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Agile Parameter Affecting Supply Chain Management Strategy

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Abstract—**Aim of this paper is to summarize Supply Chain Management (SCM) strategies which are getting affected by the agile parameters. Agile parameters are classified into Capabler, Driver, and Enabler which may help an expert to take a decision in an agile environment. Agile development may affect the working style of the modules in SCM. This paper shows business process agility defined by the number of parameters affecting SCM modules. This study shows analysis of SCM modules based on the review of a number of research papers. SCM based case study of inventory management for swatches is studied with the strategy. This mapping in different modules based on agile parameters, shows their importance. Mapping with agile parameters make a system to understand the impact and its future in the different levels of SCM modules. Different types of agility in the SCM system with its agile parameter can be an enrichment of this paper.**

Keywords— *Supply chain management, SCM strategies, agile development environment, agile parameters, agile supply chain*

1. Introduction

Supply chain management (SCM) is a big domain of working inclusive of employee relationship management and customer relationship management. As per the current market environment, SCM is more prone to get affected by agile environment. This paper helps to understand the structure of SCM with its development strategies. This paper shows the relation between listed agile parameter with SCM strategies. Section II defines overall working of SCM. Section III defines different strategies used in SCM. Whereas

Section IV shows agile environment with an agile parameter that can be identified as per SCM strategies.

2. Supply chain management

2.1 Business process agility

Business Process Management (BPM) monitors the life cycle of software development process including steps like process discovery, process specification, process implementation, process execution, monitoring and controlling. [20] [28] BPM may get affected due to the changes in the input requirement or due to the logic execution. This doesn't mean to only accept the changes as required, but need to understand the ability of the process to be adopted. Agility needs to be handled for event management, data analytics, business rules, selection of active content, and acceptance of change in the business Policies. [12] Decisions are made by the right combination of business rules, optimization, and predictive analytics. Decision Management Systems have key characteristics as decisions, agile, analytic, and adaptive. This agile system moves forward, become analytic and adapted to survive in competitive advantage.

2.2 Structure of SCM

Supply chain management (SCM) contains a chain of business modules that are roped together to work in sequential order based on the business policy. [22] [24] SCM consists of all stages which meant for directly or indirectly fulfilling a customer request. SCM stakeholders are manufacturer and suppliers, transporters, warehouses, retailers, and customers. [19] SCM integrates the process of supply chain, makes full use of external resources, realizes rapid and sharp reactions; immensely reduce the level of stock with a network of interconnected businesses. It includes management

of information flow, material flow and fund flow with activities such as marketing, new product development, finance, and customer service.

2.3 Objectives of SCM

The fundamental objective of SCM is to add value to the business component in a collaborative manner. [25] SCM accomplishes corporate strategic objectives such as reducing working capital, taking assets off the balance sheet, accelerating cash-to-cash cycles, increasing inventory turns. Also, it affects the increase in throughput while simultaneously reducing both inventory and operations. SCM strategically manages the sources of supply. SCM applies a domino effect on organisation, i.e. understanding customer's true needs. In designing SCM network, companies need to understand market demand and then need to plan accordingly. Information technology should afford a clear flow of products, services, and information.

2.4 Implementation of SCM

Implementation of the SCM solution needs to make a potential analysis of the product with respect to supplier and customer. This analysis gives the relation between usage and development of the product. In the next step, conceptual study of product considering the aspect of CRM and ERP gives benefits of product analysis with its order delivery. Project management includes maintaining the inventory of material along with customer relation management with all stakeholders. Management should be able to handle predictable or unpredictable change. [13] [24] Supply Chain Design and Operation involve functions like designing supply chains; Implementing collaborative relationships; Forging supply chain partnerships, Managing supply chain information; Making money from the supply chain. Also, some more functions like Customer service performance monitoring, Order processing, customer service, budget forecasting, Third party invoice payment, Sales forecasting, Master production planning, change control for packaging, Operational Analysis, Design Materials Handling, Distribution Strategy, Operational Improvements, Distribution Management, Warehouse Design Management.

