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A SYSTEMS DYNAMIC APPROACH TO CHANNEL MANAGEMENT

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Abstract — The purpose of this paper is to explore from a systems dynamic modelling approach ways in which to manage distribution channels in the control and instrumentation product market. In this market multi-faceted product lines, technological knowledge and the position of the product in its life cycle play important roles in the manner in which these products are diffused into the market. Due to the fast pace of emerging technologies, it is becoming increasingly difficult for manufacturers to keep their routes to the markets aligned to ensure profitability and customer satisfaction. Aims of the paper include the following: to asses whether driving factors identified by way of preliminary research case studies, qualitative methods and inductive reasoning are realistic and how the identified factors could be used within a systems dynamic modelling approach to understand the value additions derived from a distribution channel for the various types of product lines. In conducting the research, unlike many studies using qualitative methods, this paper additionally employs system dynamics simulation to develop an analysis of different scenarios that can be used by manufacturers in their channel management approach. This paper contributes to the field of technology business strategies and planning by introducing a systems dynamic model that can be of assistance to technology manufacturers to ascertain the appropriate route to market for their various product lines.

Keywords – systems dynamic modelling, manage distribution channels, technology manufacturers, control and instrumentation, product diffusion

Introduction and Rationale for the Research

Industrial product suppliers battle to maintain their profitability in an ever increasing global market combined with the fast pace of emerging technologies (Mohr et al., 2005). The way in which suppliers manage technologies and address their marketing efforts is central to their business strategies. Marketing is considered in terms of the way they approach vertical market segmentation, to positioning their products favourably against competitor products (Rolnicki, 1997). Channel structure analysis has been addressed in depth (Frazier, 1986; Gorchels et al., 2004 and Rosenbloom, 2005). Unfortunately, a relationship between the channel structure and the channel management process has not yet truly been analysed to its fullest (Rosenbloom, 2005). Rangan et al. (1999) indicates that these two areas have always been divided into design of the channel structure and the management thereof. They go furthermore to highlight the value of anticipating management issues that could materialise already during the design process. Therefore, in this paper not only the design drivers, but also the management issues and driving factors are considered.

From the authors' own perspective and experience, the Control and Instrumentation product has a distinct complexity that exists in terms of its product variety, various routes to the market and pricing into various distribution levels. The literature on channel marketing management is freely available as per Wheeler et al., (1999), but focuses on industrial marketing channel management (Leyland et al., 1999 and Rangan et al., 1999). Relevant literature applying systems thinking to the Control and Instrumentation market have not been found. This paper may therefore be a valuable contribution to this study field.

Due to the fast pace of emerging technologies and the management thereof, it is becoming increasingly difficult for manufacturers to keep their routes to the markets aligned to ensure profitability and customer satisfaction. This calls for a streamlined decision making process that takes into account as much information as possible in order to avoid side effects later on. This can be achieved by making use of a methodology that allows teams within an organisation to create pictures or views of all the influences and feedback loops within a complex problem and by changing various decisions, they can monitor the varying results (Jackson, 2003). According to Dooley (1995), the power with this type of systems thinking and modelling approach is in its creation of a shared mental model of the system in question. It also becomes an explicit story by all the team members of their perception of the interrelationships among the various parts of the system. This systems thinking approach assists greatly not just to ensure that everyone is in agreement, but also to understand the various different perceptions that could exist.

Systems thinking started with soft systems methodologies and system dynamic analysis methods (Checkland, 1999 and Forrester, 1971). Although some people still dismiss these methods as being too imprecise or "soft" for real world situations, they add definite value to understanding complex problems. Jackson (2003) and Rosenhead et al. (2005) both indicate that systems thinking offer a methodology that first constructs a framework around which deeper understanding of the problem can be found by assessing the behavioural characteristics of a complex system. It also gives a practical way to define complex problems and design solutions. Complexity stems from the nature of problems (Jackson, 2003). These problems rarely present themselves individually and come interrelated with other problems and situations. This has been aptly described as 'messes' by Ackoff (1972) as illustrated in Fig.1.

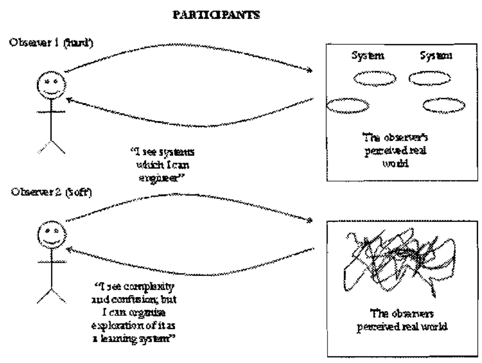

Fig. 1 The hard and soft systems stances. (Source: adapted from Checkland (2005) p. A11)

A differentiation is made between solving well-defined, simple problems where a clear solution or answer can be obtained. Where problems become more complex and ill defined, a process of managing the problem is a more accurate way of describing the process. By applying systems thinking to this type of complex system, the researcher and manager are provided with a tool that can project implications of decisions over a period of time (Checkland, 1999). The use of systems thinking uncovers the underlying complexities that influence change to the defined problem structure (Senge, 1990). Systems thinking is therefore appropriate to analyse by means of diagrams, the interaction between the various identified drivers to fully or appropriately assess the influence of the various underlying factors. Once these diagrams have been created, it can be used to qualitatively explore alternative structures and strategies that might be of benefit to the system (Wolstenholme, 1990). By making use of experiences and learning from these results, guidelines can be put forward to be in a position to redesign and improve the behaviour of the system as a whole over time.

