pace than if the literature was coded up in a traditional way using printed material and coding the documents manually. This was definitely an advantage to the project and allowed a larger amount of material to be coded up than would have otherwise been possible. However the paradigms were still generated from relatively small amount of data when compared with the number of patents examined for the TRIZ system.

The software allowed the nodes to be summarised in easy to use format and be cross analysed against each other. The nodes and the coded material helped to build up hypothesis about how the paradigms of agility should be developed and which direction the research should take moving the paradigms forward into a framework which could be useful for development and implementation of agility within an organisation.

The content analysis looked at the questions:

What is agility?

What is agile manufacturing?

What is agile strategy?

What are the paradigms or factors that are required for, or to generate agility?

The main factors which came out of the research to answer the above questions are summarised as follows:

Decentralised decision making

Technical functions involved in marketing

Leveraging intellectual power and creativity

Niche markets

Eliminate departmentalisation

Freedom and availability of information

Forming partnerships and improving relationships with supply chain

Treating each customer as individual and provide an entire solution

These factors can be developed to a more useful format by performing further content analysis and refining the paradigms. This should also generate the contradictions and how ideality can be generated eliminating the need for compromise. This should be the aim of further research and will benefit the system by creating more data and options in paradigms.

Tool selection table and automation of the system:

How did the development contribute to the overall ASF and was this successful? Does the automation system suggested give the same level of functionality and service to the BEA part of the ASF and generate appropriate tools and techniques to be implemented? Could this be expanded for the BIZ system in the future? How do the case study results compare?

The Ishikawa diagram was used in the project to help develop the tables necessary to drive the ASF system forward and take it to a stage of automation where there would be consistency of results. It was also necessary as a building block to the automation of agility and the discovery of agility paradigms for later strategic work in the project. By first examining the agile systems at the operations level the strategy element could be put onto the top of the operations building blocks. It is proposed that the strategy elements add the real push for agility within a company but the building blocks of operations need to be in place.

The Ishikawa diagrams were used to show how each sub factor had causes that fed into it to cause turbulence. The main bones of the diagram are the pillars of agility derived through the research at the agility centre. Each of the pillars of agility have elements feeding into them that will have an impact on the sub-factor.

Through the development of the Ishikawa diagram, using the ACI's the factors could be related back to tools and techniques which could impact on the sub-factor in a positive manner. The tools were selected for their ability to impact the causes of the diagram not their treatment of the effect. This was the real value of creating the diagrams. The tools put into the tables from this process have also been put through a case study validation where examples were found in industry of the tool being used to combat the cause or used to create an operational base for agility to be implemented.

The tables also form the bases for repeatability in the system which is important for the development of an automated system. Without an element of repeatability the system could not be reliably automated, therefore the results of the ASF could not be relied upon. It is also proposed that if there was not an element of repeatability to the framework then the framework itself could not be relied upon to generate robust solutions to positively impact the turbulent factors for the company being examined. The table however does generate a number of tools for a scenario; this gives more choice to implement a wide variety of tools. However a narrower focus may be desired by some who feel the system should 'choose' for them. This is counteracted by the HML ranking system to suggest the tools most suited to the task.

From this process it can be concluded that the output of the tables and tool selection process produces reliable, repeatable and validated output. This is conclusion is backed by the following:

The tool selection was developed through the Ishikawa process
The tables were then validated through case study work already carried out in the agility centre.

The tool placement was also looked at through the Toulmin logic process to give a validation through deductive research. In reality it means that each element of the table and each output from the tool was validated through independent case study material and a recognised technique for examining qualitative data.

Because the tool selection process was concluded to be robust the output has therefore been fed into the development of an automated system.

The value of the automated system is in the reliability and repeatability of data that can be gained through the use of the ASF remotely in companies with no intervention of a traditional 'consultant' role. The system means that information can be gathered and tools and techniques suggested for implementation that will provide building blocks for agility. It also means less human intervention at the beginning of the process or the data gathering stages.

There are two caveats for the use of this automated system however. One is that the system does not provide prescriptive solutions. This would narrow the selection and fit of the tools down to such a level that they become unsuitable for the environment, skill level and set up of the company being examined.

The second caveat which has not been addressed during this research is that of the host company feeling more value for money when using the services of a specialist consultant who is present on site through the whole of the implementation process. There is also some subtle information gained about the company and the way in which it functions by having face to face contact with key people within a business. Questions can be used to drill deeper into reasons, trends and throw away comments.

The table format used here for tool selection implementation may be used for implementing additional features of the ASF in future as initial tests on the automation of the system show results and functionality that gave reliable results.

Discussion of the Richardsons / Daryl Case studies Results:

This section will look at the results from the automation of the tool selection system.

First the companies used are examined. Three companies were used to ensure a variety of products and sizes of company have been covered. The three companies range in turnover from £1M, £9M and £12M. This gives a good range in terms of size of the company's studied and means that the tools used will vary from case to case. This is because of resource levels and the level of skills required to maintain some of the tools and ensure the most effective implementation. The markets in which they operate are also quite different from each other. One has products which are distributed to the medical supplies industry, one is selling shower products to industry and the public and the other is selling lubrication and surface coatings again to industrial customers. This does put all the companies as second tier suppliers but this should not be an issue as the manufacturing tools will apply to all types of supply chain levels.

The framework for evaluation and implementation has been developed specifically with the SME in mind (although applying to larger companies should be possible by breaking them down into smaller and more manageable sections) and so these three companies fit the initial criteria of SME. It may be interesting to apply the framework to a large company to see the results that this generates and what, if any, changes are needed to the system.

All three companies have been established a number of years, this indicates that there is good market knowledge in the company and a wealth of experience to draw upon when looking at the questionnaire section for analysis. It can therefore be said that the questions section and the rating of the priorities and turbulence will be quite reliable. The companies being examined are also successful and profitable so they are in a healthy economic state. This helps as it means the company is unlikely to become insolvent in the time that the work is being carried out, which would effect the results from the case studies, and they will have resources available to implement new tools, ideas, products, train staff and any other investment that may be necessary. As with all companies it will be difficult to measure the effect of all the tools and techniques implemented in terms of profit and sales as there are external factors affecting these. This may be due to an increase in customer base unexpectedly, losing a major account through no fault of the company, i.e. the customer may have been bought out, closed down or have themselves gone bust. The changes in the financial performance can be tracked through the life of the project and so the projects effect on performance will be able to be quantified to some extent. The other issue which is very hard to measure is the securing of business. Some tools and projects mean customers will stay with the company rather than moving elsewhere and the value of this is hard to measure. The framework does not include an effects measurement at the end, but if it did, and maybe it should for feedback purposes, these are some of the issues that should be addressed within it. However, each tools does have specific measure associated with it which can be used to monitor and feedback.

Three companies are examined in the application of the tools selector as mentioned before to give a range of product, market and size. Obviously this does not cover all eventualities and all companies are different, however three does seem enough to give a good indication of the tool selection system and whether it works or not. Obviously the more the tool selection is applied the more likely any anomalies or problems with it will be found, but this is true of all new things and a sample is usually the best way to get round this problem.

When examining the case studies it appears that the pillars of the framework are applied by chose of the people undertaking the work. This means it is chosen by discussion with the questioner and the questioned. The method of selection for the pillars is not clear and this may be an area that needs defining a bit more specifically as there also appears to be no literature available to describe this process.

The next stage is obviously to apply the questionnaire for the area chosen and this seems to be quite straight forward. Each factor is then given a turbulence priority number which helps to prioritise the way in which the tools are applied so that they can be most effective. This appears to work well and has been well documented and applied many times giving a range of applications. It prioritises on the basis of the companies opinion and experience of the market it is operating in so works well at identifying the needs of the company.

When the case studies were examined the list of tools and techniques suggested for use were noted down it table form. These were the actual tools implemented to some success within each company. It can therefore be said that these tools are correct and worked well for the companies and the situations that they had found themselves in. The tools selector framework was then examined to see if this also matched up these same tools for use in the company.

It became obvious as the tools selector table was consulted that it suggested far more tools than the case study examples did. For example, in the Daryl Case study 7 tools were suggested, when the selector table was used 14 tools were highlighted as possible.

The Richardsons case study suggested six and a scheduling system; when the tools selector was consulted it suggested 15.

With RS Clare the trend continued with the case study suggesting 7 and the tools selector highlighting 16 tools which might be used.

There are several reasons for this mismatch in the number of tools which will be looked at and discussed later in this section.

The other important factor is whether all the tools suggested by the case study are highlighted by the tools selector table. This is important because the case studies were successful, this is assumed to be because the right tools have been applied. This means that for the tools selector table to be useful it must also suggest these tools for implementation.

In the case studies there is one tool in each which is suggested that the tool selector table does not highlight. This means that there is an 86% agreement in the Daryl case study, an 83.3% agreement in the Richardsons study and an 86% agreement in the RS Clare study.

These figures however do not give the full story. If another alternative tool which performs a similar job is suggested or a combination of tools to perform the same job, then the tool selector table has performed better than the figures above. This is a hard factor to measure but it can be argued that in all the case studies there were alternative tools suggested. In the Daryl case the tool not suggested by the tool selector table is a factory re layout. However, cellular manufacturing has been suggested which means a movement of people and equipment into a cellular form, therefore constituting a factory re layout. The case study also suggest a quality program, where as the selector table suggests three quality programs (TQM, 6 Sigma, SPC) and also suggests Poke Yoke which gives a fail safe device which usually increases quality by not allowing mistakes to happen. This helps to explain the large number of tools suggested by the selector table. Because each company will have unique capabilities and skill levels suggesting all three quality methods is important as a company may have a preference for a type of system and some tools may not be appropriate for the situation.

In the other two case studies there is a similar situation, RS Clare has not had factory re layout suggested but has had cellular manufacturing suggested, so is the same as above. The Richardsons case study suggested Poke Yoke devices are installed in the factory but this has not been highlighted by the tool selector table. There are however other quality tools suggested by the table which may lead to the introduction of a Poke Yoke device if it is applicable in the situation. The other tools suggested are FMEA, which will examine exactly what has happened to make a process fail or how it could fail and this may lead to the introduction of a failsafe device. Also Six Sigma, TQM and BPR have been suggested which may also lead to a change in practice and the introduction of such devices.

From the above it can be stated that the framework is effective in identifying the tools necessary to bring agile capabilities to a particular company. One issue may be however the number of tools suggested by the framework. With the relatively large number of tools suggested there is still some selection, al be it from a shorter list, by the operator and the company. This may be desirable as there may be reasons why some are more preferable than others. There may also be another way to look at the tools suggested by the table. The high, medium and low scoring ratings which are present on the table may give a steer as to the best type of tool to apply. These may hold the key to giving a simple weighting factor to the tools. It is suggested that if a weighting factor is developed it should not be complicated and too rigorous as the operator of the framework may make a manual selection of one with a low rating as it has a better fit with the particular company involved in the study.

An example of how the system might work is shown below using the Daryl case study and tool selection information.

The tools suggested by the case study are:

5s
Cellular manufacturing
Cultural change and training
Factory re layout
Quality program
Stock control such as Kan ban
Mass Customisation

The tools suggested by the system are with the following priority classes are: (here a list of tools following with weightings in brackets afterwards, each weighting represents one time it was flagged up by the selector table)

Kanban (m)(l)
Mass Customisation (h)(h)(h)(h)(l)
Five S (l)(m)(h)
BPR (m)(m)(m)(h)
Kaizen (l)(l)(l)(l)(h)
Cellular Manufacturing (m)(m)(l)
SMED (l)
FMEA(l)(m)(h)(h)
TQM (h)
Six Sigma (h)
SPC (l)
OEE (m)(m)
Poke Yoke (h)
Benchmarking (m)
Multiskilling (h)

To rank the above, the number of times a tool appears must be examined, the weighting that it is given is also an important factor. It is suggested that each of the rankings is given a number 1,2 or 3. This is to make for a simple numerical ranking system. A high is given a three and a low a 1. This system will give us a ranked list of tools but does not take into account what was mentioned before about the number of times that a tool appears, and how implementing one tool which affects two areas of capability may also be desirable over implementing two tools for the same job.

The ranked list looks as follows:

Mass Customisation (h)(h)(h)(h)(l)	13
BPR (m)(m)(m)(h)	9
FMEA(l)(m)(h)(h)	8
Kaizen (l)(l)(l)(l)(h)	7
Five S (l)(m)(h)	6
Cellular Manufacturing (m)(m)(l)	5
OEE (m)(m)	4
Kanban (m)(l)	3
TQM (h)	3
Six Sigma (h)	3
Poke Yoke (h)	3
Multiskilling (h)	3
Benchmarking (m)	2
SMED (l)	1
SPC (l)	1

The tools which were actually implemented during the work carried out are as follows (in no particular rank):

5 S

Cellular manufacturing

Cultural Change and training (multi-skilling programme)

Factory re-layout

Quality programme

Stock control such as kanban

Mass Customisation

When comparing these results it is important to remember the number of tools suggested by the framework. By grouping some of these tools together the results become even more favourable than they already are. As they stand above the first nine tools on the list include 6 of the tools suggested in the case study. There are many reasons why tools may have been suggested and are not suitable, for example the tool may already be in place, the company may not have the necessary skills but are able to perform another tool to perform a similar job so use this instead. When looking at the tools suggested, grouping quality tools together for example will give a more favourable result. This is done in the original case study when suggesting methodologies because the operator wants to examine the fit of various quality tools with the company and the product. If we group six sigma, SPC, Poke Yoke, FMEA and TQM under the banner of quality tools and call this one suggestion the table will look as follows (in rank order):

Quality tools (39)
Mass customisation (13)
BPR (9)
Kaizen (7)
5S (6)
Cellular manufacturing (5)
OEE (4)
Kanban (3)
Multi-skilling (3)
Benchmarking (2)
SMED (1)

The first nine tools in rank order now contain all of the tools suggested by the system and this may be looked on as a more favourable result. It can also be said however that this is skewed to far in terms of the quality tools area and after researching the case the mass customisation element was the most important area for the company to focus on. This is number two in the list but it seams the scores are disproportionate. However it could also be looked upon that the scoring system should not focus on the value but merely the rank and the fact that Daryl is a quality or high end manufacturer is reflected here in the ranking system (with quality coming out on top) and mass customisation is still up near the top.

It can therefore be concluded that the ranking system does give a steer on how tools should be implemented and allows a prioritisation to take place. It does not however show a scale of importance.

The next section of the system which is examined is the highlighting of possible negative effects by the system on other ACI's. This section is intended to show the operator and the company the potential risks of implementing such tools and assist in avoiding weakening other areas of capability.

The negative flag up section is again ranked in High Medium and Low importance and offers the user a chance to glance through to see where else the business may be affected. It is not really designed to help choose tools or disregard them because of there negative impact but with some more work and a similar ranking system to the positive effects it could offer this capability. It was hoped to flag areas where the operator should use caution to highlight other areas of the business which should be monitored during implementation. However there is no easy look up section to see the effects of the tool clearly. This may be very helpful if there are large negative effects and the user wants to read about these and how to avoid the pitfalls represented in the table. It is an area which, with further work on the validation section, could easily be produced.