Core processes developed by stakeholders are the main value-creating processes and output is utilized by consumers. [20] Support process is the internal

processing of an organization which enables the execution of core processes. Components of a process are the control flow, data flow dependencies, and business rules. Based on feedback for usage of processes, supply chain functionality can improve quality and productivity of the different operational areas.
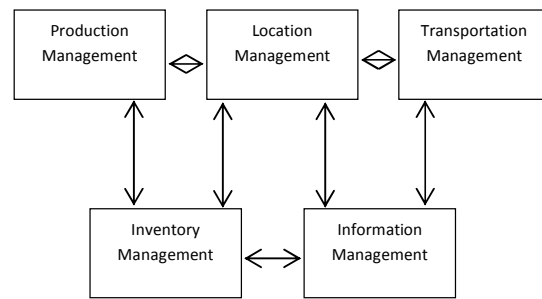
2.5 Modules present in SCM

Figure 1: General modules in the SCM

As shown in the figure 1 SCM system takes decisions based on the following areas [3]

1. Production management: This area, checks for the necessity of the product in the market. It creates master production schedules, including plant capacities, workload balancing, quality, and equipment maintenance. It works as per product focus or functional focus of the manufacturing area.

2. Inventory management: This management check for inventory of raw materials, semi-finished, or finished types of goods that are held by the manufacturers, distributors, and retailers in a supply chain. This management includes Cycle Inventory, Safety Inventory, and Seasonal Inventory. The purpose of the inventory is to check against uncertainty in the supply chain.

3. Location Management: This management handles location relations required for production and inventory storage. This check for the most cost efficient locations for production and for storage. Uncertainty for existing module mapping with a new model to gain economies of scale and efficiency.

4. Transportation management: This management focuses on the transportation of goods, raw material, and order processing from one place to another based on the type of product need to deliver. This also checks for the mode of transportation affecting the parameter such as time, cost and quality with less uncertainty. This

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uncertainty must be compensated by stocking higher levels of inventory.

5. Information Management: This management keeps the information of data volume and actual data. Timely maintained and accurate information makes better coordination and better decision making. With good information, people can make effective decisions for production, inventory, and transportation.

Besides this general management following are the some more management modules that can be considered for understanding the working of SCM.

1. Requirement management: This management check for the requirement of the new product or up gradation of the current product. This management performs a detail study of the product and understands requirement as per the stakeholders and product.

2. Sales management: This management in support with production management and inventory management handles sales of the product. This management helps to generate a pattern of sales based on product, customer, and suppliers.

3. Contract management: This management helps to generate and maintain a contract of product with stakeholders. This also helps to design new contract, upgrade new contractor to understand the pattern of changing the environment.

4. Inventory accounting: This management handles accounting of inventory management along with purchase management considering it costing and availability of raw material as well.

5. Purchase Management: This management handles process in support contract managing sales management. This generates order patterns as per product or as per stakeholders.

6. Vender management: This management concern with handling suppliers for product manufacturing. This includes managing raw material required for production, co-ordination of complex product manufacturing.

7. Stock management: This management governs vendor and purchase management considering all stock required for raw product and fine-tuned product.

8. Customer management: This management handles customer coordination, their feedback and improvement in customer care.

9. Quality management: This management handles quality of the product manufacturing, sales execution, and the over-all management of the SCM modules. This management helps to improve the manufacturing of SCM.

2.6 SCM risks and Challenges

Risk management strategies made in the supply chain are Mitigation, Avoidance, Transfer, Acceptance or Assumption. [20] [14] [31] SCM Manufacturing works for increasing business gain through the involved processes in it. [15] For SCM most important challenges are proper identification of customer needs, innovation in the product, reduction of delivery times of products, and manufacturing of quality products at low costs. Supply chain integration is benefited to lower risk and costs, increased productivity. [15] The dependency of supply chain modules may create an integration issue in SCM. The aim of integrated SCM is to optimize the function of the system so that they can ensure the maximum benefit of the whole system. To remain in a competitive environment, SCM may face issues such as modal analysis, supply chain management, and load planning, route planning, distribution network design, re-engineering, globalization, and outsourcing.