Methodology

For this paper, a multi-methodology approach will be used in trying to understand the channel design and management methodology. A question that could be posed is: if one wants to make use of a multi-methodology approach, how does one decide on which methodologies to use together? Subsequently the authors made use of recommendations from Rosenhead et al. (2005) in order to establish the best possible or appropriate options for this research problem. Soft Systems Methodology (SSM) will be used to ensure that the personal dimension is fully understood. The underlying philosophy of SSM emphasises the importance of the viewpoint of individuals and ensures that these contributions are taken into consideration with the analysis of a problem. In conjunction with this approach, a systems dynamic approach will be used in order to develop a systems dynamic model of the relations between the various components of the system.

In order to effectively design and manage channels and the various routes to the market in the control and instrumentation market, a cross-channel strategy that takes into account various complex dynamic factors is required. Therefore, the nature of the problem makes it suitable to use not just a soft systems thinking approach but also to develop a system dynamic model that could be of use to future channel managers or someone interested in understanding the influence of various factors within the channel management design and management process. These findings can then be included into a step by step framework that can be implemented within the Control and Instrumentation market.

Soft systems thinking

Whereas systems engineering can be seen as a methodology that needs to achieve its objectives, soft systems methodology is a learning system (Rosenhead et al., 2005). The learning is normally applied to a problematic complex human situation that can lead to finding a meaningful and accommodating solution which in turn could lead to purposeful actions that are aimed at improving the situation. This whole learning process can be summarised into the seven stages through which it is taken (Checkland, 1999; Rosenhead et al. 2005 and Jackson, 2003). Fig. 2 shows the typical workflow of addressing a complex problem within the seven stages of the soft systems methodology. It should be seen as a process of an organised fact finding mission about the situation in question, using this information to understand the situation and together with other role players, identifying suitable actions that can be taken in order to establish improvements in the situation.

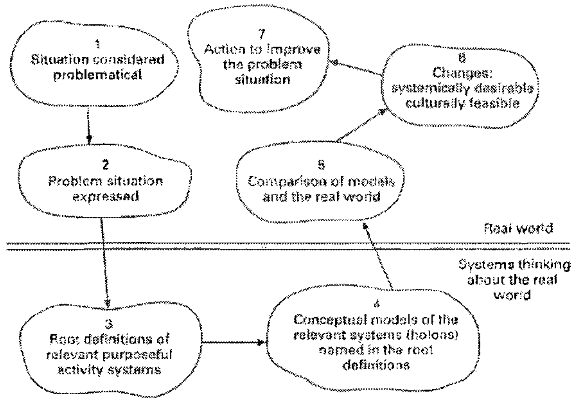

Fig. 2 The Learning cycle of Soft Systems Methodology (SSM) (Jackson, 2003 p.187)

During the first step, the situation needs to be identified and expressed. For the purpose of this paper, it is clear that the problem relates to identifying the correct channel structure design methodology that can be used for various product technology types in their routes to the market. In order to understand the problem, the author undertook an exploratory literature study to assess the relevant drivers that could influence channel structure design in the industrial market. This data enabled the author to test and identify the relevant drivers that need to be taken into consideration within a channel structure design methodology. Together with this approach, and in order to test the validity of the factors as identified in literature, the authors made use of qualitative research techniques whereby interviews were done with a focus group of parties. Qualitative methods were chosen to better understand the issues and factors faced by the various parties and to allow specific topics to be probed in depth. The feelings of the respondents were explored in terms of the identified factors and their relevance to the route to the market strategy for their specific product types. By making use of data supplied in these interviews and making graphical representations, the authors were able to show that the identified factors from literature are aligned to these real life situations and that products with typical profiles tend to have the same route to the market. These identified factors will be utilised within this paper to construct a systems dynamic model.

Systems dynamics

For the systems dynamics modelling portion of the multi-methodology approach, ideas formulated by Forrester (1971) who created a study area called Industrial Dynamics (which is currently known as system dynamics) were used. This study area was created due to a need that many problem-solving methods in the management sciences were not delivering the necessary insights and understanding into strategic problems of complex systems. Wolstenholme (1990, p.3) defines System Dynamics as *"A rigorous method for qualitative description, exploration and analysis of complex systems in term of their processes, information, organizational boundaries and strategies; which facilitates quantitative simulation modelling and analysis for the design of system structure and control"*. This is also defined elsewhere by Coyle (1996) as a branch of control theory that mainly deals with the socio economic systems.

The conceptualisation of the System Dynamic model has been based on an approach as developed by Wolstenholme and Coyle in 1983 as well as a System Dynamic modelling process as illustrated and adapted in Rosenbloom, et al. (2005) from Sterman. Wolstenholme (1990) is of the opinion that once these diagrams have been created they can be used to qualitatively explore alternative structures and strategies that might be of benefit to the system. Making use of experiences from these results, guidelines can be put forward to be in a position to redesign the system in order to improve the behaviour of the system as a whole. In more recent times, good quality graphical software have been developed that can assist in simulating these conceptual models. For the aim of this paper a software package named iThink has been used. Systems dynamic models can be created from making use of various elements and simulated within this software package. A very important point that is raised by Rosenhead et al. (2005) is the fact that the entire purpose of constructing a system dynamic model is not to be able to predict the future but rather to use it as a learning platform about the situation through the development and use of the model.

In order to illustrate the various inter-relationships, a specific type of notation is used. Rosenhead et al., (2005) defines one type of inter-relationship illustration as a positive feedback loop when an increase (decrease) in one period leads through other factors to a further increase (decrease) in a later period. The opposite is true for an inter-relationship that illustrates a negative feedback loop where an increase (decrease) in one period leads through other factors to a decrease (increase) in later periods. This has a stabilising effect counteracting initial change. These feedback loops also assist the user in understanding the underlying relationships of the various factors.