In its current form the negative flag up is useful but it is thought that it would be made more user friendly by using a referencing table. This would require more paper work but may be worth it, all operators may not want to use this and the table with ranked High Medium and Low effects may be sufficient to jog the memory and start the team thinking about how capabilities may be affected and what can be done about it.

Paradigm research:

This section examines the TRIZ, BIZ system and how successful or useful this area has been. Was the content analysis a successful way of generating paradigms of agility? How can these and the BIZ system be developed?

Paradigms of agility:

After reviewing the content analysis work several factors keep appearing in relation to what is agility. This becomes apparent after coding in NVIVO and displaying the results for each of the nodes. These factors include:
Decentralised decision making
Technical functions involved in marketing
Leveraging intellectual power and creativity
Niche markets
Eliminate departmentalisation
Freedom and availability of information
Forming partnerships and improving relationships with supply chain
Treating each customer as individual and provide an entire solution

So how do these relate to a TRIZ type system? If we examine the first three factors we can put these into principles rather than a statement about something.

Decentralised decision making: This relate to flat structured organisations where employees are empowered to make decisions on the job. Therefore there needs to be an amount of training and skilling of the workforce to enable this to happen. There also needs to be an information system that provides the right information and enables its manipulation to make a decision at the right point in the product or service process. Here people are key to generating agility in choosing the correct product path. However a clearly defined choice process is needed with flexible operations.

Leveraging intellectual power and creativity: A company that utilises all of the brain power available to it must be intellectually superior to one which utilises only a small percentage. This is a typical problem where management think they should be the only people using creative or intellectual capacity. Again this relates back to the first point about people having the authority to make decisions and the information to make the right ones.

Technical functions involved in marketing: This is really talking about what are the possibilities that technical areas can offer the customer in terms of enhanced products and choice. Rather than marketing coming up with all the ideas for new products there should be an input from technical functions to show the possibilities that can be created. To be truly agile this should have input fom customer as well. This allows the product range to create agility through niche creation and solution offerings. It allows set up of operations to match strategy implementation.

Moving through each of these functions and looking at what they are really driving at it appears that maybe the paradigms of agility can be split into PPPOO pillars.

The first two here for example:

People:
Provided with timely accurate information at the right point in a process (this could also be placed into organisation under information flow to decision making shop floor staff)
Authority to make decisions rests with shop floor (structured process for allowing decisions to happen)
Skills are increased amongst all employees
Involving al employees in development processes (harnessing brain power)

Organisation:
Effective cross functional teams
End customer involvement

Reflecting on how the system works, the BIZ process is in the early stages of development. The TRIZ system appears to fit well with this type of innovation for agility and the research has pulled together some interesting paradigms. Key strategic principles have been examined to help the system function and these have been instrumental in developing stage 4 of the BIZ system which is paradigm application.

The BIZ model has advantages in that:

It is expandable

The structured approach gives a new method of strategic implementation of agility

Solutions outside the knowledge sphere of the company and operator can be gained if the paradigm system is fully expanded

The system can become easy to apply and it is the authors belief that this will lend itself to computer automation, as the TRIZ system has done, after expansion of the BIZ paradigms.

Development work is needed however on several areas of the system:

More content analysis and paradigm identification is needed

More case study and strategic implementation work must b undertaken to aid in validation of the paradigm system

A contradiction table must be developed which will aid in the movement towards ideality

Ranking systems would help here to apply smaller sections to strategic thinking

The research has led to the proposal of the existence of paradigms of agility. Some of these paradigms have been suggested here in the conclusions. During the research it has also emerged that there is a maturity cycle to agility and that the development of an agile strategy means that the company must be following a cycle of innovation to remain agile.

This cycle of agility in strategy is similar to that of the operational maturity model proposed earlier I the project, showing the three stages of the cycle to be robust, responsive and proactive. In an agile strategy a company must be moving to the proactive stage and be putting into place techniques and skills to remain valued by the customer. An example of this might be a company that is continually looking at buying in new skills or techniques to offer the existing customer base. It then sweats these assets by developing them into other markets while at the same time looking for the next set of skills or product offerings to push out to the marketplace. The acquiring of capability is one way of implementing a mature proactive strategy, product development, R&D, merging; creating networks are examples of others.

It is proposed that a mature strategy will become opportunistic in exploiting the available markets, but for true maturity this will be a planned opportunistic approach. The opportunities are sought actively and investigated for implementation on a regular basis. It is proposed that this maturity in agile strategy can be linked into a company's life cycle and the behaviour that it is likely to exhibit at a particular stage of its life. This is as shown in the work of McCarthy, as examined briefly during the research process.

It is proposed that McCarthys work which has been examined around lifecycles and classification of companies could be more integrated into the system. This work will give key pointers to why a company system is behaving in the manner it is. The advantage of knowing this type of information will be in identifying the type of innovations and strategic thinking that will benefit a company at different stage of the company life cycle. This may provide a key element in looking at how strategic implementation of agility will fit more comfortably with the company's' current challenges and strategic impetus.

Contents

Appendix 1:

Summary of Turbulence level rules

Turbulence Assessment Table

Turbulence in each area will be assessed by establishing the forms in which changes take place through the assessment of a number of components. There are 7 change components.

Time base

Pattern

Trend

Distance

Frequency

Magnitude

Size

Time Base: TB

This is the period of time for which the particular sub factor is assessed

S = Short Term – The measure is over days.

M = Medium Term - The measure is over months.

L = Long Term - The measure is over a year.

Pattern of Change: P

This identifies the form of change for each factor. Changes could be:

~ = Cyclical

▬ = Non-cyclical

Trend: T

For the specific pattern of change, this metric measures the direction the change moves in from the beginning to the end of the time base specified. This can be:

↑ = Increasing

↓ = Decreasing

O = The same

⇑ = Exponentially increasing

⇓ = Exponentially decreasing

Distance

The value of the change from the beginning to the end of the time base

L = Low – Less than 5% of the value at the beginning of the time base.

M = Medium – Between 5% and 30% of the value at the beginning of the time base.

H = High – Greater the 30% of the value at the beginning of the time base.

Frequency

How often the change occurs; this metric is really only relevant to cyclical patterns of change.

L = Low – up to 5 cycles over the time base.

M = Medium – from 5 to 10 cycles over the time base.

H = High – greater than 10 cycles over the time base.

Magnitude

The average deviation from the mean in cyclical patterns of change.

L = Low - Less than 5% of the value at the beginning of the time base.

M = Medium - Between 5% and 30% of the value at the beginning of the time base.

H = High - Greater the 30% of the value at the beginning of the time base.

Size

This is the mean value for the sub factor and its unit of measurement.

Appendix 2

Example of ACI and metrics:

Applied Level		2.a.1.1 MACHINE SCALABILITY	
Tool			
Machine	X		
Cell	X		
Department	X		

Explanation

This is the ability of a machine to scale up or down its production in response to fluctuating demands with the available resources.

Scalability may be addressed from a machine, a cell or a department perspective.

Note:

This will be measured by identifying the current resource available to the machine and then comparing this against the maximum amount of time that the machine maybe run for with the resources available to you. This could be identified as either overtime or additional shifts.

Applying at a Machine Level

Equation

$$\text{Machine Scalability} = \frac{\text{Additional Time Machine could run with available resources}}{\text{Current Time Available to Machine}} \times 100\%$$

Data Required

- Current time available to machine.
- Additional time machine could run with available resources.

Example

Machine A
Current Time available on Machine = 8 Hours
Additional Time
Morning Overtime = 2 Hours
Evening Overtime = 2 Hours

$$\text{Scalability of Machine A} = \frac{4}{8} \times 100\% = 50\%$$

Appendix 3

How ACI's match up to Miltenbergs Manufacturing Outputs

An explanation of why I think that the ACI's fit into the Miltenberg manufacturing outputs from his book Manufacturing Strategy. (page 92 in note book)

Each manufacturing output is covered in turn. Under each heading the explanation for the placements of ACI's will follow. The definitions of the outputs are re-iterated in the following table to aid in understanding of the arguments used.

Manufacturing Output	Definition
Cost	The cost of material, labour, overhead and other resources used to produce a product.
Quality	The extent to which materials and operations conform to specifications and customer expectations, and how tight or difficult the specifications and expectations are.
Performance	The product features, and the extent to which the features or design permit the product to do things that other products cannot do.
Delivery time and delivery time reliability	The time between order taking and delivery to the customer. How often are orders late and how late are they when they are late?
Flexibility	The extent to which volumes of existing products can be increased or decreased to respond to the needs of customers.
Innovativeness	The ability too quickly introduce new product or make design changes to existing products.

Table showing placement of ACI's into Miltenberg manufacturing outputs, this was developed from the first fishbone diagram. The full table of ACI placements and validation for the placements can be found in the validation section of the project. This offers a brief explanation of why ACI's were placed where they are in the first development stages of the project.

Outputs	Delivery	Cost	Quality	Performance	Flexibility	Innovativeness
ACI's						
	B1	B6	B2	A1	B2	A6
	B4		C2	A6	B4	A2
	C2			A2	B1	
				B2		

Some examples are given from the company I work for who are a first tier supplier to a number of large companies and supply key components which add aesthetic elements to the end product. The products are not branded with our own company name but are thought of as the product of the OEM.

Cost:

(All elements will effect cost to some degree as changing any factor will have some impact on the cost of raw material, labour or overheads to some degree. This however is ignored as counting pennies when examining the turnover of most businesses is irrelevant. Obviously large amounts and large changes need to be examined, so elements covered here are deemed to have a large(r) effect on the cost than most.

ACI's Placed in this section:

B6 Robustness: Robustness will affect all elements but in most consumer manufacturing today, cost is a large element in the decision making process of the consumer or industrial customer.

If a process or system is not robust the varying demands of volume placed upon the system will cause maintenance, quality and planning problems. This will therefore have a knock on effect on cost especially if the process is a bottleneck. Extra cost will be incurred if the process or system breaks down or needs extra maintenance because of increased demand. Cost will also increase if the machine runs out of its intended parameters and produces poor quality product which cannot be sold but uses up resources in making scrap products. If by varying demand the particular function in question needs continual re planning then cost is incurred as an overhead which must be absorbed into the product somewhere.

Bottleneck operations will particularly incur costs for manufacturers as they restrict all areas of the manufacturing system and add stock one side and a starvation of work the other if they are not robust enough. Therefore a bottle neck operation must be particularly robust in order to prevent a build up of cost. This may be combated to some extent by machine or process replace-ability although it could be argued that this may hide the problem rather than tackle the root cause.

While observing this factor at the company I work in, varying demands placed irregular use on the equipment. This meant that there were always lots of breakdowns which caused poor delivery performance, poor quality and lack of motivation in staff. While the machine was down costs were increasing due to production staff standing around idle and the amount of un-saleable product being produced from the repair process. Therefore robustness helps to keep manufacturing costs under control.

Quality:

ACI's placed in this section:

B2 Re-configurability: If a process can be re-configured effectively and quickly good quality product should result. Many companies however use machines / processes not suited to the task and end up producing large amounts of scrap or poor quality, something that has a negative effect on their capabilities.

If the above is true there will also be large impact on delivery, quality, cost and profit margin too.

While observing this factor at the company where I work it became apparent that when changing from one product to the next there was always a period where poor quality products were produced.. this was due to inadequate setup of the machines and staff continuously having to apply a totally different set of skill to make one product to the next. This produced product requiring either expensive re-work or which was scrap. In this case dividing the two product types and purchasing an extra machine solved the situation. This was done due to the machine being relatively cheap compared to the amount of scrap it would save.

Another method may have been to reduce the number of changeovers, perform some sort of SMED exercise or re train the staff intensively.

C2 Replace-ability: Training of staff needs to be adequate enough to cover processes which are critical if staff are absent or leave, this includes absenteeism, illness and holidays. Several people need to be trained effectively so that they are able to produce at the same speed and at the same quality as the member of staff who is absent. If training is not adequate then delivery performance will be poor, cost through poor quality, either rework, rejects internally or rejects by customers, will increase and capabilities will be affected.

At the company I have been working in the effect of some staff being absent caused large problems. Certain key members of staff were multi-skilled on all operations where as others were not. This meant when the multi skilled staff were on holiday or sick certain tasks were performed extremely slowly and with poor quality results. This was solved through and extensive re training programme and =assessment of staff skills using a skills matrix to determine where training was needed for the majority of people first.

Performance:

A1 Degree of Customisation: This allows customers to spec 'their' product which gives a feeling of uniqueness to the customer. In some markets no customisation would mean no sales or extremely reduced sales of the product. In others customisation is not important in the slightest. But companies who can offer high levels of product performance (customisation) for a perceived reasonable cost in a short lead time the advantages will be large over their rivals especially if the market is large with many companies competing with similar products.

In the company I work for this was observed when business was won from a number of rivals by allowing the customer to design their own product. Before the manufacturer would spec the part to fit the customers' product, now the customer could spec anything they wanted. This was something a large amount of people wanted to do and would pay a premium for this, although this was still perceived as good value by the customer because of the freedom they were given.

A6 Component adaptability: This is important in terms of keeping the cost of performance under control. It means new products can be brought to market quickly and without massive development costs and having to source entirely new materials. It also impacts on the company's ability to add functionality to a product. By using the same components the cost of customisation is kept down while allowing a perception of high product performance.

This was true in my company also. A slightly different chemical was sourced from a supplier giving massively improved results to quality and product performance in other ways but allowed the same tooling and processing equipment to be used. This meant effectively a new product range along side the existing one which gave our customers a perception of choice for a very small investment.

A2 Component flexibility: The ability to supply from alternative sources allows the suppliers to aid in product performance to. Suppliers will always be looking to win the bigger chunk of business and may improve the product or products supplied to a company. This may lead to new innovations in product performance which hadn't been thought of before. This allows more performance for the product.

The previous example of this can be used again to show how a chemical suppliers innovations helped to generate a new product for the end customer.

B2 Re-configurability: If performance / feature requirements of a product change regularly how does a product deal with this? Can production cope with many different colours, sizes and feature all in one go? If it can then the cost of performance is reduced from having to set up new machines, production facilities and possibly the training costs of staff. If re-configurability is easy then features can be bolted on after launch to extend the products life cycle. One example may be the walkman which started as a tape, and then a tape radio, then added balance controls to the volume, then became smaller, etc. By bolting extras on a re-configuring easily companies can pre-empt the market and give extra feature customers didn't ask for which give a great feeling of product performance and satisfaction.

This can be seen in my company when new ideas for products are sent to customers even without asking. They are shown different variation of products without cannibalising our own market which helps them to innovate with their own products by looking at some of the possibilities of ours. This also gives a better position over rivals as they never know what is coming to market soon and so are always competing against the product which is likely to be replaced with the next model at any point.