3   Strategies of SCM

3.1 Strategy

SCM modules need to handle with the proper strategy to get desire results. SCM strategy involves setting goals, determining actions to achieve the goals, and changing resources to execute the actions. [17] [8] Supply chain delivers optimal value based on the different strategy as per the aspects of inbound and outbound logistics parameter such as speed, cost, flexibility, and quality, etc. [3] The business strategy focuses on the overall logical flow of business in an organization, whereas supply chain strategy works as a connection between the business strategy and different functional strategies of the organization. List of strategies are displayed in table 1.

3.2 Strategic management in SCM

Strategic management in SCM is the wide-ranging collection of on-going activities and processes that organizations use to systematically coordinate, align with resources, a map with objective, mission, vision used in an organization. [1] As shown in the figure 2, starting from its current state of supply chain, it analyses the environment of the product in the supply chain. Based on the different scenarios,

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it evaluates parameterized impact of the current strategy. This impact considers resources and stakeholders for current strategy. As per the impact of previous step, it adjusts the current plan of action for implementation of the level. Strategic program is evaluated as per the process and its implementation. The final step is to finalize the operation of implementation as per its review, different perspective of supply chain and change in the strategy. [7] [27] [10] [23] [5] Table 1 describes different strategies present in the SCM.

3.3 Relating Strategies with different SCM modules

Based on the study of different modules, SCM can be related with different strategies. [24] Table 2 shows modules with respect to defined strategies at respective operational level. This table shows logical gap for finding impact of change in the different modules of SCM.
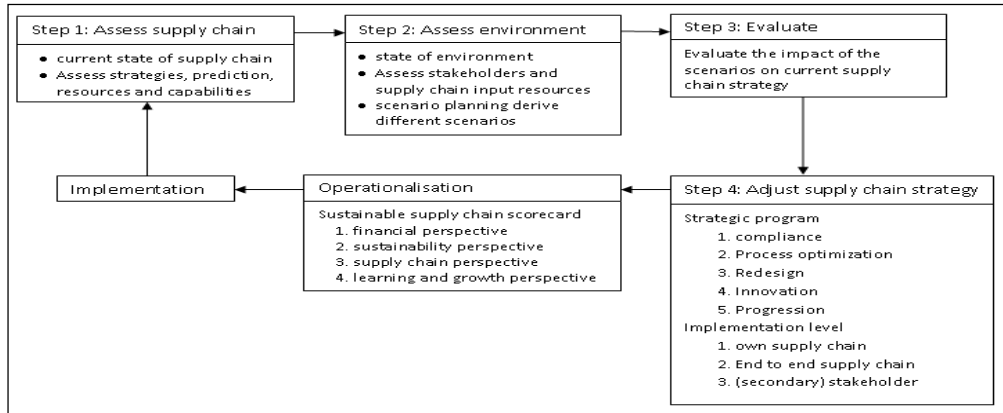

Figure 2: Steps to develop SCM strategies

Table 1: different strategy in SCM

Sr. No.	Name of the strategy	Description
1	Customer	It handles the customer segment based on interviews, feedback and their performance for different operation.
2	Organization	It defines the nature, direction and value system of an organization.
3	Value chain Business	It defines the integration of business design and business rule decisions in the value chain of SCM for Long-term business planning
4	Data	It defines policy for reliable data resources, data format, Data storage and data duplication.
5	Intelligence	It generates meaningful intelligence from data to turn into actionable process so that to improve business.
6	Analytics	It defines analytics as business, predictive, and prescriptive based on the developed product.
7	Competitive	It defines policies for competitors, Competitive environment and changes offered to have a competitive advantage.
8	Sustainability	It establishes strategic partnerships with suppliers and trading partners to set mutually beneficial goals and to share business processes and information.
9	Integration	It defines policy for the combination of a number of independent and dependent modules used in the system.
10	Social factors	It shows legal pressure, business policy, working style of organization in designing a working environment of SCM.

3.4 Application of SC

SCM is giving expected benefits of profitable growth, working-capital reductions, Fixed-capital efficiency, and Global tax minimization. Applications of SCM system are distribution, network optimization, Shipment consolidation, Cross docking, Supplier management, Supplier integration and much more.