Rosenhead et al. (2005) adapts a system dynamic modelling process from Sterman and from additional literature produced by Coyle (1996) and Wolstenholme (1990), the following methodology is commonly referred to as the relevant process to follow when embarking on a system dynamic modelling process:
(i) *Problem recognition.*
(ii) *Problem understanding and system description.*
(iii) *Formulation of a simulation model.*
(iv) *Testing and validation.*
(v) *Using the model - policy design and evaluation.*

Channel Management

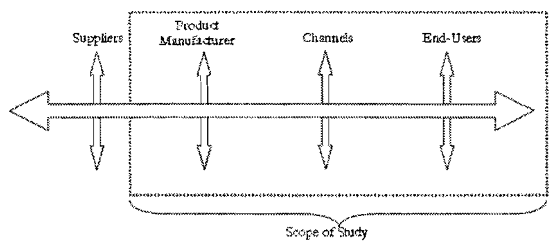

Fig. 3 Logistics supply chain. This figure highlighting the scope of this study

For this paper, the authors propose as per Fig. 3 that only the downstream portions of the supply chain process are taken into account, i.e. from the product manufacturer through all distributing, value adding resellers to the end-user.

Channel design

Channel selection can only be truly optimal when considered simultaneously with other marketing components (Rangan et al. 1999). Therefore, in planning the channel design, specific channel design drivers need to be identified. Channel drivers that were identified from literature and from available literature studies are as follows (Gorchels et al., 2004 and Rosenbloom, 2005):

(i) Primary products need to be defined
(ii) Supplier size and ability to distribute and be representative in the market
(iii) Changing customer behaviour, expertise and sophistication
(iv) Product commoditisation
(v) Establishment of new routes to the market, e.g. building of relationships
(vi) Service and Support
(vii) Developments in IT, product technologies and logistics
(viii) New products and or modifications on existing products
(ix) Competitive pressures
(x) Opportunities to increase market share

(xi) Life cycles (Product / Market / Technology)
(xii) Channel proliferation

Rangan et al., (1999) refer to extensive empirical research done in the 90's. This research entailed routes to the market for new industrial products and factors determining these routes. Some of the channel choices are shown in Table 1.

Table. 1 Factors determining channel choice (Rangan et al., p71)

Customer requirement of channel function	Literature identified description	Direct if:	Indirect if:
Product configuration	Adjustment, customisation, configuration	High	Low
Availability	Frequency of usage, time of consumption	Not critical	Critical
Service and support	Waiting time, need for service	Not critical	Critical
Lot Size	Purchasing effort, order size, unit value, extent of usage	Large	Small
Gross Margin	Profit achievable on product	High	Low
Rate of technology change	How quickly does the technology change?	High	Low
Product Life Cycle	Where in the Product Life Cycle is the product?	Introduction	Mature
Customer Needs	Complexity of customer buying and decision-making process	High	Low

Preliminary Research Findings

In order to ensure a clear understanding of the various factors identified in the literature study and their relevance in the market, the authors made use of qualitative research methods to explore these factors in more detail. This was done in order to explore the attitudes and feelings of the respondents in terms of the identified factors and their relevance to the route to the market strategy for their specific product types.

Preliminary data analysis

In terms of a qualitative research methodology approach, interviews were scheduled with various parties and all the data were analysed for commonalities within the context of the research objectives (Dirker et al., 2008a). Themes were allowed to emerge in an 'inductive' manner from the interviews (Strauss, 1990). These themes (together with themes from the literature review) were then synthesised together and the primary qualitative research is therefore a culmination of these two important elements. Drivers that influence channel management models were identified as follows (Gorchel et al., 2005; Rolnicki, 1997 and Rosenbloom, 2005):

(i) Pricing / Profitability.
(ii) Changes in customer behaviour.

(iii) New routes to the market.
(iv) Availability.
(v) Service and support.
(vi) The product life cycle
(vii) Competitive pressures
(viii) Product complexity.
(ix) Volume requirement.
(x) Buying requirement.
(xi) Market share.
(xii) Internet / extranet strategies.
(xiii) Effective two way communication.
(xiv) Improvement of channels.

Soft systems thinking approach

A proposed root definition for the current research problem could be formulated as follows:
A **Manufacturer's**^{AO} approach to **effectively**^{W} **model**^{T} and manage distribution channels in the control and instrumentation product market where **multi-faceted product**^{E} lines, technological know-how and the position of the product in its life-cycle play important roles in the manner in which these products are diffused into the market while ensuring that the **customer's**^{C} needs are met.

The **CATWOE** analysis could be the following:
C – The beneficiaries or victims of the activity will be the customers.
A – The manufacturer will be responsible for the activities relating to the development and management of the channel models.
T – A model or methodology is responsible for the transformation activity that could ensure an effective management of channel structures and leads to successful relationships between the manufacturer and its partners / customers or not.
W – The world view would be to have a structure in place that can be operated profitable for all parties without any conflict and to the best competitive advantage of the manufacturer.
O – The owner of the activity is also the manufacturer.
E – Environmental constraints that can be taken as a given with this definition could be the product type or industry type dependant on the way in which segmentation is done.

Within a rich picture Fig. 4, the identified drivers that could have a significant influence on the outcome of the channel structure are shown. Here most of the channel drivers as identified within the channel literature and qualitative case study can be seen as having an influence on the channel structure design. Not all the drivers identified within the qualitative portion of the study have relevance to the design portion of a channel structure. Some of the drivers, i.e. improvement of channels, two way communication and intranet / extranet strategies are channel drivers but only influence the channel structure after implementation and management over time.