Delivery:

B1 Scale-ability: If a company has the ability to scale up or down production capacity quickly and easily to meet demand then they will meet delivery times, have shorter lead times and be able to compete with rivals on the delivery aspect of their service. It means orders may be able to be brought forward if the customer so wishes and in certain markets may be an order winning factor if the product can be delivered quicker than a competitor.

In the company I work in the ability to scale up and down is very important. There is a definite busy half of the year when customers place increased demand on the company with the same lead tie expectations as when the company is quiet. This means production capacity must be quickly ramped up to meet demand and still meet the performance measure on which the company is compared against. If this performance measures are not met consistently then suppliers are not considered suitable for supply and an alternative will be sought. This means for the company I work for they must deliver full orders on time to stay within the approved supplier rating.

B4 Replace-ability. If components can be supplied from an alternative machine this allows for unplanned breakdown, scheduled maintenance and gives scalability options if one product line become particularly busy. This does also depend on other techniques and capabilities being in place such as SMED, but for the time being this is taken as possible. Because of the extra capability the company will be able to maintain or improve on delivery performance during busy period, periods of maintenance or unplanned breakdowns.

This capability proved useful I the company I work for as one product line would always become busier than the other. By have the two production lines able to produce both ranges of product swapping production gave the capabilities to fulfil orders during the busy period and stopped the waste of staff having little work on one line while the other was very busy. Because the changeover was quick and could be completed during end of shift close down the capability could be quickly installed on the production line. It also meant that if there was a breakdown on the busy line production of that range of products didn't have to stop, it could continue after a short while on the alternative line. This ensured delivery of even the busy product was in line with customer expectations.

Flexibility:

B2 Re-configurability of process. By being able to change the mix, volume, colour and product on a set of machines, seasonal variations, fashion and simple customer choice can be dealt with more efficiently. This helps in a highly customisable market such as car manufacture or other make to order products. The key here to flexibility is being able to re configure quickly, with minimal scrap and minimal setup time and be able to produce the alternative product to the correct quality standards. This will mean an advantage over rivals by being more responsive to the demands placed on the company and by having this flexibility the cost of machines can be kept to a minimum and labour can be utilised better within the factory.

This can be seen in the example above for the company I work for. If the products that were being made on the alternative line took a long time to set up and produced lots of scrap and poor quality product this in fact is a hindrance rather than a help. It means the machines; processes and people are not flexible. Therefore the effective re-configurability is an important factor in flexibility issues.

B4 Replace-ability. This is much the same as above, if a product range has high demand and processes can be replaced with alternative ones to aid in the processing of components and raw materials then this give flexibility to the manufacturing system. Again aids with planned maintenance, unplanned downtime, and possibly staff absenteeism.

B1 Saleability. Allows flexibility of demand up or down for all product ranges, means staff will have to be able to be multi skilled to allow for increase in any area of the factory.

Innovativeness:

A6 Component adaptability. Innovativeness does not have to be a large leap forward in technology or a completely new product. Often small incremental steps lead to new product ranges, new versions and increase in the life of a product. Having components which are easily used in new products is beneficial to the company in the fact that new products may not necessarily require lots of new components. By allowing component adaptability many new ideas can come from within the company for new products and services. It also means obsolete stock is less of an issue and costs may be avoided here. Components may be used for a long period of time in products especially if these components are internal and do not provide aesthetic value to the product. Aesthetic components are harder to adapt because of the change in consumer fashions.

This has happened a number of times within the company I work for when chemical suppliers has helped to develop an new appearance to the products by putting small amounts of additive into the existing chemical system. This has helped to give the product a totally different 'feel' and 'look' which has made the customers think that a whole new system has been developed.

A2 Component flexibility. By having components supplied by different suppliers and used across different product ranges the company can drive innovation from suppliers in much the same way as talked about in the examples before. It means that changes will also effect across a range of products if so desired. Problems solving of one product may also lead to new ideas in other areas and generate new ideas across different products.

Appendix 3

New tools developed (3 examples)
Tools Definitions:

Benchmarking

A metric unit on a scale for measuring. A continuous systematic process for evaluating products, services and work processes of organisations that offer the best practice in a particular market / field. This is then used for organisational improvement or ones own product / service to become 'best in field'.

Explanation (what /how):

Internal benchmarking: Benchmark against internal operations or standards, usually in a multi-division or multinational enterprise.
Industry (or competitive) benchmarking: Benchmarking against other companies in the same industry, whether they are direst competitors or not.
Process (or generic) benchmarking: Benchmarking generic processes (ordering, dispatch etc) against best operation or leaders in a any industry.

To Benchmark:

P-Plan; the preparation of benchmarking study plan, selection of teams, partner selection, process analysis, who, what, where, when, how.

D-Data Collection; preparation and administration of questions, airing data.

A-Analysis; includes determination of performance gaps, best practice identification, methods evaluation and enablers identification.

A-Adaptation and improvement; includes publication of findings, improvement plan creation, and execution of the plan. Benchmarking does not end at the analysis phase.

Requirements when implementing:

Tie in with overall strategic objectives of the company
Operate efficiently as benchmarking team
Team comprised of interested motivated people
Focus on relative issues
Set realistic time tables
Pick correct business partners
Follow proper protocol
Collect manageable amounts of data
Identify targets in advance

Tips and Tricks:

Set realistic targets
Ensure quality infrastructure is in place to deal with any changes
Monitor changes effectiveness and ensure plans put into place
Often fails due to lack of management commitment
Lack of follow up gives poor results
Focus on metric rather than processes, i.e. measurable's
Graphical representation of measurement helps

Risks:

Benchmarking wrong product, service, company, will give false results and complacency e.g. Lexus should not benchmark against Fiat, wrong target market. Do not get too absorbed with processes, try to define a measurable and compare each product, e.g. lifetime in hrs of an electric motor.

A great deal of analysis and no action is a risk. If management do not follow up, large amounts of data will be gathered and no change generated.

Benchmarking must fit with the company strategy, i.e. do we want to produce best in class or are we bespoke, mass produced, etc.

Could end up incurring extra cost and killing own market if proper analysis or changes is not undertaken.

Relationship to ETI:

All areas of a business may be benchmarked, focus on a particular aspect, product, service, component for best results.

Relationship to ACI:

B5 Utilisation

Cellular manufacturing:

A cell is a group of workstations machines or equipment arranged so that a product can be assembled progressively from one work station to the next without having to wait fro a batch to be completed or requiring additional handling between operations. Cells may be dedicated in various ways, common methods include product, component, process or sub component. The way in which they are organised really depends on what the type of product is and how complex it is along with the complexity of the operations performed to manufacture it. Cells can have a substantial impact on a company's productivity and throughput and flexible cells can be very effective when applied in an environment of low volume but large product variation.

Explanation (what / how):

There are four basic patterns of cell design. Straight through flow of product, U shaped product flow, L shaped product flow, and comb (or spine) product flow.

Straight through is easy to schedule, easy to access on two sides and allows straight inexpensive handling methods.

U shaped allows the product to return to the start of the cell with fixtures and fittings which can then travel around the cell again. Reduced operator movement is an advantage as well as encouraging team work.

This allows a lengthy series of operations in a limited space. It also allows a split in or out flow of materials or products.

Comb or spine allows the operations along the length to change frequently and means different products with different types of operation can flow down the main spine but only visit selected teeth of the comb.

The three methods of grouping machinery in a cell are as follows.

Product line cell: Forms a progressive sequence of operations devoted to basically one item. When the quantity is high and product processes are conventional this is the preferred type of line.

Group technology cell: Forms a grouping of different operations dedicated to a group or family of products. When the product itself has special features or constitutes a group or family of items the group technology is called for.

Functional cell: Forms a cluster or small functional department of similar operations set together to work as an integrated unit. When the process is dominant - large equipment, costly utilities, special building requirements – the functional cell is the key.

Tips / Tricks:

Define the requirements of the cell. Look at the flow of pieces and task balancing to get one piece flow ideally. Set the size and location of the team to work on the cell and who is in charge of this team. Write job descriptions and task descriptions carefully and set criteria for the selection of these teams.

When designing the cell take into account orientation of the surroundings, detail on the cell design produced, implementation which may be costly if large machinery and equipment must be used.

Risks:

Simply moving machinery around so that it is closer and not actually looking at the tasks involved and how to cellularise these. Capitalisation will be required and this needs to be carefully planned. Look at the skill levels of the staff, they may need changing, as might the number of staff, which could be a problem.

Relationship to ETI:
Dynamic customer requirements
Intensity of competition
Supply chain turbulence
Changes in STEEP

Poke Yoke:

Translates to failsafe devices. This is a way of installing a system which means that a critical function or action is carried out correctly no matter who carries out the task. If there is only one way to do something and absolutely no possibility that it can be done in another way then there will be no mistakes made.

A good example of this is a three pin plug which goes in a wall socket. The plug will only fit into the receptor in one way no matter who is trying to plug in a device. Therefore no harm may come to the user or device by incorrect location of the pins.

Explanation (what / how):

Observe the equipment / process on which a failsafe is to be fitted. Decide the critical task which will ensure the process cannot work if procedures are not carried out correctly. Think about how this process / procedure can go wrong and who or what will make it go wrong. Think about redesigns to the equipment which may help to prevent this operation from being performed incorrectly.

Tips / Tricks:

When looking at the process think about:

Location pins
Location holes
Male / female connection specific to that machine, process, tank, product.....
Electrical cut out switches
Mechanical cut out switches
Shape size of tools etc

Risks:

If there is a way round the device it will be found by someone at some point in time

Operator not trained properly and perform operations in the wrong order

Poke Yoke prevents flexibility by not allowing changes to components or combinations of components

The poke yoke device makes the process take much longer, therefore drastically reducing the productivity

Makes the operator perform the task in the wrong way

Relationship to ETI:

Intensity of competition

Dynamic customer requirements

Supply chain turbulence

Changes in STEEP

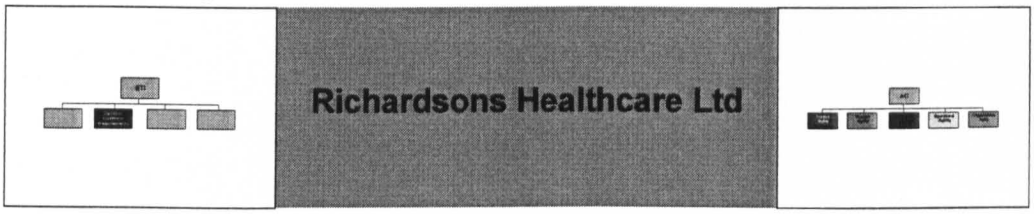
Relationship to ACI:

B2 C2 – Customer quality

B6 Robustness

Appendix 4

Case Study Report Richardsons Healthcare



Introduction

The objective of this report is to analyse the impact of the Business Environment on the Internal Capabilities of an organisation. The structured approach will concentrate on the utilisation of the Environmental Turbulence Indicators Audit Tool to identify factors and give understanding of what is happening within the Business Environment from the perspective of an individual organisation. The factors are prioritised to identify those areas that are having the greatest impact and ultimately driving the organisation in a particular direction. This information can then be used to address the internal capabilities of the organisation and focus on those internal areas for improvement from the perspective of the Product, the Process, the People, the Operations or the Organisational hierarchy through the implementation of tools, techniques or methodologies that 'fit the purpose'.

Company Overview

Richardsons Healthcare has been in operation for around 50 years producing mattresses for operating tables that are subsequently used within hospital operating theatres. The Company provides practical and innovative solutions to eliminate secondary ailments, caused through pressure points on certain parts of the patients' body when immobile for a long period of time. There are two niche products manufactured, the Integral Skin (IS) and the more recent introduction of the Visco-Elastic Foam (VEF). The Company has 22 employees and a turnover of just over £1M.

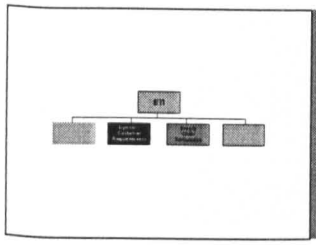
Environmental Turbulence Indicators Applied

- Dynamic Customer Requirements
    - Product Performance

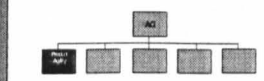
Critical Turbulence Factors

2. Dynamic Customer Requirements (DCR)											
2b. Product Performance											
Sub Factors	Tb	P	T	D	F	M	S	TLR Score	Control	Impact	TPN Score
	SML	~ ?	↑↓O⚷	LMH	LMH	LMH					
Percentage of Orders Cancelled/lost due to Price	L	?	↑	H				7	2	9	126
Product Demand This factor looks at the demand of the company's product.	L	?	↑	M				4	2	7	56
Part Orders This factor is looking at orders that are split and only part delivered due to Customer requirement.	L	?	O	H				7	2	3	42
Percentage of products exported This factor is looking at whether there is an increase in product exports.	L	?	↑	M				4	1	9	36

To Date, Richardsons Healthcare Ltd has applied one pillar of the Business Environment Audit to the operatin table mouldin market, as above. Focus will be iven to the re



1.1.1.1. Daryl Industries Ltd
Arcadia & Prima Products
Shower Enclosure Market



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Company Overview

Daryl Industries Ltd is an SME based in Wallasey, Merseyside. The company's business activities are dedicated to the design, manufacture and distribution of shower enclosures, bath screens and water delivery systems. Daryl had experienced a growth rate of 25% per annum, compared to a 5% per annum growth in the shower enclosure market. In the upper end of the UK shower enclosure market being worth approximately £90m, Daryl had an 11-12% market share. A number of export markets had also been opened up, providing approximately 5% of total turnover. The area addressed for analysis is the Arcadia & Prima shower enclosure range.

Environmental Turbulence Indicators applied

Dynamic Customer Requirements.

Supply Chain Turbulence.

Critical Turbulence Factors

Dynamic Customer Requirements (Customer Bargaining Power)

Sub-factor	Tb	P	T	D	M	F	TLR	Control	Impact	TPN
	SML	~ ?	↑↓○⇕	LMH	LMH	LMH				
Market capacity utilisation	M	?	↑	M	-	-	4	2	9	72

Supply Chain Turbulence (Changes in Manufacturing)

Sub-factor	T	P	T	D	M	F	TLR	Control	Impact	TPN
	SML	~ ?	↑↓○⇕	LMH	LMH	LMH				
% defects	M	~	↑	M	M	M	6	2	6	72

Market capacity utilisation: high market capacity utilisation indicates enhanced customer bargaining power, this is due to larger product variety within the market, increasing competition. That may become an initial driver for agility and requires high levels of all the performance aspects. For that reason, all the ACI's may be used in order to identify the areas that need improvement. For this purpose, it was considered that Daryl could absorb the impact of any change of the sub-factor.

% Defects

Due to high levels of production it was found that recurring errors would have a detrimental effect on the process efficiency. To eliminate this 'pipeline effect' the configuration of the product components along with process capabilities would affect the robustness of the processes and the products. For this purpose, it was considered that a change in this sub-factor would have detrimental consequences on company objectives.