4. Supply Chain Agility

4.1 Agile Development

Agility cannot be defined as just the ability to change, but it can be defined as a cultivated capability that supports an organization to respond to the changing environment in a timely, effective, and sustainable way. [26] Agility is also strategically relevant; they do not follow change for change's sake, but they pursue it for the sake of competitive advantage as well. The agile environment is unpredictable. [29] Increasing demand, change in usage, and change in raw material may create an agile development for organizations to work in agile behaviours. [2] As per the business domain, agile principles control agile development. [21] Agile development works on agility driver which are responsible for making changes in the business environment. Agile drivers motivate changes in the organizational strategy. Agile capablers are based on agile drivers provides the ability for generating patterns from a set of input and adapting changes in the business processes. Agile enablers are responsible for making the environment to get affected by another environment. [2] Agile rules can be defined based on the agile development which will state a way to change very quickly in the changing environment. [30] Agile product life cycle is very short and the time delay in response is also short. Uncertainty and complexity in usage of SCM parameter may increase external vulnerability of SCM. As external parameter vulnerability increases, supply chain agility should decrease to limit complexity and uncertainty. Increased agility can be achieved by applying the changes to a mixture of long and short term commitments. Adaptability might be defined as long-term agility.

Table 2: Mapping of SCM modules with strategy

Sr. No	Module	Strategy
1.	Production management	This handles value chain strategy for designing different product, mapping with business rules as per the organization's policy. Analytics strategy helps in production to take decision for business analytics, predictive analytics, and prescriptive analytics.
2	Inventory management	This handles all the strategy defined in the table 1, as it includes execution of all the modules of the SCM system.
3	Location Management	This handles customer, integration and analytics strategy related to inventory of transfer and storage of product giving impact with social factors.
4	Transportation management	This handles customer, organization, integration, competitive and analytics strategy related to inventory by transfer of product / services as per the location management.
5	Information Management	This handles data, intelligence, analytics and sustainability strategy for maintaining the information of product, stakeholders etc.
6	Requirement management	This handles sustainability, integration; value chain business strategy for checking requirement of the new product or up-gradation of the current product or services.
7	Quality management	This handles integration, data, analytics, social factors, integration and competitive strategy mapping with the quality of the services and products.
8	Customer management	This management handles customer coordination, their feedback. This also handles improvement in customer care.
9	Stock management	This handles integration, value chain, analytics, data strategy, and maintaining the stock of products.
10	Vender	This handles integration, data, customer, social factors, organization and

	management	Sustainability strategy for stakeholders of the organization.
11	Purchase Management	This handles integration, value chain business, competitive and intelligence strategy with inventory management.
12	Inventory accounting	This handles almost all strategy defined in table 1 for managing the services and product of the organization.
13	Contract management	This handles social factors and competitive strategy for different suppliers and customers.
14	Sales management	This handles integration, social factors, intelligence, analytics, and competitive strategy for managing sales of the product with its provided services.

4.2 Supply Chain Agility

The main objective of supply chain agility is to respond for changes in short-term or quickly demand. This is also to handle external disruptions smoothly. [11] The agile supply chain is highly market responsive. It has key characteristics as

1. Virtual integration checks for physical inventories as per extensive demand and supply information sharing among buyers and suppliers.
2. Deep process integration between the partner's shares, extensive demand information enables between buyers and suppliers.
3. The supply chain partners working together may create competing networks with their final customers. These competencies can be defined as agile or lean.
4. Growth in the niche market, increasing number of new products, its life and many markets changing situation may affect SCM development.
5. Rapidly changing markets, increasing costs, international competitiveness, and a short development time for new products may create a short agile development life cycle.
6. Change in the customer requirements or customization, increased expectations about quality and a minimum delivery time may develop operational gap.
7. New efficient production facilities, system integration, and introduction of new technology may affect the development of the product or services.
8. Environmental protection, workplace expectations, legal pressure and working style may create change in the development and usage of supply chain value.
9. Based on the changes, new integration of existing processes may affect the agile development of the organization.