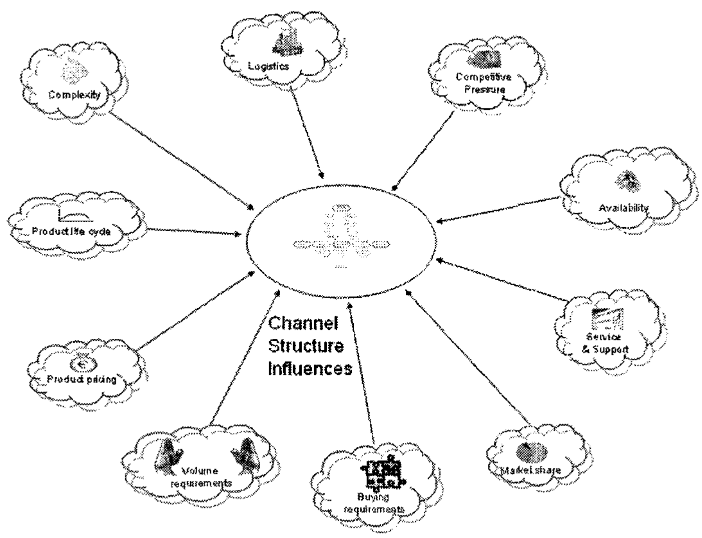

Fig. 4 Channel Structure influences rich picture

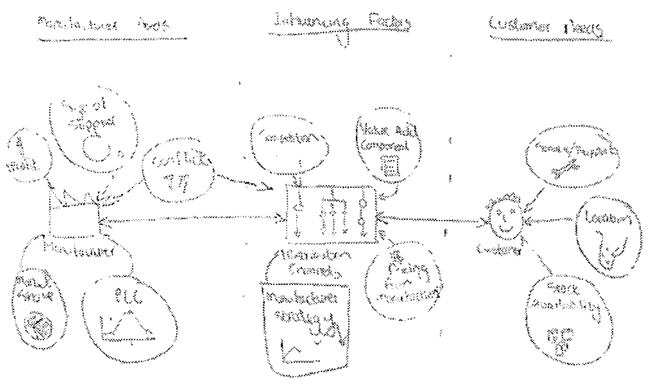

Fig. 5 Channel Structure influences rich picture no1.

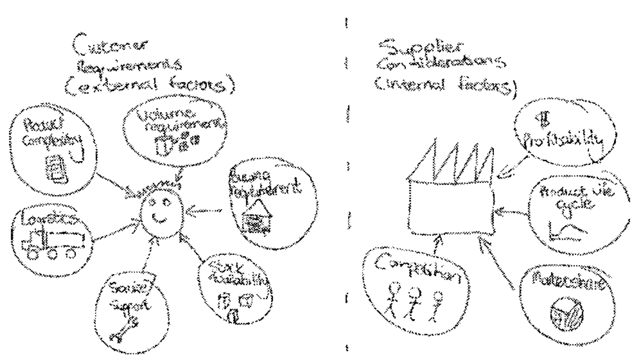

Fig. 6 Channel Structure influences rich picture no2.

With Fig. 5 and Fig. 6, the various interrelated factors and where they had an influence relating them back to the reality are shown with the rich picture approach. Rich pictures within the systems thinking approach is normally hand drawn and done in a focus group environment.

Fig. 6 is used for further clarification. Here a distinction was made between factors relevant to the manufacturer and to the customer that influence the channel structure. From a customer viewpoint, driving factors such as the complexity of the product, service and support, stock availability, logistics, volume and buying requirements are factors that influence the route to the market. In addition to these factors there are manufacturer considerations that also need to be taken into consideration before finally deciding on a channel structure. These include profitability / pricing, the product life cycle, market share and competitive behaviour.

This interpretation of reality ties in with the first rich picture illustration but it shows the relationships in a slightly different light. It also illustrates that one type of complex problem could have various types of rich pictures which could all lead to the participants of such a brainstorming session to understand a problem better by analysing various viewpoints.

Applying the system dynamic methodology

By first making use of causal loop diagrams and subsequently the use of the software package iThink to generate an unique systems dynamic model, it is demonstrated how the multitude of factors have an influence on channel strategy and what the possible outcome of various decision scenarios can be. This will be done by simplifying the number of variables and demonstrating the impact of changed selected variables.

In order to assess the various routes to the market, a Channel Structure Index (CSI) that will give an output value is proposed by the first author. This value will be an indication of the route to the market that the product will be best suited for, where 0% will be direct and 100% will be indirect. It can also be interpreted in terms of the higher the CSI value, the longer or more complex the route to the market will be. A reality check will be done by making use of the original, novel systems dynamic model as generated within the iThink software package to interpret the product types as found within the qualitative research portion and to understand whether the CSI output correlates to reality.

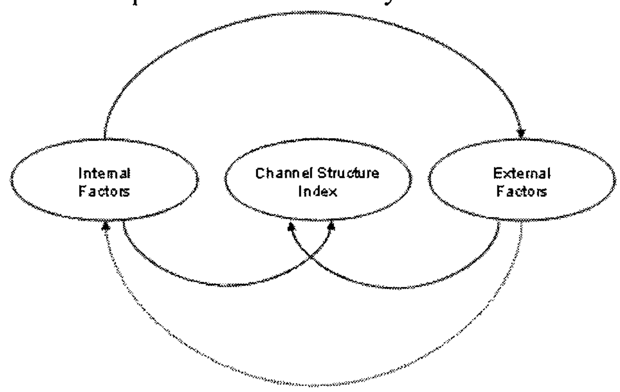

Fig. 7 Loop diagram for channel structure influences. (Own)

In Fig. 7 a simplified loop diagram of the internal (organisational considerations) and external (customer requirements) factors is shown that can influence the Channel Structure Index. Within Fig. 8 these grouped driving factors are illustrated as a simplified causal loop diagram excluding any possible interactions between the various factors. This illustration focuses on the type of factors, e.g. positive or negative feedback loops.