Relationship to Agility Capabilities Indicator (ACI)

Due to the implications of the changes identified through the application of ETI and the fact that Daryl will have to continuously assess changes in the environment to sustain their growth rate and competitive advantage the following internal areas will be affected:

- Product
- Process
- People

Because the process and people (culture) requirements were carried out prior to an ETI audit, this report will focus on the ACI metrics measuring the capabilities of the company's Arcadia and Prima Range.

Product

As stated earlier, Daryl had a high growth rate in the market, which was being challenged by the competition following their lead by imitating their product range. Because of the fact that the market was saturated, Daryl had to find a way of differentiating its products from the competition. To do this the following internal areas were addressed to measure the capability of the current product range. The metrics applied were:

Component Reuse

Component Re-Use measures the extent to which the components used to build a product are also used to build other products in a Product Family/Group/Line. Thus promoting standardisation. This section enables

a company to evaluate their current component re-use and identify possible routes for improvement.

Conclusion

From calculating the component re-use, it was found that the standardisation of the component parts following the introduction of the phase I, resulting in:

- Complete factory re-layout
- Introduction of cellular manufacture
- Improved levels of product quality
- Cell design based on product complexity & volume
- Development of product/component/volume model
- Launch of Visual Management of Stock (VMS)
- Application of simulation techniques
- Turnover per direct employee improved by 15%
- Stock turn improved by a factor of 2
- Gearing 20% better than budget
- Foundation for 5 year plan manufacturing strategy

had an aggregate component re-use was 63%.

However, Daryl still encountered problems due to the competition still having the ability to duplicate products and increase product quality, enabling middle range manufacturers to position themselves in the upper end user market. It was this issue that prompted the management team to focus on the overall product design approach and thus take advantage of an identified niche within the shower enclosure market, the production of customer specific customisable products. The findings were as such:

- The design process was developed over a long period of time, with no formal methodology for new product Development (NPD). This in turn led to the design of new parts for each new customer requirement, leading to part proliferation.
- The manufacturing stage was far too complex due to the number of parts being generated at the design stage. All though group technology was incorporated defining product families, there were too many changeovers. Further, supplier material control was minimal resulting in incoming faulty materials.
- The assembly cells became too product dependent and specialised on particular product ranges, which in turn lead to operators becoming too focussed on a particular cell, thus restricting operators to a particular assembly function.
- Distribution was inflexible and not meeting customer requirements due to inherent problems within the manufacturing function, and particularly the supplied materials.

To address these issues, and meet the needs of an identified niche market of giving the customer what they actually require thus differentiating their products, it was proposed that the product range would have a complete overhaul and new

design called the 'Series 2000' incorporating the methodology of Mass Customisation.

Recommendations

From the analysis above it is suggested that Daryl employ the methodology of Mass Customisation, with the following areas to be addressed recommended: -

- Modular Product Design: to enable the configuration of specified customer requirements utilising custom parts based on the following:
- Size of shower units available;
- Colour
- Finish (tinted, etc)
- Universal opening (left or right handed usage)
- Rationalise product lines
- Increase the re-use of the components used
- Reduce internal Variety (e.g. eliminate handed components)
- Develop metrics for the measurement of Product Similarity
- Introduce commonality of product assembly
- Introduce an ERP system (Product Configurator) to reduce product data maintenance and improve accuracy of information.

Benefits

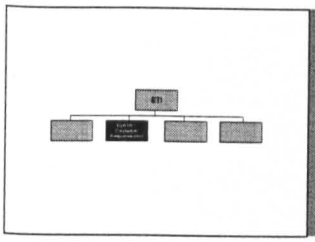
The benefits of implementing the above result in:

- The understanding of the strategies and approaches to customising value chain activities, enabling managers to assess how the demands of customers and potential customisation are suited to the capabilities of the company, and
- By measuring the similarity of the products in a mass customisable product family (based on modular product structures and the reuse of common components), the design of product families can be optimised to improve the reuse of components and reduce internal variety.

Risks

It is worthwhile noting that if the commonality of component parts is dependent upon a few suppliers, and problems occur with the supply of products or a supplier no longer trades this could lead to a failure with the supply of outsourced items to the manufacturing function and would ultimately have a 'knock on' effect with the distribution aspects of the business that Daryl pride themselves on.

Therefore, on this note a further recommendation is that a contingency plan be implemented to safeguard the eventuality of this event occurring. This could be in the form of an analysis on sub contracted parts through a make-or-buy strategy.



R.S. Clare & Co. Ltd

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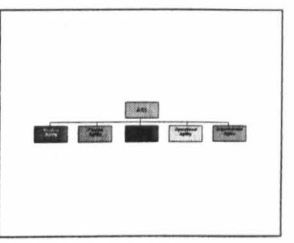


Introduction

The objective of this report is to analyse the impact of the Business Environment on the Internal Capabilities of an organisation. The structured approach will concentrate on the utilisation of the Environmental Turbulence Indicators Audit Tool to identify factors and give understanding of what is happening within the Business Environment from the perspective of an individual organisation. The factors are prioritised to identify those areas that are having the greatest impact and ultimately driving the organisation in a particular direction. This information can then be used to address the internal capabilities of the organisation and focus on those internal areas for improvement from the perspective of the Product, the Process or the People, through the implementation of tools, techniques or methodologies that 'fit the purpose'.

Company Overview

R.S Clare & Co. Ltd was founded in Liverpool in 1748 at the start of the Industrial Revolution. With its origins in Lubrication Technology it has diversified during the 20th Century to develop Thermoplastics, Epoxy and Polyurethane production facilities. The Company has 54 employees and an annual turnover of £12 million, which is split between Lubricating Greases, Surface Coatings, Road Markings and Contracting.

Environmental Turbulence Indicators Applied

- Dynamic Customer Requirements
- Product Performance

Critical Turbulence Factors

2. Dynamic Customer Requirements (DCR)											
2b. Product Performance											
Sub Factors	Tb	P	T	D	F	M	S	TLR Score	Control	Impact	TPN Score
	SML	~ ?	↑↓O⤴⤵	LMH	LMH	LMH					
Number of live sales orders	L	?	↑	M				4	2	7	56
Percentage of Orders Cancelled/lost due to Price	L	?	↑	M				4	1	7	28
Product Variety This factor looks at the number of products within the addressed group of products and whether this is increasing.	L	?	↑	M				4	1	5	20

The area focused on a particular product range associated to the Wholesale market that supplies 'Own Brand' greases to the likes of Shell and Texaco. To Date R.S. Clare & Co. Ltd has applied one pillar of the Business Environment Audit, as above. Focus will be given to the grey areas, which are identified as the immediate prioritised critical turbulence factors to be addressed. The following personnel answered this section:

- Mr Phil Linley – General Manager – Lubricants & Surface Coatings;
- Mrs Elaine Littlewood – Sales Service Manager, and
- Mr Paul Wilson – Operations Manager.

Relationship to Agility Capabilities Indicator (ACI)

As stated above it has been identified that the key issue, in terms of priority, having the greatest affect on the company is *"Number of Live Sales Orders"*. A key contributor of this is the proliferation in new product variants that has not only been customer driven but company driven to exploit new market opportunities. As a result this has had a major impact on the internal departments of the company, which at present is finding it increasingly difficult to manage this increase in 'live sales orders'.

The view of senior management within the company is that operations need to be robust to enable them to respond more effectively to the dynamics of the customer. However, there are also issues internal to the company that are creating dynamics within and as a result should be addressed as well so that the company is not made more robust to these internally created dynamics. In other words departments need to be aware of the implications of their actions on other departments.

Due to the pressures of overseas markets there has been an increase in the *'Percentage of orders cancelled/lost due to Price'* this is mainly due to the fact that the far east markets are being serviced by 'Home' suppliers and the company cannot compete on the price factor.

As a result of these factors, the following areas internal to the organisation will be ultimately affected: -

- Product Agility
- Process Agility
- People Agility
- Operational Agility
- Organisational Agility

Product Agility

Areas that could be addressed are as follows: -

Product Variation causing proliferation

As the variations of products is increasing and on the whole this is creating problems in terms of managing these, it may be beneficial to address these products in terms of modularity. This identifies the internal variety of parts and compares this against the resultant external variety, which enables companies to see whether they are making maximum use from their core components. The theory behind this is to postpone variation to as late on in the manufacturing

cycle as possible. By reducing your internal variety will ultimately increase your ability to manage these components more effectively.

Rationalising product range through standardisation

This enables companies to address their products and see how similar they are in terms of the components that make them. A simple component re-use metric may be applied to identify whether unnecessary components can be eliminated or even whether components can be standardised and as a result increase the number of products they are used in. Again this will enable the company to manage these components more effectively.

Both of the above look at reducing the amount of components by making better use of them, reducing internal variation and maximising external variation. This will ease the problems in managing these components internally as there will be fewer of them.

Process Agility

Areas that could be addressed are as follows: -

Capacity

By having large variations of components/numbers of orders puts constraints on your capacity.

Utilisation

By having large variations of components/numbers of orders reduces your overall utilisation because you will generally have more setup and teardown activities and other non-value added activities.

Setup and tear downs

By having large variations of components/numbers of orders increases your setup and teardowns, thus reducing your ability to respond to the dynamics of the customer as well as keeping your economic batch quantities inflated.

Scalability issues

By having large variations of components/numbers of orders reduces your ability to scale up production, simply from a capacity perspective.

Re-Placeability

By having large variations of components/numbers of orders may mean that if machines break down or problems occur then it is more important to have contingency plans in place. This would take the form of alternative machines, tools, materials, etc that could undertake the same activity.

People Agility

Areas that could be addressed are as follows: -

Utilisation

Large variations of components/numbers of orders may, depending on how they are managed have a negative affect on the utilisation of staff. By addressing People Utilisation will enable you to identify how long individuals spend on each activity within the process, whether this be value added or non-value added.

Skill Level

Large variations of components/numbers of orders may be an issue in terms of the skills required to deliver these. By addressing People Skills will enable you to identify what skill levels are actually required to deliver these products.

Re-Placeability

Large variations of components/number of orders may represent potential problems in terms of whether your staff is multi skilled or if certain people only undertake certain activities. By addressing the Re-Placeability issue will enable you to build a more robust workforce by ensuring that your staff are trained to a level such that if a member of staff is absent there is always another person who can step in and as a result production is not halted.

Operational Agility

Areas that could be addressed are as follows: -

New Product Development

Due to the increasing numbers of product variations being introduced it may be advantageous to address how these are developed and more importantly how long this takes. It may also be necessary to identify the numbers of these that have been successful and whether there are procedures in place when introducing new products, i.e. knowledge management systems.

Supply issues

Large variations of components/number of orders also cause problems from a supply perspective. In order to build some robustness into your system and enable you to better manage the demands being forced upon you then the following areas need to be addressed: -

Process Map Exercise & Data Collection

It will be necessary to map the activities undertaken on receipt of an order to the despatch of the order. Rough lead times need to be identified at each activity to identify where exactly potential problems lie.

Next will be necessary to understand the dynamics of the customer and ultimately the internal demands placed on your products. This will enable suitable material replenishment and material management strategies to be identified.

Material Replenishment Strategy

A material strategy needs to be identified with suitable stocking quantities and batch sizes to enable you to respond to the dynamics of the customer.

Material Management Strategy

A material management strategy needs to be identified to manage the large variations of components/number of orders and ultimately assist in identifying what should be manufactured and when. This will then play a big role in the planning and scheduling stages of manufacture.

Procurement Issues

Large variations of components/numbers of orders can create procurement problems in where and how these materials will be sourced. It may be

necessary to address the suppliers employed by the company to identify potential weaknesses. These could take the form of only one supplier that can supply a particular part, a supplier that performs poorly on delivery or quality, a material that is specific to a product or standardising on materials. It may be beneficial for you to address the number of active suppliers with the view of reducing these, but always being aware of other potential suppliers that could be used in the case of unforeseen problems.

Organisational Agility

Alignment of Strategies

As the numbers of variations in products/number of orders is increasing it may be necessary to check the alignment of existing strategies for this range of products from a management to an operational level to check that these are in line with each other. The view of senior management within the company is that operations at present are not robust and this is an attribute that is required to enable them to build some stability into the business and enable them to respond to the dynamics of the customer more effectively. However, at present this is not the opinion of all tiers within the company as not all tiers experience the internal dynamics that are being created from actions elsewhere within the company. All tiers need to understand these internal dynamics so that the company is not made more robust to these, but are made more robust to the external dynamics of the customer. In other words departments need to be aware of the implications of their actions on other departments.

Recommendations

As the number of product variations/customer orders is increasing it is becoming increasingly difficult to manage these with the companies current procedures. Therefore, with this in mind the following recommendations have been identified through the preliminary analysis above:

Alignment of Strategies

As the numbers of variations in products/number of orders is increasing it may be necessary to check the alignment of existing strategies for this range of products from a management to an operational level to check that these are in line with each other. The view of senior management within the company is that operations at present are not robust and this is an attribute that is required to enable them to build some stability into the business and enable them to respond to the dynamics of the customer more effectively. However, at present this is not the opinion of all tiers within the company as not all tiers experience the internal dynamics that are being created from actions elsewhere within the company. All tiers need to understand these internal dynamics so that the company is not made more robust to these, but are made more robust to the external dynamics of the customer. In other words departments need to be aware of the implications of their actions on other departments. This exercise is the buy in exercise because for this project to be successful you need buy in from all departments at all levels.

Process Map Exercise

It will be necessary to map the activities undertaken on receipt of an order to the despatch of the order. Rough lead times need to be identified at each activity to identify where exactly potential problems lie.

Understand the dynamics of the customer & demand of the product

Next will be necessary to understand the dynamics of the customer and ultimately the internal demands placed on your products. This will involve collecting historic data on the demands of the products to enable you to identify suitable material replenishment and material management strategies.

Material Replenishment Strategy

A material strategy needs to be identified with suitable stocking quantities and batch sizes to enable you to respond to the dynamics of the customer.

Material Management Strategy

A material management strategy needs to be identified to enable you to manage the large variations of components/number of orders and ultimately assist in identifying what should be manufactured and when. This could possibly take the form of a spreadsheet initially, however the implications into a Materials Requirements Planning (MRP) module may want to be looked into as a longer-term project. This will then play a big role in the planning and scheduling stages of procurement, manufacture and despatch.

From all the areas identified within Product, Process, People, Operational and Organisational Agility, we feel the areas stated within the recommendations need to be addressed to start building some robustness into the company to enable it to respond to the dynamics of the customer more effectively. However, all the issues discussed earlier need careful consideration and should be considered when introducing more product variations.

Appendix 5

Case Study

ASF System with tool automation and strategic element

This chapter shows the whole ARM (Agility Road Map) process pre development of the BIZ framework. The process shows an example of strategy iteration. It highlights why the process is necessary and where the ideas for the BIZ framework were based.

The BEA System:

Overview of Framework

The diagram shows the Agility road map framework, a comprehensive system for agile implementation developed by the Agility Centre at the University of Liverpool. The agile manufacturing concept has been developed by 'placing practical manufacturing requirements at the centre of agility strategies' [8]. The approach has been applied to a number of SME's in the manufacturing sector.