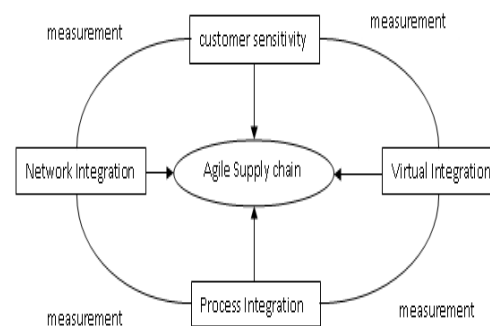Different levels in agile frameworks are explained the table 3.

Figure 3: SCM Agility Framework

Sr. No	Framework Level	Description of "agile" policies
1	Customer sensitivity	It emphasize on customer's requirement, markets and technology changes
2	Virtual integration	It handles instantaneous demand, interpretation, and response for integration of different modules in the SCM
3	Process integration	It work as self-management to maximize autonomy of the process and immediate response of output
4	Network integration	It emphasize on fluid clusters of network associates
5	Measurement	It gives broad-based measures that underpin capabilities

Table 3: Levels in agile framework

Shared information between supply chain stakeholders can be fully leveraged through SCM process integration. Agile supply chain carries inventory in standard semi-finished products. This

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helps for the strategy of postponement. To maintain greater agility in the organization, they should maintain prerequisites as a rational supply base. Supplier base should have a high level of shared information. Agility has barrier as that of the complexity of the process and extends their marketing reach. [9] Agility framework for SCM is shown in figure 3. Architectural levels are defined as per the agile policies in the table 3. This table shows each level affected by the change in requirement based on the organizational policies.

4.3 Agility and Leanness

Agility and Lean are two supply chain strategies. [3] Agility used to understand the flow of information for developing collaborative relationships with suppliers and customers; Agility helps in designing plans of action in case of rescheduling. [18] Leanness implies a concept of zero inventories with the just-in-time approach. Leanness will not enable the organization to meet the actual needs of the customer. [16] Agility & leanness work best in certain contexts as suggested in Table 4.

Attributes	Lean Supply	Agile Supply
Marketplace Demand	Predictable	Volatile
Product Variety	Low	High
Product Life Cycle	Long	Short
Customer Drivers	Cost	Availability
Profit Margin	Low	High
Dominant Costs	Physical Costs	Marketability
Information Enrichment	Highly Desirable	Obligatory
Forecasting	Algorithmic	Consultative
Social factors	Low	High
Integration	Dependent	Maybe independent
Collaboration with other organization	High	Low

Table 4: Comparison of Lean Supply and Agile Supply

4.4 Agile pattern for SCM

The agile supply chain is greatly linked to manufacturing and logistics postponement strategies, Agility pattern can be defined in different types. [11] Horizontal pattern, market demand fluctuates around a constant mean based on the level of demand. This mean does not heavily increase or decrease over a long time-period, but it keeps continuously changing in a shorter time horizon. In the seasonal pattern, requirement keeps on changing based on the pattern of customer usage. This demand will have peaks and valleys over a fixed time period. In Cyclical demand pattern, gradual increase and decrease over the extended periods of time shows the evaluation of changes given as per the customer. In random demand pattern, certain market demand is not possible to forecast.

4.5 Agile parameter affecting SCM

As specified in SCM working, a number of internal parameters of SCM system may get affected due to agile development. [6] Supply chain component may be broken down into the basic segments such as sourcing, manufacturing, and delivery. This component may work as inbound and outbound logistics of the supply chain. As per the ISO – 9000, a number of parameters are available, but out of it, listed parameter in this paper can be more suitable for SCM-based agility evaluation [18]. As defined in the agile concept, parameter needs to be differentiated as agile enablers (E), agile capability (C), and agile drivers (D). As per the scope, the different parameter will work with different domain shown in different modules which are listed below. This parameter helps to find working of the system as agile in expected or in an unexpected environment.

1. Strategy (E): Partnership strategy helps suppliers to exchange the information and to ensure the safety of the supply using flexible contracts.
2. Capacity (D): Change in the required information is to upgrade or downgrade requirement affecting the productivity of the product system
3. Customization (D): this is the value-adding content of the products as per new requirement from stakeholders or resources.
4. Speed (C): This shows carrying out activities in the shortest possible time for developed product/service i.e. delivery time
5. Responsiveness (C): It gives Sensitiveness to exhibit output response time
6. Productivity (D): It shows activities which work efficiently if changes occur and output is effective.