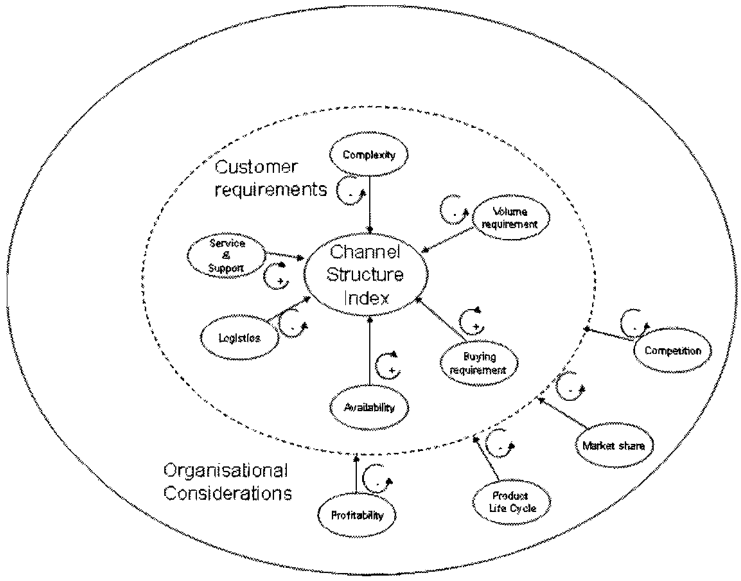

Fig. 8. Influence diagram for channel structures. Source: Own

Understanding the influencing factors
Without defining or interpreting any interfactor relations, a short description of influencing factors as illustrated in Fig. 8 is provided.

Internal Manufacturer Considerations

(i) **Profitability** – *Negative feedback loop.* This will have a negative (shortening) effect on the route to the market. A higher profit is achievable when the route to the market is shorter. Keeping in mind that the increased length in a route to the market will increase the associated cost of the product due to storage, delivery and transport costs. It will be more cost effective for the manufacturer to supply directly.

(ii) **Product Life Cycle** – *Positive feedback loop.* If the literature study findings are taken into consideration it could be stated that as the product moves through the product life cycle, the possibility of a longer route to market increases the further the product moves through the product life cycle.

(iii) **Competition** – *Negative feedback loop.* Using the information gathered as part of the qualitative exercise conducted, it was noted that competition could dictate in certain situations the manner in which products are sold into the market. For this illustration it shows that an increase in competitive behaviour to sell more directly, could lead to a reduced channel structure from the manufacturer in order to stay competitive.

(iv) **Market share** – *Negative feedback loop.* It is illustrated that in most cases an increase in market share gives the manufacturer more power in terms of being able to dictate to the market. This can be done by selling more directly thereby increasing profits etc.

External customer requirements

(i) **Logistics** – *Negative feedback loop.* It can be described that the more complex the logistics requirement from the customer, the shorter the channel structure could become. This is due to the possibility that the manufacturer will be located in various strategic locations across its customer base and dependant on its size have the capability to store, deliver and transport all products to its customers when and where it is needed. This could therefore point to less channel structures needed.

(ii) **Service and support** – *Positive feedback loop.* The positive feedback loop supports the notion that as the customer requires more service and support, the manufacturer will increase its channel partners or distribution network to ensure proper after sales service capability.

(iii) **Availability** – *Positive feedback loop.* For certain types of products, availability to spares and products are key factors for customers. Therefore it can be said that the requirement for products to be available will have a positive effect on the channel structure in terms of lengthening and ensuring proper representation in all areas.

(iv) **Buying requirements** – *Positive feedback loop.* The bigger the assortment and complimentary products required by the customer, the more indirect channels will be used.

(v) **Volume requirements** – *Negative feedback loop.* The higher the value of a product, or if it is used extensively and important to the customer, the more likely it is that the product will be sold directly rather than indirectly.

(vi) **Complexity** – *Negative feedback loop.* Customers tend to trust the manufacturer more when purchasing complex products than going through a normal distribution channel. Therefore, the more complex the product, the shorter the channel structure.

Understanding the influencing driving factors inter-relationships

In Fig. 9 an attempt is provided to refine the influence diagram into a causal loop diagram in order to further explore and understand underlying factors and inter-relationships that could influence the channel structure arrangement.

Significant changes and interrelationships of various driving factors between the influence diagram of Fig. 8 and Fig. 9 have been identified as follows:

(i) The **product life cycle** and **profitability** – *Negative feedback loop.* As the product progresses through the product life cycle it becomes more susceptible to being sold through a longer channel structure, e.g. through a distributor network etc. This is turn has a negative impact on the profit or product pricing a manufacturer can charge to the product. The profit achievable on a product, especially a low technology product, becomes smaller as the product progresses through its life cycle.

(ii) **Competitive pressures** and **product life cycle** – *Positive feedback loop.* As the product progress through its lifecycle, competitive pressures increase as more and more competitors start manufacturing similar products, their products become more available and the pricing becomes more competitive.

(iii)**Complexity** and **volume requirement** – *Negative feedback loop.* This interrelationship and feedback loop propose that the procurement of more complex products tend to be lower volume and less frequent than with commodity items.