The main objective at this first stage is to 'capture knowledge and data from the company which may be tacit and hard to quantify' [Ismail HS 2006]. This is done through a series of questions relating to the environmental turbulence that the company is facing then analysing the turbulence for ability to control the change.

Once the turbulence has been assessed a focus tool is applied giving targets for areas of improvement, this also gives measures and indicators to monitor the effects of any tools and techniques applied.

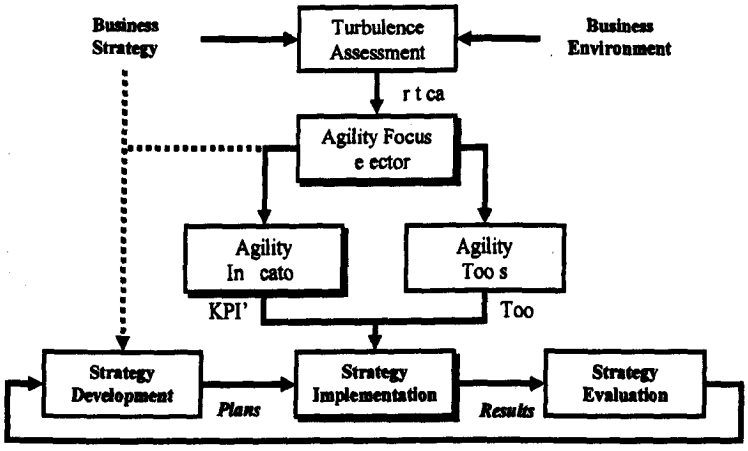


Figure 46: The overview of the agility road map (Ismail)

The final section in the agility framework is the development, implementation and evaluation of manufacturing strategy. This process involves some continuous revision to align strategy with current market requirements, company capabilities and many other factors. It also starts at the development stage as many SME's do not have a formal strategy in place. '(Strategy is) a direction, a guide or course of action into the future' [Mintzburg et al 1998]. This is why although a complicated and oft discussed area it must be included in the full framework. The manufacturing strategy must be aligned with corporate strategy or disaster waits when parts of the same company pull in different directions.

We can present a more detailed model of companies in various stages of Agility maturity. This model takes into account where a company may be in relation to lean (the building blocks for agility) and where on the agility road map the company may be. This model is covered more deeply later on as has been developed through the work with Richardsons and other companies from the original model above.

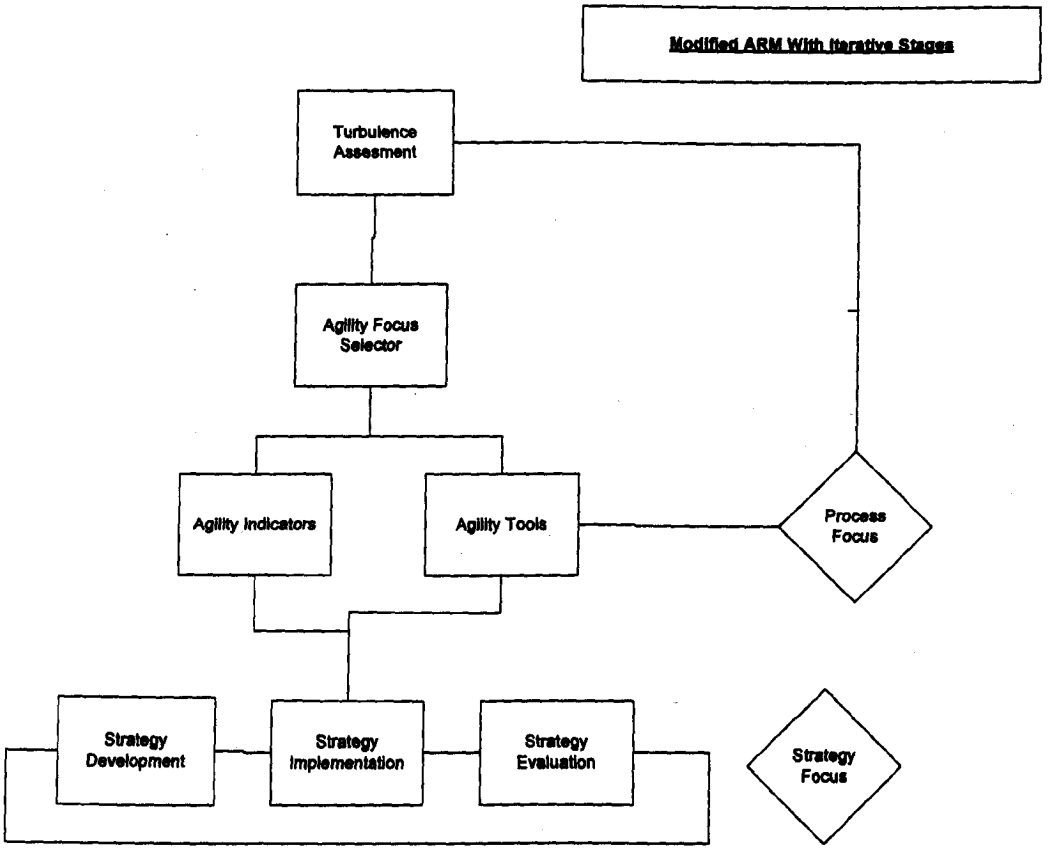


Figure 47: Modified ARM (Hetherington)

The start of the process identifies business threats and opportunities and highlights how the organisation will cope with the threats through its strengths or be exposed through its weaknesses. The main objective at this first stage is to capture knowledge and data from the company. The four key areas that the ARM is concerned with are:

Understanding the business strategy

Understanding the business environment a company is in

Understanding the organisation and how it performs

Understanding manufacturing methods that can improve the performance of the business and where and how this knowledge should be applied.

The framework collects information about the business strategy and company aims and uses this information to help select measures of performance and capability indicators, which in turn lead to tools and methodologies to aid in strengthening these capabilities. This also feeds back into redefining strategies if necessary with input from the business environment and company skill set. Strategy selection is aligned with Miltenberg's (1995) work on manufacturing strategies which gives six basic pillars for understanding manufacturing output; these are defined as cost, delivery, quality, performance, flexibility and innovativeness.

Outline of completing a BEA:

The BEA is carried out with key members of the company who, from their work and involvement in operations and processes, will posses intrinsic knowledge about the company. This intrinsic knowledge is extracted in a form of questionnaire which is tailored to specific areas of the company and will provide information about certain aspects or factors that provide turbulence. Some of the intrinsic knowledge will be on trends and pattems over time and will involve qualitative information that the person may have about recent events or the market place work. It is therefore key to identify people within the organisation who have the experience to have gained this type of knowledge. Because the person who is providing information is talking about tends, absolute measures and scales are not used, relative measures to other factors in the business are applied. This gives a relative turbulence fator unique to the company and therefore should not be compared with other businesses. Below is a walk through section of a BEA.

The BEA is applied in a number of steps to identify those areas of management concern within the business. This information is sourced through discussions with senior management who have knowledge at the strategic level but encompassing the operational characteristics of the business. Below is an outline for the identification, classification, measurement and prioritisation of those factors impacting on the performance of the business.

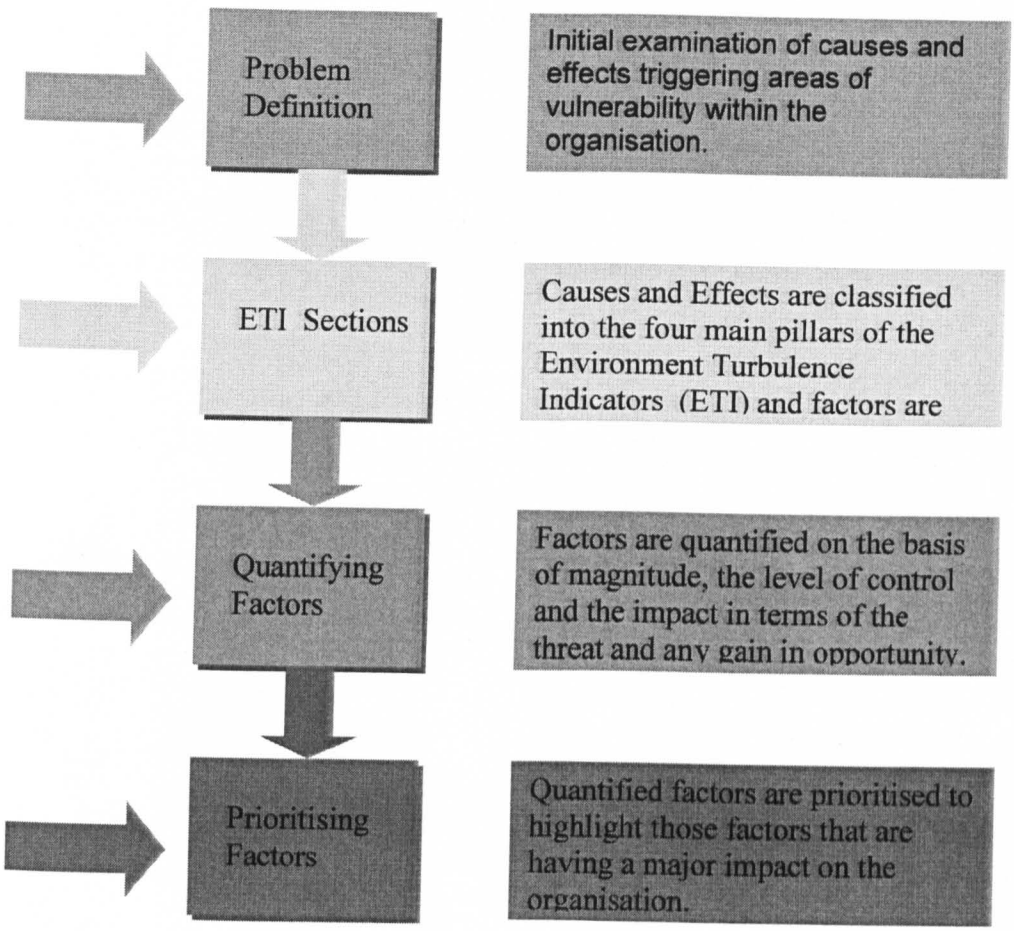


Figure 48: Outline of BEA process stages (Ismail)

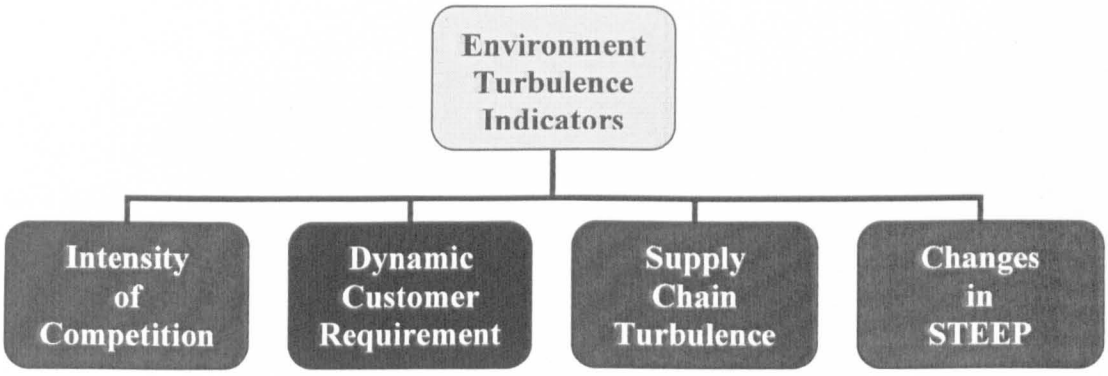


Figure 49: ETI structure within BEA audit (Ismail)

The BEA is based on evaluating the key Environmental Turbulence Indicators. These are grouped under four main pillars which are in turn subdivided to sub-categories containing a series of questions covering more specific business turbulence factors.

A brief outline of each pillar is shown below.

Intensity of Competition:	**Examines changes that have occurred in the direct competitive environment.**
Dynamic Customer Requirements:	**Examines how customer needs and expectations are diversifying and how those demands are placing additional pressure on Companies.**
Supply Chain Turbulence:	**Examines changes in the network of facilities and options that perform the functions of Procurement, Manufacture and Distribution.**
Changes in STEEP:	**This represents factors in the macro-environment and refers to Social, Technological, Environmental, Economic and Political and the effect these factors have on an organisation or within a particular industrial sector.**

Figure 50: ETI pillars of turbulence outline (Ismail)

Elements of a Questionnaire

Each subsection in the ETI is represented by a series of questions as shown below. The ETI is more effective as a tool when it is applied to a product range our group of similar products. The applied level could range from the parent company to a subsidiary plant.

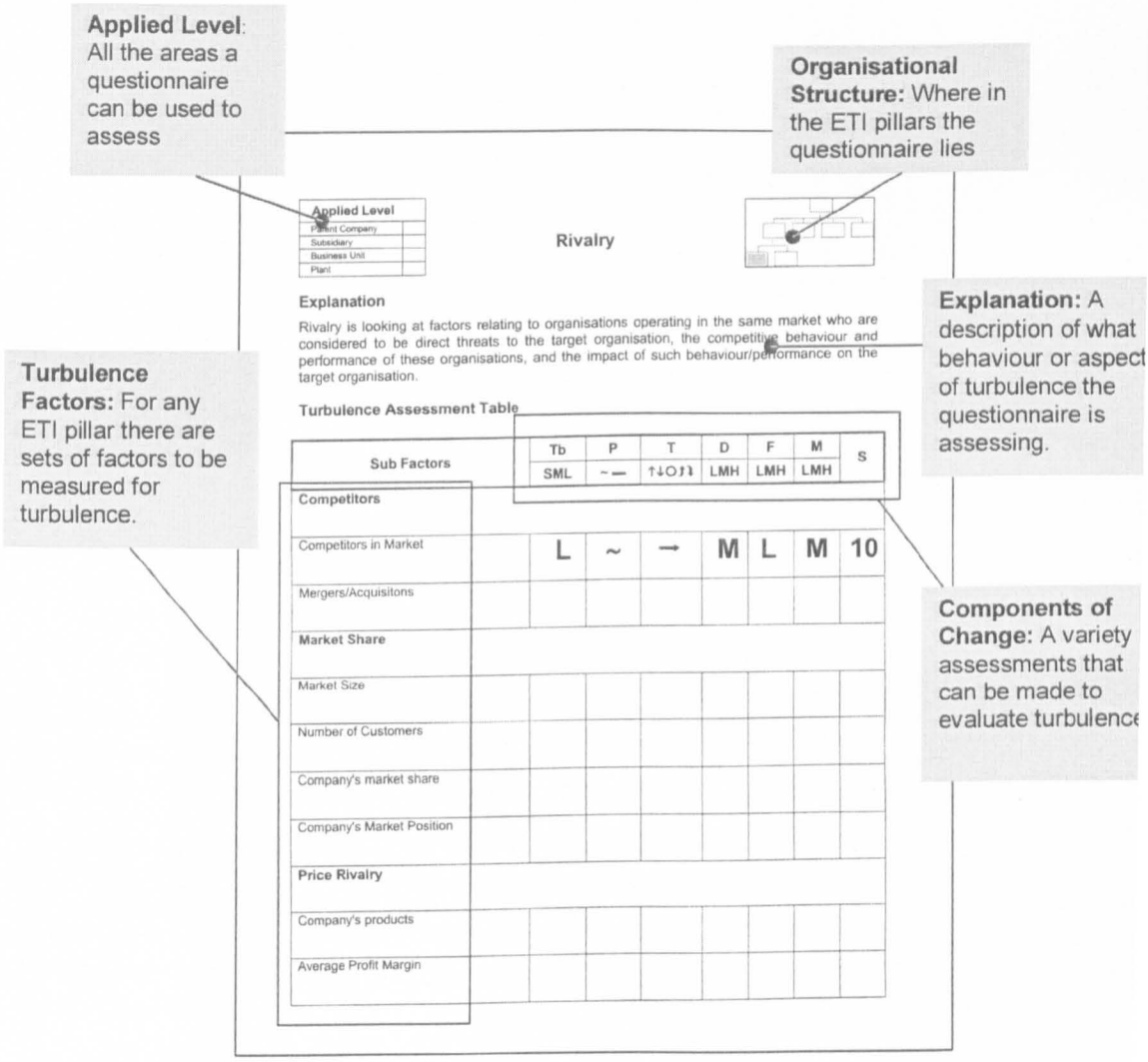


Figure 5: Anatomy of a questionnaire (Ismail)

For each of the questions the participant is required to identify the level of turbulence through evaluating a number of change components. These components are measures of how the turbulence factor under consideration changes with time. The components of change are explained in detail in the following section.