7. Flexibility (C): It allows accommodation of expected and unexpected changes by activities
8. Interoperability (E): It shows dependencies among different modules measured using interoperability.
9. Integration (E): It shows collaboration of flow of material, communication, & information affecting interaction between processes, products, and suppliers.
10. Visibility (D): It gives information accessibility from another modules
11. Self-organizing (E): Flow of module is organized on their own with changing conditions
12. Modularity(C): It allows changes to affect the modular structure of the process.

13. Scalability (C): Processes are able to scale themselves when applied to change in the production
14. Robustness (E): Modules are able to withstand in any worst condition.

As defined for SCM, a different strategy may face with a number of agile parameters in agile development. Finding the relation between strategies with working modules may helps to take a decision facing similar type of problem. Table 4 shows the same listed agile parameter affecting number of strategies. SCM scenario can have the effect on the same or different agile parameter.

4.6 SCM strategy with agile parameter

Table 4: mapping agile parameter with strategy level.

Sr. No	Name of strategy	Affecting agile parameter
1	Customer	Self- organizing, customization, interoperability, Strategy
2	Organization	Self-organizing, customization, interoperability, Strategy, productivity, modularity
3	Value chain Business	Interoperability, speed, integration, scalability, flexibility, responsiveness, productivity
4	Data	Speed, modularity, integration
5	Intelligence	Strategy, self-organizing, robustness
6	Analytics	Integration, interoperability
7	Competitive	Speed, responsiveness, productivity, customization
8	Sustainability	Interoperability, flexibility, modularity, customization
9	Integration	Integration, interoperability, strategy, modularity
10	Social factors	Strategy, customization

4.7 Decision making using Agile parameter at different strategic level

Agile parameter and strategy mapping help to understand SCM modules in an agile environment. Depending on the strategy, respective modules are evaluated for performance gap. This gap needs to be analyzed from traditional approaches to agile approaches. Strategy is modified as per the goal or mission of the business policy of the organization. As a result, it is easy to find the interoperability in the different strategies. A decision like adapting the changes or declining the changes depends on the type of parameter. The agile parameter can work as enablers, capabler, or drivers where decision depends on strategies changing.

4.8 SCM based ABC Company

ABC Company is handling Swatch Management System (SMS) based on Supply chain management. This system evaluation is done to understand the working of different modules depending on each other. Swatch is the fashionable design material, which can be used by the client on cloth, shoes, purse, etc. This swatch can be used considering current fashion, season or as per client requirement. The client may ask swatch for the view, ask for a quotation, or place an order for the swatch. The client places an order for the swatch based on the season, trend and requirement. This enterprise solution handles inventory system related to swatch. Master table entry for SMS is based on the swatch operations like view swatch, a quotation for the swatch, and order for the swatch. SMS also handles operation like managing client, quality information for maintaining swatch. The swatch

view process used to send an email to the client for his order. This system generates PDF for swatch order aligning images of selected swatch. The solution allows sending this PDF as an attachment to the client. SMS stores master data of client, suppliers, merchandiser and product. The working of the system is as shown in figure 4. Table 5 shows different modules from SCM which is mapped with different strategies as per modules and hence with the agile parameters. This parameter helps to make system built in an agile environment. SCM can be aligned with agility related to stakeholders, products, processes. Measuring agility helps to take decision for handling the process.
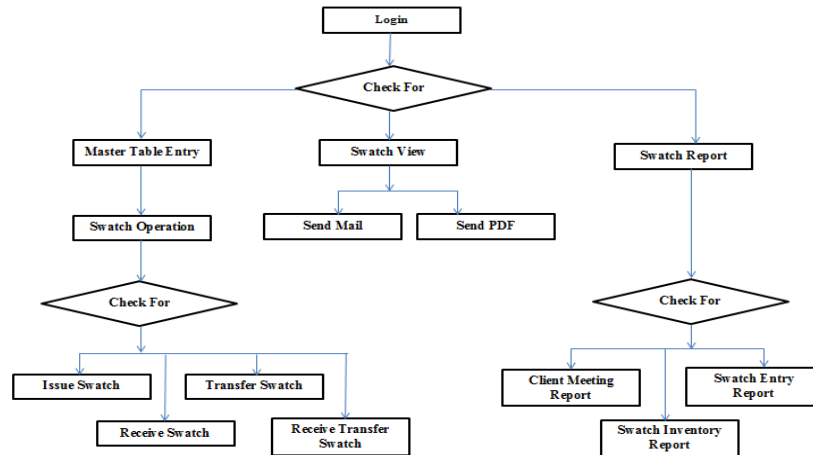
Figure 4: working of Swatch Management System