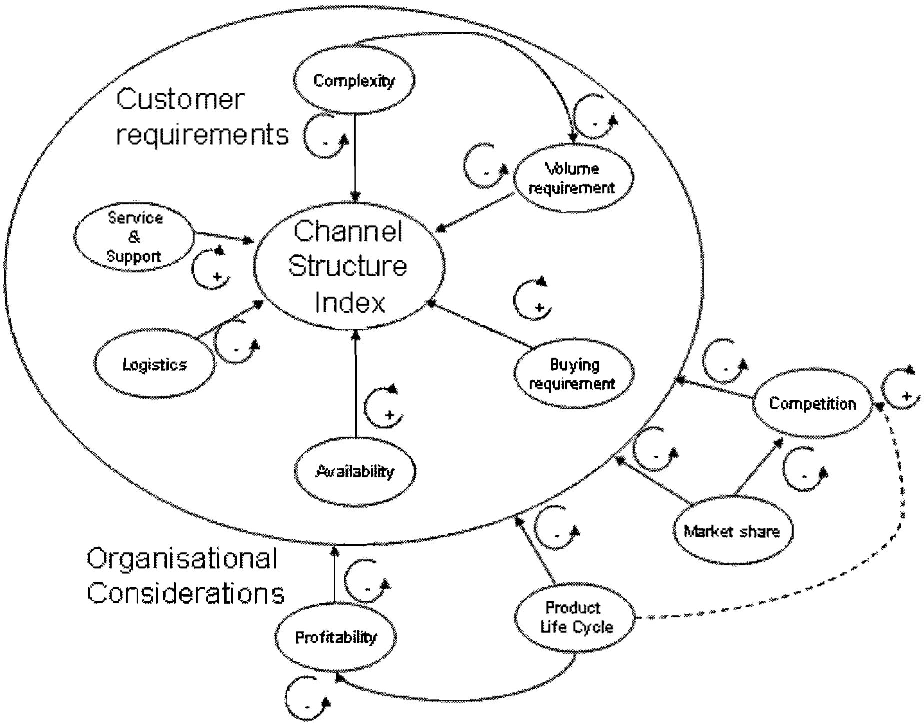

Fig. 9 Loop diagram for channel structures influences. Source: Own

Systems dynamic simulation

In order to ensure that the relevant driving factors and interrelationships are correctly interpreted, a system dynamic software package (iThink) is used to mathematically model the causal loop diagrams and to relate the results back to reality.

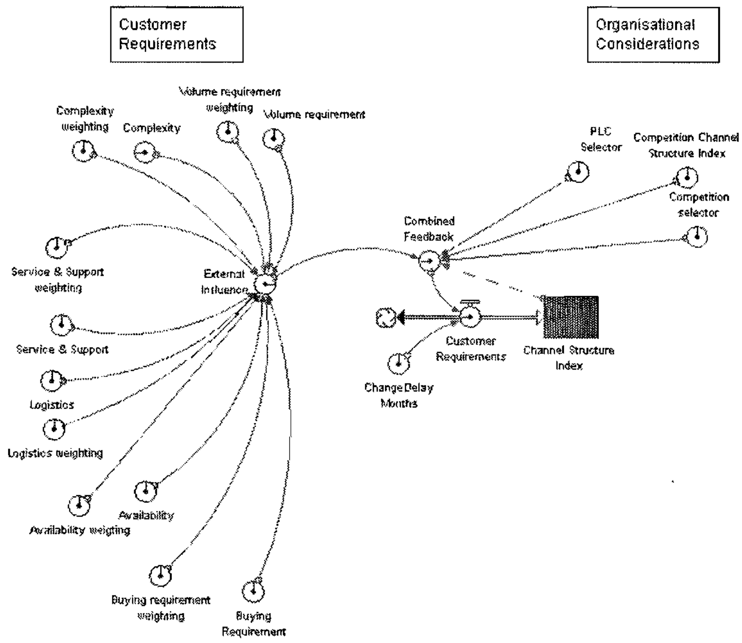

Fig. 10 Systems dynamic model as designed within iThink software. Source: Own

In Fig. 10 an illustration of the systems model within the iThink software package that has been developed can be seen. The model makes use of eight out of the ten identified driving factors. Market share and profitability have been excluded. They will be used as possible overriding factors that need to be taken into consideration by an organisation after a Channel Structure Index (CSI) has been obtained. Of the eight variables used, the six customer requirement factors are used to obtain an external influence that is an input into the simulation model. Each of the six factors can be weighted by the user in terms of their perceived importance. The remaining two factors namely product life cycle and competitive behaviour are used as internal consideration factors and can either be included or excluded from the simulation.

A time delay factor of how long it would take to implement any major strategy change within the channel structure is also taken into account. The use of just the customer requirements gives a dynamic increase dependant on the time delay up to a steady Channel Structure Index illustrated over time. By making choices in terms of including the product life cycle and / or competition, the systems dynamic response over time can be shown. This will give the simulator a good indication what could happen to the Channel Structure Index over time.
In essence the Channel Structure Index is calculated as the sum of the weighted customer requirements or channel driving factors as identified earlier.

Systems dynamic model interface

In order to facilitate the simulation of various product types, an interface was developed where the simulator can input various conditions. In Fig. 11 the main interface area where the customer requirements can be input is shown. The weighting of all the factors are interlinked to ensure a total weighting of 100% for all factors.

In Fig. 12 the simulation area is shown where organisational considerations can be included or excluded from the simulation. With these additional considerations, a trend over time can be obtained which will greatly assist the user in assessing possible future changes to a channel structure.