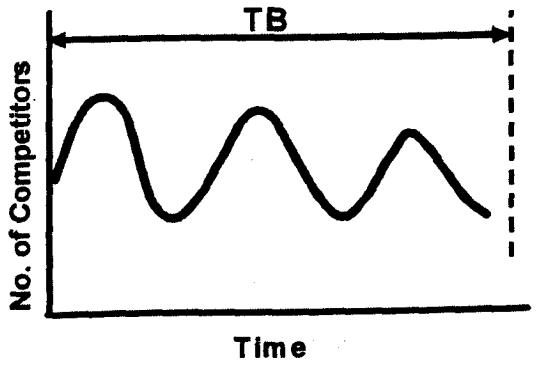
Measured Components of Change

Turbulence in each area will be assessed by establishing the forms in which changes take place through the assessment of a number of components. There are 7 change components.

1. Time Base (TB)

This is the period of time over which the particular sub factor is assessed

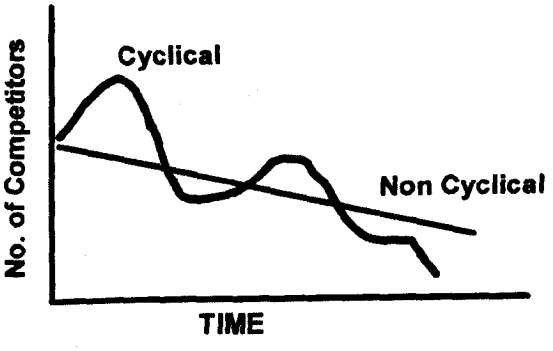
- **Short Term:** (days-weeks). **(S)**
- **Medium Term:** (months) **(M)**
- **Long Term:** (months-years) **(L)**



2. Pattern of Change (P)

This identifies the form of change for each factor. Changes could be:

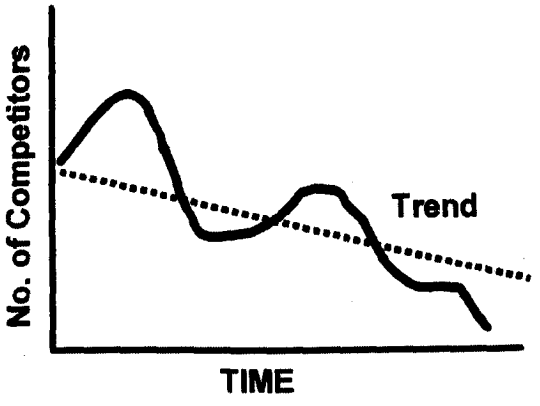
- **Cyclical** **(~)**
- **Non-cyclical** **(—)**



3. Trend (T)

For the specific pattern of change, this metric measures the direction the change moves in from the beginning to the end of the time base specified. This can be:

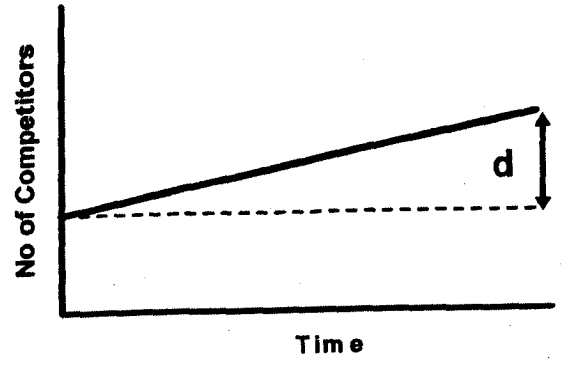
- **Linear increase** **(↑)**
- **Linear decrease** **(↓)**
- **Constant** **(O)**
- **Exponential increase** **(⇑)**
- **Exponential decrease** **(⇓)**



4. Distance (d)

The value of the change from the beginning to the end of the time base

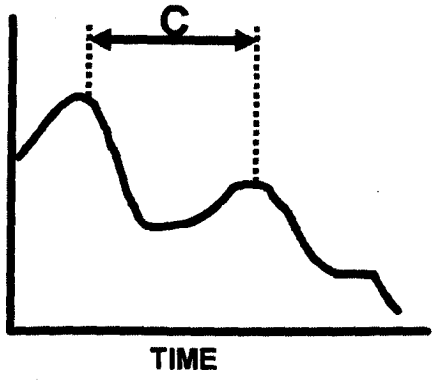
- **Low:** Less than 5% **(L)**
- **Medium:** 5% to 30% **(M)**
- **High:** Greater the 30% **(H)**



5. Frequency

How often the change occurs; this metric is only relevant to cyclical patterns of change.

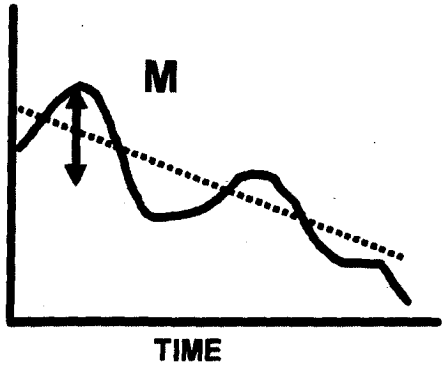
- **Low:** up to 5 cycles over TB (L)
- **Medium:** 5 to 10 cycles over TB (M)
- **High:** more than 10 cycles over TB (H)



6. Magnitude

The average deviation from the mean in cyclical patterns of change.

- **Low:** Less than 5% (L)
- **Medium:** 5% and 30% (M)
- **High:** Greater the 30% (H)



7. Size

This represents the scale of the factor being measured in terms of number size etc.

Figure 6: Components of change measurement (Christian)

The procedure for carrying out a BEA is as follows:

Form the audit teams
For each questionnaire fill in the turbulence assessment table
Utilising the Turbulence Level Rules identify high medium and low areas of turbulence
From the score identify which areas cause the most turbulence and are going to be addressed. These can be plotted on a radar graph
Prioritise the turbulence with the TEA tool and identify which ACI should be used to aid measurement of agility
Use the tool selector table to selection tools which will have a high positive impact on the ACI and combat the turbulent areas identified in the BEA.
Implement tools
Formulate strategy for company
Implement through operational action plans
Check strategy through BIZ framework / system

Once the tools have been selected to combat turbulent factors in the business an implementation program must be developed. This is the plan to allow the business to gain the required agility to compete in the marketplace.

The plan forms around the process / operation tools that will give the required skills for agility. However, Agility is also about strategy, in fact some may argue this is the main focus and therefore there must be a strategy phase coupled with the operations phase. The strategy section often comes after the operations implementation as this is when the company will decide how it is going to position itself in the market place for future growth with its new operational capabilities allowing continuation of current business in an efficient manner. The strategy formulation may also feed back into operational requirements if the company wishes to move further forward developing its capabilities and operational plans will emerge from the strategy exercise.

Below the strategy phase is discussed in relation to the robust responsive proactive cycle of agility.

The Robust Responsive Cycle:

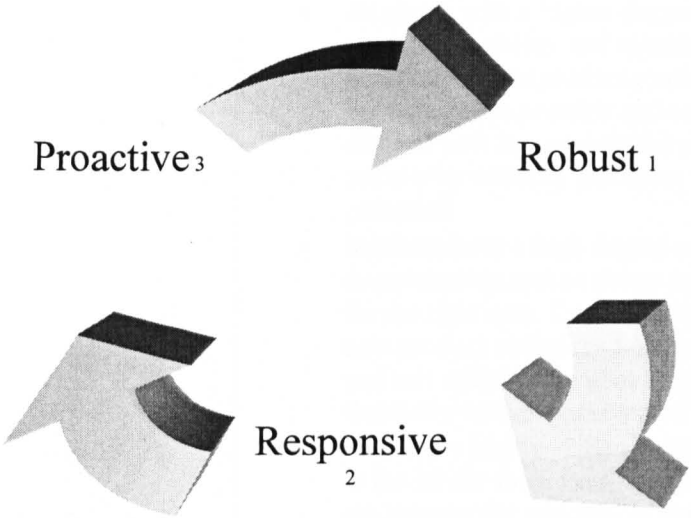


Figure 51: The Robust Responsive cycle (Ismail)

The above diagram shows the cycle which a company is expected to go though to achieve agility. Each stage will show the company and its management structure exhibiting different behaviours and showing different actions and controls in place. The above model can also be over-layed against a psychological model to show how the people involved with this change can be expected to react and behave depending on where in this cycle the company is. This is the psychological model of change. Below are the authors suggestions of characteristics displayed by a company at each stage of the cycle.

Stage of Cycle	Characteristics of Company
Robust	• Processes and operations 'under control', where demand fluctuations can be managed easily, and processes can be utilised effectively to meet customer requirements. OEE should be high, waste minimal and cycle time should be balanced throughout. During high demand, breakdown is minimised maintenance is planned product manufacture is to plan. • Products of high quality, made on time under the right cost. There will typically be a moderate product range available • People with a moderate skill level for their job, workforce is flexible, able to move to cope with demand fluctuations. Personnel can be replaced without too much disruption to production. • Operations flow, deliveries are on time even during high volume and report orders are the norm.

	• Organisation
Responsive	• As above with a higher degree of reconfigure-ability and machine replace-ability. Multiple product routings through the factory are possible and customers will demand new innovations for products which are met by utilising processes to their full potential. • Products have a high degree of customisation and as above are high quality for the right cost. Customers will ask for new product variations which are designed and met utilising the above process flexibility and responsiveness. • People are highly skilled and the flexibility in the labour force means majority of staff can operate the majority of equipment. It is easy to train and recruit new staff. • Operations as above. Service is paramount and flexibility with delivery times is available • Organisation
Proactive	As above but the organisation actively seeks new opportunities. The company is always first to market, capitalises on this with higher margins and best quality. The organisation constantly creates ne offerings in the marketplace. It utilises: • Product customisation and flex-ability, with high replace-ability of components. • Processes which can be reconfigured, replaced and re-utilised to make new, more and different configurations of product. • The people in the organisation are actively involved in development of the product and process and push the limits on these, they are also very knowledgeable about the processes and skilled in many areas. • Operations support the innovative strategy and enable the company to market effectively.

This cycle has been developed from the many iterations of the BEA audit that a company goes through.

It was first envisioned that the BEA audit would be a one time processes and that a company could find tools and techniques to make it more agile. Once implemented the company should be on the road to agility. For many reasons this has not been the case and several iterations of the BEA have been undertaken to drive change and move the company to the next stage. The Robust Responsive cycle typifies the iterations that a company will go through. Some of the major reasons that company will have stages of change involve the psychology of change within a business. Others involve taking stock of where the company is after a prolonged period of initiating changes to productions systems and re-checking the market place. And other will involve financial and time constraints that all businesses find themselves under.

Case Study Background:

The company is a small to medium sized enterprise formed in 1948. It started out life making pillows and foam mattresses and distributing to consumers. Eventually a new avenue opened up with the medical trade and this became the company's sole area of business.

This change meant that the company gradually moved into a niche area of business and became one of a small group of suppliers of this type of product to OEM's within the medical field.

Recently the company built on its knowledge of the medical market by developing a moulded operating theatre mattress along with support accessories. These products quickly became the most popular on the market and the company tied up with several large OEM's to supply for new equipment. The reasons for the fast take up and increased demand of the product were mainly due to the feature benefits compared to an existing sewn product on the market.

A moulded product contains no seams, can take complex shapes and is very hardwearing. Along with this the product was also quicker to produce than a sewn product and offered positioning of patient not possible with a single sewn mattress.

This new product gave the company three main areas of business, a sewn product range, traditional hand crafted products (cut and shaped foam covered in neoprene) and a moulded product range. The company particularly focused on the moulded range as this was where the majority of the business was and where most new business came from with little or no marketing effort.

The capacity of the moulding area in the factory was soon coming under pressure from new accounts and existing customers demanding greater quantity of product. This organic growth was by far the largest pressure facing the business. As the pressure increased upon the company quality and delivery suffered along with the costs rising due to high internal reject rate, equipment failure and double delivery to customers' because of split orders.

After experiencing this pressure internally for some time the company sought outside help from The Agility Centre at the University of Liverpool.

When assessing the company for help the Agility Centre used the BEA model to help evaluate where the company was experiencing pressure, where other companies were within the marketplace and the likely future direction of the market that the company were operating in.

This helped to evaluate the procedures and tools to use to allow the company combat these pressures and develop to cope with the demand in a satisfactory manner both internally and externally.

People: Majority of the workforce were skilled in one job only. There had been no rotation of jobs or multi-skilling and each individual work area was seen as a very separate part of the company. However the workforce had mostly been with the company a long time and the staff turnover was low. Therefore there were some large opportunities to develop staff skills to aid agility.

Products: The product range was small but in a specialist market the company knew a large amount of information about customer requirements, who the main customers were and market trends. Each product was bespoke for a particular customer and would not be sold to any other competitor within the marketplace.

Processes: The agility for the company came from the fact the same core processes were used to make products for many different customers. This was due to the fact the company were able to cycle moulds very quickly and produce down to a minimum order quantity of one.