Table 5: Mapping of SCM modules with strategy

Sr. No	Name of the Module	Strategy	Agile Parameter
1.	Production management	value chain business, Analytics	Capacity, Speed, Responsiveness, Productivity, Flexibility, Interoperability, Integration, Visibility, Scalability, Robustness
2	Inventory management	all the strategy	Visibility, Capacity, Integration Customization, Speed, Responsiveness, Productivity, Modularity, Flexibility, Interoperability, Scalability, Robustness
3	Location Management	Customer, Integration, analytics, social factors.	Capacity, Customization, Responsiveness, Flexibility, Visibility, Self-organizing, Scalability, Robustness
4	Transportation management	Customer, Analytics Integration, Competitive	Strategy, Flexibility, Capacity, Customization, Speed, Responsiveness, Scalability, Interoperability, Modularity
5	Information Management	Data, Sustainability Intelligence, Analytics,	Strategy, Scalability, Customization, Responsiveness, Productivity, Interoperability, Integration, Visibility, Self-organizing, Modularity
6	Requirement management	Sustainability, Integration, value chain business	Strategy, Customization, Responsiveness Productivity, Flexibility, Interoperability, Integration, Visibility, Modularity, Scalability
7	Quality management	Integration, Data, Analytics, Social factors, Competitive	Strategy, Integration, Customization, Productivity, Flexibility, Interoperability, Visibility, Self-organizing, Robustness
8	Customer management	Customer	Strategy, Customization, Responsiveness, Flexibility, Interoperability, Integration, Visibility, Self-organizing, Modularity, Scalability
9	Stock management	Integration, Value chain business, Analytics, Data	Capacity, Customization, Speed, Responsiveness, Productivity, Flexibility, Interoperability, Integration
10	Vender management	Integration, Data, Customer, Social factors, Organization,	Strategy, Customization, Responsiveness, Flexibility, Interoperability, Visibility, Self-organizing, Modularity, Scalability, Robustness

		Sustainability	
11	Purchase Management	Integration, Value chain, Competitive, business Intelligence	Strategy, Visibility, Capacity, Speed, Responsiveness, Interoperability, Scalability
12	Inventory accounting	all strategy	Strategy, Visibility, Capacity, Customization, Speed, Responsiveness, Scalability, Productivity, Flexibility, Interoperability, Modularity, Integration, Self-organizing, Robustness
13	Contract management	Social factors, Competitive	Strategy, Capacity, Customization, Visibility, Self-organizing, Modularity
14	Sales management	Integration, Social factors, Intelligence, Analytics, Competitive	Capacity, Customization, Speed, Responsiveness, Productivity, Integration, Visibility, Self-organizing, Modularity, Scalability, Robustness

The outcome of this case study shows a simple SCM giving more volatile modules as per quality management, production management, and sales management. Hence this organization needs to check for the parameter as customization, productivity, Integration, Modularity, Scalability, and Robustness.

5. Conclusion

SCM domain is more prone to changes in the different modules. Classification of agility as an enabler, capabler, developer makes changes in stages such as evolving stage, maturing stage or maintaining stage. Hence mapping agility parameter with SCM strategy makes expert to think about handling changes in the extreme condition. Agility should not be confused with leanness. Agility may impact on the list of the parameters affecting agile environment. This paper gives detail study of the SCM structure showing dependency among different modules. This paper shows mapping for a real-time case study. A number of parameters show most affective modules which need to be taken care in changes. The traditional study approach may not help to be stable in the agile environment as that of agile study approach. Identification of more parameters may further researched for a method to measure the agility.

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