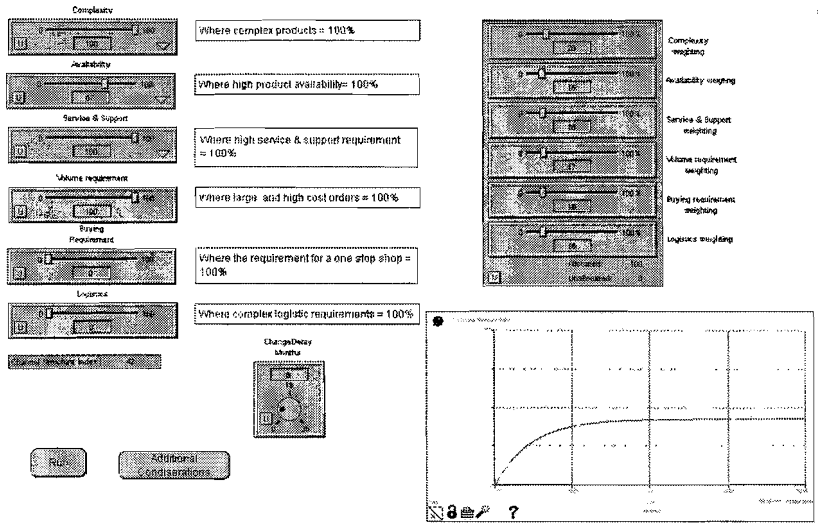

Fig. 11 Customer requirement interface. Source: Own

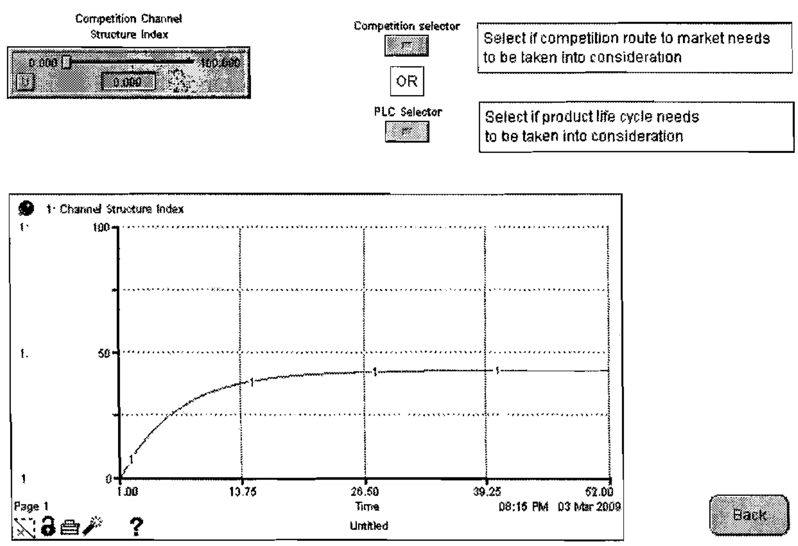

Fig. 12 Additional organizational considerations interface. Source: Own

Systems dynamic model validation

It is necessary to validate the developed system dynamics model in order to establish sufficient confidence in the model. There are significant varieties of opinions in terms of the underlying concept of validation in literature (Coyle, 1996; Forrester, 1971 and Jackson, 2003). Forrester suggests that the significance of a model depends on how well it serves the purpose of what it was meant to be used for. He puts forward 13 subjective criteria that can be used to validate and criticise popular validation techniques due to the fact that they rely too heavily on quantitative validation rather than focussing on the usefulness of the model to assist in future policy and decision making. He also puts forward that validation techniques and processes ignore underlying assumptions which might have significant impact on the model performance.

According to Senge (1990) and Wolstenholme (1990), the use of Systems Thinking allows for the uncovering of underlying complexities and the exploration of various alternative structures. By making use of experiences from these results, the user is then in a position to compile guidelines that can be used to either redesign or alter a current process sufficiently in order to improve the behaviour of the system sufficiently. The insights from using Systems Thinking approaches should therefore be used and not necessarily the projections, i.e. numbers that are produced for the various scenarios. Keeping this in mind, a sample of some of the user cases within the qualitative research data collected by Dirker (2009), have been used in order to validate the systems dynamic model as generated within iThink for the various scenarios.

Table 2 contains a summary and description of the findings using the system dynamic model correlated back to the relevant user cases.

Table. 2. Channel Structure Index simulation results. Source (own)

User Case	Customer Requirements						Channel Structure Index	The Channel Structure Index validation with reference to qualitative data obtained earlier in the research study.
	Complexity	Availability	Service and Support	Volume requirement	Buying requirement	Logistics		
1	100%	0%	100%	80%	0%	0%	35	These products tend to be distributed directly but it allows for distribution through a distribution channel that can add value in terms of offering service and support for these high technology products.
2.1	100%	0%	100%	100%	0%	100%	16	The difference between this and the previous case study is the fact that due to the logistics requirements and high cost of these products, the end-users tend to procure these products directly from the manufacturer.
2.2	100%	100%	100%	50%	0%	100%	40	These products are distributed either directly but more through specialised distribution channels that can offer service and support and ensure the availability of the products where the customer requires them. These products are normally critical to production.
3	0%	100%	0%	0%	0%	0%	68	These are low technology products that require to be available to end-users. The CSI of 68 points to these products being sold through value added resellers in the form of Original Equipment Manufacturers as well as distribution channels.
4	0%	100%	50%	0%	100%	0%	92	This commodity product tends to be distributed through distribution and value added channels.
5	80%	30%	0%	50%	100%	50%	25	It tends to be mostly distributed through value added channels, but can also be sold direct. High Technology product in terms of complexity, but does not need the same type of service and support capabilities as user case 1. Normally these products can only be repaired in-house by the manufacturer.
6	80%	0%	0%	100%	0%	50%	12	These products are similar to user case 5 with the exception that they are bigger and higher cost items. Availability is not a pre-requisite and due to their niche in the market the end-users tend to buy directly.
8	100%	100%	100%	20%	0%	0%	61	A CSI of 50 indicates that both an indirect and direct sales strategy can be beneficial for these products. This aligns to the user case in terms of majority sales going through value added resellers.

Table 2 contains a summary and description of the findings using the iThink system dynamic model developed correlated back to the relevant user cases.

Figure 13 shows the trend of user case 3 as defined in table 2 when the additional consideration of competitive behaviour is introduced to the system dynamic model. It shows, as was found within the qualitative research portion, that over time in order to address the competitive behaviour, the route to the market taken by an organisation mimics that of competition. In this specific case, the competition changed their sales strategy and sold directly to the end-customer.