Marketplace / Competitors: The market place was a small one and most customers and competitors were known to the company. The nature of the industry tended to mean that there was a long lead time to getting customers and this meant a lot of hard work in securing business. This was partly due to investment required in mould tools from customers and partly due to the fact that the product was often produced in house by the OEM. The customers that did move to the company were keen to use the expertise of someone who specialised in a particular area and could offer a single point for several solutions. This was a good marketing point for the company. The main customer base was in Europe, leaving the USA, although a vast market, mainly untapped. There was also an aftermarket area which the company did not service. OEM's would supply replacement articles to the end user, but there was also several small companies who specialised in making alternative replacement products. This was also true for those companies who Richardsons did not supply. There was therefore a market to supply direct to the end user a high end product as an upgrade for a standard supplied item.

Customers: These were large OEM's who specialised in design and assembly of operating tables which could become quite a complicated product and had high retail value. The first part of the table that customer would see is the mattress and supports and so these formed a vital part of the operating table especially in terms of marketing. There is a limited number of operating table manufacturers, and in Europe three companies dominated the market, the company supplied two. The end user of the product, i.e. the hospitals, were not Richardsons customers and therefore there could be a market for making mattresses for OEM tables that did not currently source direct from the company.

The first BEA audit carried out on the company used the pillar of:
'2. Dynamic Customer Requirements (DCR)'
Under this critical turbulent factor the sub-section:
'2b. Product Performance' was applied.

A small section of the table used for the questionnaire under this subsection has been included:

2. Dynamic Customer Requirements (DCR)											
2b. Product Performance											
Sub Factors	Tb	P	T	D	F	M	S	TLR Score	Control	Impact	TPN Score
	SML	~ ?	↑↓O⇵	LMH	LMH	LMH					
Percentage of Orders Cancelled/lost due to Price	L	?	↑	H				7	2	9	126
Product Demand This factor looks at the demand of the company's product.	L	?	↑	M				4	2	7	56
Part Orders This factor is looking at orders that are split and only part delivered due to Customer requirement.	L	?	O	H				7	2	3	42
Percentage of products exported This factor is looking at whether there is an increase in product exports.	L	?	↑	M				4	1	9	36

Figure 52: Section of the DCR questionnaire from the audit (Ismail)

The area which became highlighted from the questions asked under this subsection was Percentage of orders cancelled or lost due to price. This factor was highlighted due to the highest turbulence rating or (TPN) score. The value is not on an absolute scale but is a means of prioritising the factors for applications of manufacturing improvement tools.

This impact was driven by the fact that the company began facing competition from cheaper products on the market that can be used as a direct alternative to those which Richardsons produce. However the product Richardsons make are superior in quality and benefit to the patient. There was perceived to be an increase in demand from the market both in the UK and in Europe so the company wished to take advantage of this and maintain its current market position as the largest independent supplier in Europe.

The pillars of agility where addressed in respect to this subsection, these are:
Product
Process
People
Operational
Organisational

Product: The product is not currently agile as the product itself in not bespoke, however the agility comes from the fact that materials and processes used are the same to make different designs of product so there is a high amount of machine / process re-usage and similarity.

Process: The process needs to be able to take into account set up and tear downs and the emphasis must be on quicker and more efficient times to aid reduction in cost to combat the effect of orders lost due to price. Tools like SMED (Single Minute exchange of Dies) should be applied.

The second area to examine here is the workflow and ensure that there is a smooth flow with balanced operations and no bottle necks. Non value adding activities should be eliminated and the layout of the cell should be such that work moves in a streamlined manner.

People: Utilisation and skill level should be addressed here, by addressing people utilisation the company will be able to identify if staffing levels can fluctuate to the demand and if other activities can be carried out by existing staff to shorten delivery times.

Skill level should be maximised to allow effective processing in the plant. Also identifying what skills are necessary will help to start multi-skilling programs.

Operational: Scheduling should be implemented in order to be able to properly manage the demand placed by customers. As the company prides itself on being innovative, product development should take high priority, and being first to market with new products will reap rewards by commanding higher prices and raising the company profile. Process mapping and costing will help the company to understand how it can make manufacturing more streamlined, maintain high quality and command the right price for its product by understanding where the cost comes from in the manufacturing process.

Organisational: Information flow, needs to be companywide and employees need to understand the order winning factors for Richardsons. This can also be linked with culture and the involvement of staff in the future success of the company.

Therefore recommendations made to the company were as follows:
Process map and collect data on receipt of order to shipping of product, this will assist in eliminating non value adding activities. Rough lead times should be collected to allow for analysis on realistic delivery times for customers.

Set up and tear downs need to be examined for efficiency, tools like SMED should be applied to allow for cost reduction, and to make available more time for production.

Workflow of mould movement should be mapped out to see how the moulds are moving within the cell and identify efficiencies here.

Because of the problem of part order deliveries the company should look at some type of scheduling procedure to allow full order shipment. This should also help to reduce WIP and therefore costs to the company.

Staff skill levels and levels of staff: Multi-skilling is key here to aid in production flow and ensure that the company can meet changing requirements across all of its product ranges. It may also mean staff levels can be made more efficient due to relocation of labour when necessary to other potentially busier parts of the business.

Information capture / flow. This needs to be a single point of information and allow easy access of relevant information for the necessary people. It will support all the above activities and capture accurately order information and shipping information This should aid in full on time delivery.

Note the tool selector table has not been used here as this has been covered in previous case studies.

Knowledge Transfer Partnership (KTP) Program and Capability Improved:

Richardsons decided to undertake a 2 year KTP project to drive through the improvements identified through the BEA audit. The project was put together with the help of the Agility Centre and built around the outcome of the audit.

The KTP focussed around the process side of the business and the process improvements identified from the BEA. As we can see from the agility maturity levels diagram this is usually the first step towards becoming an agile company. The reactive proactive cycle demonstrates this more clearly and explains each section to a greater degree. The model for applying the BEA has been adapted to allow several iterations because a number of audits will be required to move around the reactive proactive cycle and change the level on the agility maturity scale. This has been discovered through the application of the audit to companies wishing to move towards agility. The nature of change, and how this fits with psychological models of change, shows how the time taken to drive through change can lead to the need for a further audit to re-invigorate the process and re asses the company's situation.

The psychological models of change look at the scale of change involved and peoples reactions to change, it makes sense to move round the cycle in several iterations to allow for the changes necessary in 'mindset' as well and physical engineering changes..

From a time scale point of view, moving in several iterations is sensible as turbulent factors may differ from the original assessment, new companies may emerge and market forces out of your control may provide new turbulence factors. These will be picked up in the second or third stage iterations of the BEA.

The KTP project focused mainly process for the duration of the project, as to improve the levels of performance to a level where the existing customer base was being satisfied. An outline of the project follows.

Target outcomes from the project were in general terms defined as:

To increase productivity by 20% without additional resources
To have the ability to double production levels by identifying resources needed
To reduce levels of wastage: Quality increased, non VA(value adding) activities reduced, Raw Materials utilised more effectively
Design and implement new training and induction for staff
Improve supply chain integration and delivery performance

The specific activities to achieve the above were set out as the following:

Process mapping in relation to
Production planning
Manufacturing operations
Cycle times / utilisation
Materials management
Quality audit procedures

From the above new designs for layouts were generated. A five S implementation plan was drawn up along with optimisation of the existing process through removal / reduction of non VA activities.

To embed the above, continuous improvement teams were set up, training days were planned an implemented. Visual management and visual management of performance targets was a key aspect to achieving increase in performance and the new layout supported this aspect.

As mentioned before the agility of the company came from the fact that the same processes were being used to manufacture products in 400+ shapes and sizes for a number of customers with a minimum order quantity of one unit. It was key to keep this one unit size as trade moulders could not match this and it gave a considerable advantage to the company by allowing customers to keep minimal stock levels. However the existing demand was outstripping capacity and therefore aligning with customer schedules was proving hard. Working with the

supply chain in terms of keeping aligned with customer schedules was key to progressing the companies position within the market place.

Implementation of the above was monitored using traditional project management techniques. A Gantt Chart with key project objectives and milestones clearly market was displayed and regular team meetings held to asses progress.

The next task after the initial KTP was to look at the strategy of the business and carry out a strategic iteration of the BEA.

Strategy Iteration of BEA

Summary of Advantages held in the market place:

The company held many advantages in the market place which helped them to maintain a healthy market share and profit margin. Some of these advantages were linked to the company's ability to produce down to very small batch sizes and maintain a prestige product image.

The company were operating in a niche market area which enabled them to specialise in one particular type of product. It also gave the company the opportunity to become very knowledgeable about the product that they were selling and manufacturing enabling them to advise customers on what type of materials and design they should be considering. This knowledge gave them very close working relationships with customers and maintained high repeat business with existing customers. Richardsons were always present at the design stage of a new product discussing how their product would fit into the new range, and assisting in what was possible and the likely costs associated with new ideas. The comapny were also fortunate to be supplying the largest OEM in the marketplace meaning their product had a large exposure. This helped to maintain full order book and stay ahead of competitors by working closely with the OEM in developing their new product offerings.

Another advantage held by the company was that the product was unique. There were many alternatives but the product features developed by the company meant that they could be seen as the most advanced and created an aesthetically pleasing and functional product which enhanced the customers end product in the eyes of the consumer. This held large advantages as the product was instantly recognisable in the market place and was seen as the best (and the most expensive) product. As the product was expensive it did mean that is wasn't suitable for customers aiming at the cheaper end of the market. The company had also decided that this is not where they wanted to aim their products and damage the brand they had created, or give existing customers the option of a cheaper alternative and damage the margins that they were making on the high end product range. Because the product was seen as a high end or top of the range item it was easy to maintain relations with existing customers who looked on the product as the best possible option for the end user. It also meant that this could be leveraged for high margins and used as marketing ammunition when trying to expand the business.

As mentioned earlier there was a close relationship with customer, the company also fostered close working relationships with suppliers. This went o the extent that the supplier could often use the comapny to develop new types of product in a production situation and the supplier could bring other customers to see a production situation and be involved in trials. This meant that when Richardsons needed development work doing they had a ready support network with the supplier, and also meant that prices where keenly negotiated. The development work often came in useful especially when there was to be a switch in chemicals due to regulatory issues. It also meant that new tooling issues could be investigated with the supplier to create better quality products.

The company had some agility in the way that the production process was set up. This agility came from the fact that even though the tooling for each product was different the process each one went through was the same. This meant that tools could be swapped in and out quite easily without too much disruption to production processes and a large combination of different products could be manufactured at the same time. Richardsons customers could stock a wider

variety of products and accessories to offer the end user as the supplier (Richardsons) could easily manufacturer a high number of different parts.

This was also helped by the fact that there was a very flat structure to the company and staff were allowed to make decisions at the point of manufacture. There was also a system for recording anomalies to the norm which meant extra operations or omissions from the norm could be done without any extra work in finding out the requirements. This helped to keep the processing time to a minimum.

Strategy position / Any Change of position:

Strategy position was one of top end product, high quality / high price
Make unique to customer and sell only to OEM market
Undertake development work in collaboration with customer to create solution to customers design ideas
Small volume high margin
Organic growth with key existing customers

The strategy position before any work was undertaken was a fairly simple one to examine.

The company wanted to make high end high quality products which commanded a high price in the market place because of their perceived advantages over other competitor's products. These benefits included features of the product: fluid proof, no seams, assisted pressure reduction in patients, could be made to any shape the customer required; and also benefits of dealing with the company in terms of the knowledge that they held, the development work that could be done and the personal relationship that the company built with its customers.

Richardsons also only looked at its market in terms of selling direct to the OEM. Even though there was a large market for replacement products, for existing customers and non customers, the focus was on dealing with OEM's. This was for a number of reasons, firstly the existing customers served their own replacement market and for Richardsons to go out and compete with this was only to disadvantage its own customers. However they could have serviced these on behalf of the customer. This brings us to the next reason. The costs versus the benefits of servicing individual end users did not make sense. To supply larger amounts to one geographical location meant the complexity of the business was cut down. It was for this reason that Richardsons did not invest time and money into manufacturing replacement products for other manufacturers who did not use Richardsons as an OEM supplier. The cost of finding the product spec and marketing the individual products would have been relatively high and reduced the margin made on the product. With hindsight it could have been a good way to get the OEM's attention and move to be a supplier, but at the time was not considered core business.

The volumes that Richardsons aimed for were fairly small; this was due to the high variety each customer required and the fact that the product was niche. The margins on the product were kept high by being the preferred supplier, proving additional benefits and features, and assisting in development work to provide a whole solution to the customer's requirements.

This also meant that Richardsons growth came mainly through organic means with existing customers. No real marketing effort was put into developing the business. The two main reasons for this were capacity issues to start with but also the perceived lead time to generating new business. There was also a reluctance to spend money on what could potentially be a long lead time for return on investment. This may have been part of a small company attitude, lack of forward planning more that one or two years in to the future, and resistance to change, that there has never been this kind of spend. Again this ties in with the psychological models of change that can demonstrate the reason behind resistance to change and can be particularly relevant to small companies, where one or two people are driving the majority of the decision making; getting them to take on board new ideas and change can sometimes be a hard task.

Project key milestones / Events:

The Richardsons Project was structured into a Gantt Chart format to map out the key milestones and achievements that were expected along the implementation process.

These are briefly explained here in terms of the task numbers at the side of the Gantt chart:

1. Intro to the Company
2. Training
3. Mini H and S project (Health and Safety)
4. Annual Leave
5. Training
6. Business Market Strategy Data Collection
7. Process Mapping Modelling and Analysis
8. Develop Operations Improvement Plan
9. Change Management and Culture Issues
10. Health and Safety
11. Identify quality Issues and Implement Changes
12. Supply Chain Management
13. Implement Operations & Process Improvement
14. Review of Business Strategy
15. Implementation of Expansion Plans and Review

The most relevant parts of the project for consideration in this paper are No6 (business and market strategy data collection) and from this the development of an operational improvement plan. The project up until No 14 is essentially an implementation of the findings from the BEA as previously discussed. No 14 then aims to look at the strategy side with the involvement of the company. This is done once the operations have been strengthened to a point where the company is operating from a stable base which is agile enough to supply the demands of the market. The strategy assessment and formulation looks at how to drive the existing position forward to enable the company to offer more than it currently does and expand its market share or operate in different areas.

The implementation of the expansion plans and review is done through the use of action sheets. The direction of the company and expansion plans are broken down into operational actions that must happen. These can be from processes changes on the shop floor to development of marketing materials, to development of product. However, each one is assigned an owner and a report back date is agreed. This is where the progress is monitored and the project is driven forward by each party completing the agreed sections on their action sheets.

It is worth mentioning here that while there was initial enthusiasm through out the project deliverables, significant resistance was encountered along the way put into place by the directors. The project managers didn't originally expect this to be the case and while change management of the shop floor was closely monitored the change management of the directors was not something thought to be necessary. This needs to be taken into account on future projects and looking at psychological models of change can help to understand why there was resistance and where it is likely to occur on future projects.

Key mile stones on the way to completing the projects and reaching the strategy development stage were:

New training and induction pack for employees
Health and safety development leading to a reduction in insurance premium of 10k per year
Operational improvement plan that yielded a 46% increase in productivity with no extra resources
Close relationships developed with customers by implementing an employee exchange program
Reducing the number of late deliveries and customer complaints to bring supplier rating score with customers above the minimum level
Implementing a third production line to keep up with customers organic growth in certain product ranges
Developing staff involvement through regular management meeting with staff and away day training sessions covering H & S, employee development, workplace design and training in processes and procedures.

Why Strategy Development:

After development of processes at Richardsons there cane a point at which the existing customer base was being satisfied to an acceptable level. However, the company had undertaken no strategic analysis up to this point to drive the company forward with new found agility.

There was also several motivating factors at this point for the management of the company to take a different view and look for strategic growth. The past few years of organic growth had left the company stagnant in terms of innovation and the market place was starting to change, in that, a number of smaller manufacturers were entering the market or becoming more aggressive in trying to win business. There was also moves at Richardsons main customer to split the business between two main suppliers. The reason behind this was the purchasing departments previous frustrations with the supply from Richardsons and the fact that good practice meant having two suppliers would give better flexibility to the OEM.

The sourcing of a second supplier had been a long process due to the fact that Richardsons were operating in a niche market and had been the company to develop a fully moulded operating table mattress. However, the main customer approached a very small PU moulding company and aided then with development work to build a similar product.

This was then tested on one part for a period of time until satisfactory. Once the customer was happy they had found a dual supply they started to very slowly split the business, impacting on Richardsons volumes.

Two issues had come from this. One was the fact that there was some loss of business, the other was the fact that someone else had developed the process to a satisfactory level and may attempt to enter the medical market with other OEM manufacturers. However, Richardsons was a larger company than the second supplier, had a quicker mould development process and knew the market. They also had spare capacity to attack the market, and could do so at lower prices than they previously had been able to. They were however loathe to do this as it meant lower margins to existing customers to help secure the business, (the new supplier was coming in with a very cheap price, more akin to traditional PU (Polyurethane) moulding margins), and meant a large marketing exercise.

However the company after some period of time decided to review its strategic options before the new rival could develop further capacity and attack other areas of the market.

Planning and implementation:

A strategy review day was initiated for Richardsons with the Agility Centre and the directors and managers of the company attended a day session reviewing the market place and strategic operations. This was not specifically designed into the BEA tool although information from the audit would be used to help make decisions in the strategy making process. The process also aided in thinking around the automation and systematisation of strategy.

The information gathering and analysis part of the strategic process utilised tools already readily available. This is similar in approach to the information gathering technique for the BEA. Many tools are available for this type of work, it is the format structure and the output that form a useful framework for strategy evaluation and formulation.

The evaluation day took the following format:

Current state – BEA data

Risk Scenarios – BEA data

General Action Plans – Ansoff framework

Future State – Ansoff framework

Specific Strategies Action Plan – Action sheets

Current State:

Here examined items included:

Turnover: Current and desired in 5 yrs
Products: Types, Share of turnover
Demand patterns
Improvement potential internally
Growth capability
Market: No of customers, ability to steal competitors market share,
Market share wanted in an ideal world

Risk Scenarios:

Market: Customer, competitor, technology, regulations
Internal: Product, Process, People,
Actions: Immediate, Pre-emption,
Trends: Impact and opportunities,

General Actions Plans:

Internal: Product, Process, People, Operations,

External: Current customers, new customers, potential customers,

Future State:

New strategies development

Growth through existing customer base

Atract new customer for existing product

Develop new product for ecisting customers

New Strategies culling and assessment:

Degree of control

Importance or urgency

Level of risk

Demands on time

Resource requirements

Return on investment

Priority (1-40)

Specific Strategies Actions:

Strategy Name

Goal of this strategy

Breakdown of action steps

Tasks to be accomplished

Owner

Due date

The current state overview is given in a chart that looks like the following and is displayed for information purposes throughout the day. On it is recorded all major decision points.

Current State Overview

Question: How do you visualise Richardsons' Healthcare in fifteen years from now and what do you expect the product portfolio would look like?

Current Turnover _____ Turnover expected 5 Years from now (stretching) _____ (stretching)

Current share of turnover for product catagories			
Ideal share of turnover for product catagories			
Market / customer demand pattern (increasing / stable / decline / unsure)			
Internal Improvement potential			

Figure 53: Current state strategic overview (Poolton)

The first two sections of current state and risk scenarios are developed from the data that is available for the BEA. This data helps to form the discussion points and look at the type of turbulence that the company is facing. It also feeds into the next three sections to give appropriate information to form actions.

From the risk scenarios action plans are drawn up to combat these risks and each one is split into parts and assigned an owner and a due date.

The risk scenarios are displayed in the following format:

Scenario Category _____

Scenarios Scenario and likelihood H M L	**Impact** How it impacts on you and level of Impact H M L	**Rectify** How to recitfy and how difficult and time consuming H M L	**Pre-emption and Prevention** How to pre-empt or prevent and how easy to do H M L
	Causes problem 1		
Scenario A	H		
		Put in place tool F	
Scenario B		M	
			Change structure to B
Scenario C			L

Figure 54: Strategy risk scenarios (Poolton)

General Action Plans recorded as above but under the general headings and split in Product Process Operations People.

The Future state is where we start adding some really creative thinking to the process and looking at where the company might go.

It is thought about under the Ansoff Matrix type structure and recorded as follows:

The Ansoff matrix is displayed and its four quadrants described. The extended ansoff developed by Ismail can also be used:

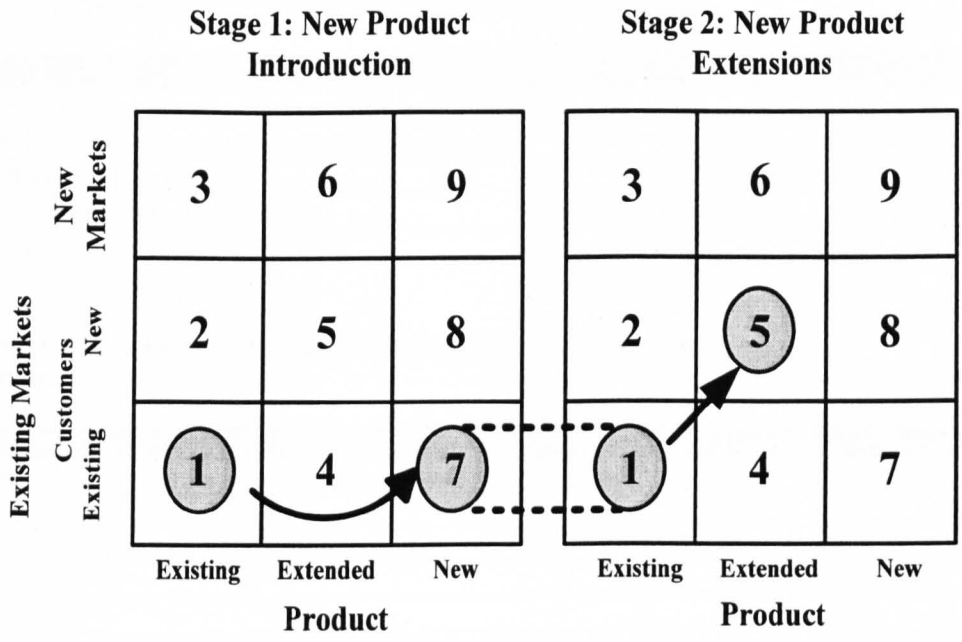


Figure 15: Extended Ansoff Matrix (Ismail 2005)

Growth Tactics

1) Market Penetration: Growth through existing customers

Increase sales of unit sold to existing customers	L	M	H
Any Potential to get customers to single source	L	M	H
Add -ons to product	L	M	H
Service elements included?	L	M	H
Dissvounts for forward ordering?	L	M	H

2) Market Development: Attract new customers for exisitng products

What is the peotential to move the market to new neiches?	H	M	L
Name these Niches or customer groups:			
Product A	H	M	L
Product B	H	M	L
Product C	H	M	L
Others	H	M	L

3) Market Development: Introduce new products for existing customers

Is there any opportunity to add internal features to the product	H	M	L
Is there oprtunity to add internal features to the product	H	M	L
Any opertunity to change chemical composition	H	M	L
Other chemical adatives	H	M	L
Add / Adapt / Modify / Magnify / minimise / substitiute ...existing features	H	M	L
Develop different versions (e.g. budget range or super deluxe range)	H	M	L
Create different versions of the same product (e.g. pillow or back supports)	H	M	L
Develop additional ranges	H	M	L
Others?	H	M	L

4) Diversification: Develop new products for new markets

This is most risky strategy of all

Is there any potential to develop a completely new product for a completely new market?

Once all the growth tactics have been discussed, the unrealistic ones must be removed from the potential list. This is the new strategies culling and assessment stage.

To be taken into account here must be the current state map drawn up at the begging. Here we stated what turnover should be in five years time and which products should make up that turnover, the growth strategies should deliver this desired turnover in the correct proportions. It is OK at this stage to amend the figures but the reasons for the amendments should be carefully considered.

The culling of the strategies is done under the following criteria, they are not exhaustive but give a good starting point for examining the new ideas critically.

Degree of control
Importance or urgency
Level of risk
Demands on time
Resource requirements
Return on investment
Fit and feel are often qualitative measure but may be based on real reasons people find hard to articulate so should have some importance here.

The final stage of the process is to translate all of the above into action plans. The action plan chart is included below. It should be made in duplicate, one for the action owner, and a second copy to record who is undertaking what action by when, and if necessary, how.

The following actions should be recorded:

Risk Scenarios:

There should be agreement on which of these are high priority and which need to have action taken immediately. These are to be recorded on action sheets with the agreed upon action. If the company is trying to deal with large amounts of turbulence it may not be ready or Agile enough to move forward. There may need to be anther iteration of the BEA to introduce enough robustness into the company's processes to deal with everyday turbulence

General action plans:

These can be for growth as well as to improve the company's ability in the current situation. They are mainly for consolidation and continuous improvement areas. As in the previous example a priority list needs to be created and action sheets drawn up for the most urgent or most beneficial.

Growth Action Plans:

These are the actions which will drive a company forward and are more strategic in nature. They are creating or investigating opportunities for the future. These are likely to be larger actions which need follow up so breaking them down into the smallest part possible is often useful. They may also require that money is spent in investigation or as a capital project so the assignment of action owners for these needs to be done very carefully. Several sub action sheets may come from one main action sheet which will allow the main owner to delegate more easily.

Converting Strategies Into Action

Action Planning Worksheet

Straegy Name:

What is the specific and over-reaching goal of this strategy?

Break down of action step needed to realsie goal(s)

Action Plan:

Figure 55: Strategy Action Sheet (Poolton)

Top down Vs Bottom Up:

The process explained in the previous section, (planning and implementation), is started from a Bottom Up approach looking at existing capabilities and where the company may be able to leverage these advantages in elsewhere in the market place. This type of approach is fine for the most part but comes unglued when looking at the fourth section in the Ansoff matrix. This really requires a top down approach to generate enough momentum and capital to take the risk that this section is associated with.

However, this fourth section is also the least used section of the matrix as growth often comes from related products processes, markets, customers etc and can be built up from a bottom up approach. The fourth quadrant is the most risky for growth.

The bottom up approach ensures that the company has the capabilities to complete what it has set out as a target or goal. It also feels like a more organic way to grow and it is often more comfortable for people to grow in this way than to move to a totally new area where they may have little or no experience.

The bottom up approach avoids Ivory Tower thinking and the workforce or shop floor feeling that decisions are made without consultations. It can be used to cerate a feeling of involvement and buy in which can be critical to setting up the workforce to supply in an agile manner. It can be useful to create culture on the shop floor where the operators fully understand the information systems they require, and help to build a more robust manufacturing system.

The bottom up approach also enables the company to create actions plans based on the competencies required to fulfil the strategy in mind. This ensures that entering the market is done so with the right 'equipment'. Here equipment may be thought of as the capability to supply what the company have set out to supply, on time for the right cost and in the manner that the customer requires. It is also about setting up to supply in an agile manner. That is, can their product be made to be customisable, to supply many options and choices for the customer. The product should be able to create a niche in the market by creating a unique offering and so using the USP to generate market share.

In summary

Inward Vs Outward Focus:

Traditional views look at the market first and company capabilities second
This can give a more open minded view as not constrained by what can and cannot do
May generate lots of ides in the fourth quadrant which is most risky area
Can lead to uncontrolled growth into areas not equip to deal with
May not fully understand the capabilities of company and what offerings can be made easily with existing skills
May be underutilising the existing plant / capital / people / processes
Has advantages of large step change
Has disadvantages mentioned above
Fits into strategy Safari in the entrepreneurial school of thought

Traditional views of strategy take the outward focus of looking at markets and what competitors are doing within the market or area of business the company operates in. But continuously out looking does not always mean that you can generate the best agile products and services. It can mean that you always become a follower and not a leader within the marketplace.

An inward focus looks at the capabilities of the company and, what is possible for us to achieve stance. The inward focus tends to generate lots of ideas in the first there quadrants of the Ansoff matrix. These are the areas where the most growth is likely to come from as there is the least risk in these areas.

An outward focus does help to generate ideas which have the potential to completely change a company and move into a new direction or new market. This can be what a company wants to do and there are times when a company may need to do this as they are saturated in their own market, have many competitors and niches are become harder to find.

However, most growth should take place within the existing market place first to utilise fully the plant, capital and skills that a company has invested in and worked hard to acquire.

For where outward and inward fit into traditional strategy see the tables developed about strategy focus and traditional schools of thought round strategy formulation.

Is inward development a good way of developing agile strategy? In short the answer is yes as the development process purely by its nature must ensure that the capabilities are in place to properly service the strategic area targeted. However it is still possible to develop strategies from an inward focus that the company is not equip to fully serve and create a true niche offering or solution product.

During inward development the assessment of capabilities and strengths must be related to the marketplace (outward) and have some relevance to what the customer really wants from the company. Therefore the development team must truly know the capabilities and processes of the company.

This brings us onto the next point. If the company is large the processes must be known very well by a small number of people to be able to perform this properly. Hence why this techniques should work better within an SME. SME's are often able to supply a small number of people who will have vast amounts of knowledge about the company, its markets, it products it capabilities and the type of market that they operate in currently. A larger company may require many more people and the process may become somewhat cumbersome. In this case several teams may need to be set up, one to investigate potential ideas and the other to develop the ideas through interdepartmental activities.

The other area of disadvantage that this type of technique may have in an SME is that often the leader of a company has a force of personality through there position and often through their character which may lead to them 'taking over' or forcing though their own ideas. Obviously if the person owns the company they have some right to veto decisions but this should be done at the right point in the processes and people in the contributing group need to be able to get their ideas out. This process is important as many people have great ideas which will not have been thought about and utilising these ideas, is what the strategy development is all about. To combat this, a strong chairperson is required to stick to the agenda, ensure all get their say and quash negative comments from others in the group. Even the wildest ideas can develop into something that the business can use for product or market development.

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