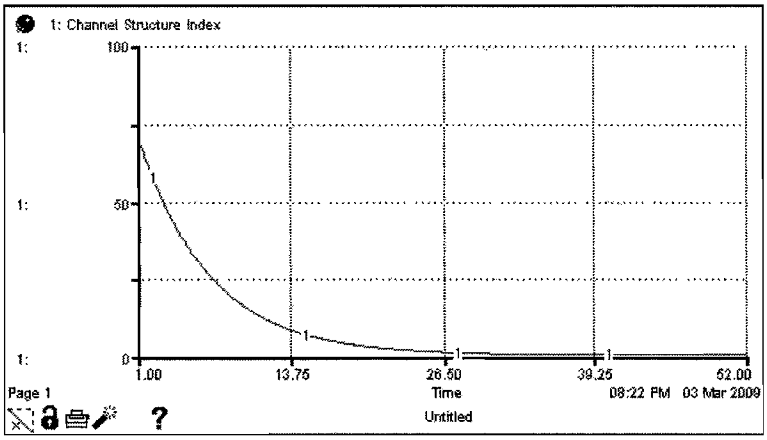

Fig. 13. Additional consideration settings – Competitive behaviour. Source: Own

An interesting observation can be made by taking the product life cycle of user case 3 as defined in table 2 into consideration. With the product already being in a mature stage of its product life cycle, Figure 14 shows a trend that illustrates a higher Channel Structure Index over time, indicating the route to the market being more inclined through distribution channels. This however in reality is not the case due to the overriding competitive behaviour factor.

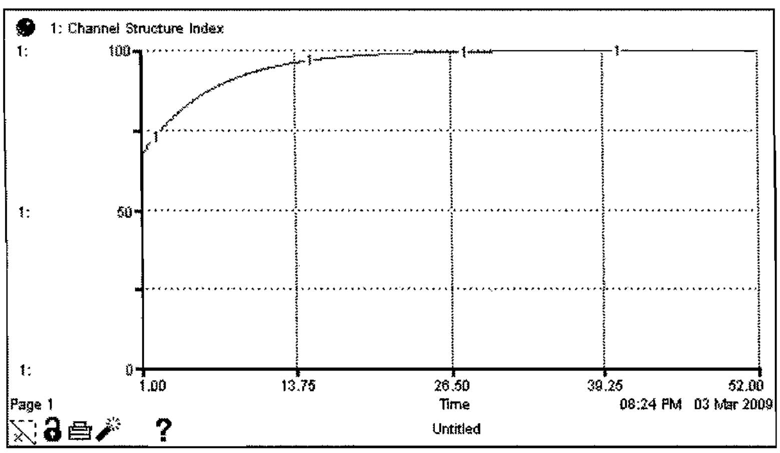

Fig. 14. Additional consideration settings – Product Life Cycle. Source: Own

By making use of the findings of the systems dynamic model as developed within the iThink software package and the guideline as proposed in Table 3, the user can quickly and easily get a general understanding and feel for which type of channel structure the product is best suited.

Table. 3 Channel Structure Index guideline. Source: Own

Channel Structure Index	Possible route to market
0 - 10	Predominantly direct business
10 - 50	In this range the products tend to be sold either direct or via specialised or value adding resellers
50 - 90	In this range the products are sold via value adding resellers and normal distributors and wholesalers
90 - 100	Predominantly indirect business via distribution / wholesale partner

By making use of the findings of the iThink model and the guideline as proposed in Table 3, the user can quickly and easily get a general understanding and feel for which type of channel structure the product is best suited.

Some of the most important additional channel structure driving factors to consider are profitability and competitor behaviour. Market share and product life cycle are useful factors to understand the manufacturer's power within the market segment and should also be used to understand long term channel structure trends. They can be overriding factors, but are based on strategic intent from the manufacturer.

Conclusion

The System Dynamic methodology utilising causal loop diagrams and the unique systems dynamic model as designed with the iThink software assists greatly in understanding and illustrating the various inter-relationships between the channel drivers. It also illustrates the type of feedback loops between the various channel drivers and their influence in terms of the system outcome.

By making use of the model as designed within the iThink software package to validate the system dynamic model for channel management and channel structure design, it was shown that the various cases correlated to real life except where overriding influencing factors caused the best route to the market to be altered in order to stay competitive in the market.

Two variables were left out in the final model to be used only as additional organisaitonal considerations outside of the dynamic model. The first being that of market share. Market share does not have a direct influence on the route to the market without the strategic intent of the manufacturer. It only affects the relationship space (Frazier, 1986). Only if a manufacturer decides that due to its majority market share it wants to sell a product in a certain way, the market share (together with competitive behaviour and profitability) will become an overriding factor. Another overriding factor is profitability. Regardless of how customer requirements are aligned, a manufacturer still needs to take into consideration the profitability in doing business in a certain manner. If existing channel structures need to be altered, then there are certain financial implications that need to be taken into account. The same applies for new products and establishing new routes to the market. There are also costs associated for these approaches (Rangan et al., 1999).

Possible limitations

As with any type of framework, possible limitations exist and the following should be taken into consideration. This proposed multi-methodology approach is aimed specifically at the control and instrumentation market and products that are diffused into this market. It has not been tested on other industrial products or on the commodity and commercial market. Care should be taken not to use the framework in a discrete and quantitative manner. The limitations of proposed channel structures and future changes required should be understood. Furthermore, a deeper understanding of all influencing factors by all members of an organisation is needed and a step by step process should be used to align this understanding whilst deciding together on the best possible route.

Recommendations

This framework was specifically developed to take into consideration the major factors and influences prevalent in the industrial control and instrumentation market. Future studies should focus on new emerging technologies and factors that could influence the future channel structures in ways that might be inconceivable at the moment. We live in an environment where nothing but change is constant. It is therefore a certainty that the way in which channel structures are influenced tomorrow will differ from today. If a simple but powerful framework is used to understand the underlying factors, it will become a fairly easy process of adjusting and re-adjusting perceptions and requirements of channel structures into the future.

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