

DIGITAL TRANSFORMATION OF AN INDUSTRIAL SYSTEM CONSIDERING CUSTOMER SATISFACTION

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1. ABSTRACT:

Business is undergoing a major paradigm shift, moving from traditional management into a world of agile organizations and processes. An agile corporation should be able to rapidly respond to market changes. In a bid to cope with market instability, companies now look beyond cost advantage speed, quality and flexibility are being emphasized as means of responding to the unique needs of customer and market.

This study addresses the problems and challenges faced in digitization and develop a model for initializing digital transformation in enterprises and “How digital transformation of an industry can be carried out using collaborative information system to fulfill customer requirements. And also to measure the digital maturity of organization through product lifecycle management (PLM)”.

The research framework and analysis is described in detail The importance of Digital Transformation and what are the digital barriers. To measure the maturity of an organization two maturity models are described and four strategic models to achieve digital transformation are presented. In which two are management models which linearize relationships, one is radical change model and last one is the Initialization Model. The Initialization Model is based on a continuous improvement cycle, and also includes triggers for innovative and digital thinking within the enterprises. In second time, the collaborative information system and an agent based modular approach for product development is described. We explain also about supply chain and supply chain models that which type of model is useful for which industry. Then a global model is explained which is applicable for almost all types of industries.

This study explains that according to today’s environment, customer satisfaction had become a central concern for all enterprises. User experience (UX) can be defined as follows: —person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service. [2]

This study is focusing on finding Global Model of Supply Chain using collaborative information system considering user experience to improve customer satisfaction.

KEYWORDS: *Digital Transformation, Digital Maturity Models, Interactive Strategy Design, Supply Chain, Customer satisfaction, User Experience, Collaborative Information System.*

2.PROJECT CONTENT :

2.2 Context:

The project supervised by the contract consists for the laboratory in an analysis of state of art to determine approaches, models and strategies published in the theme of support to innovation. The state of art and its analysis focus on the following keywords-

Digital Transformation, Digital Maturity Model, Interactive Strategy Design, Supply Chain, Customer Satisfaction, User Experience, Collaborative Information System.

2.3 Research Methodology:

For our research work, we have collected data from several research articles available on Science Direct, Researchgate, GoogleScholar and various scientific blogs. This research is a collaborative work conducted by two candidates Miss Divya Thakurani and Mr. Ashish Kumar. Divya has worked on three keywords named as Digital Transformation, digital Maturity Model, Interaction Strategy Design and Ashish has worked on Supply Chain, Customer Satisfaction, User Experience. We use Collaborative information System to link our research work.

3. RESEARCH FRAMEWORK AND ANALYSIS:

3.1 Digital Transformation:

The realignment of or new investment in technology, business models, and processes to drive new value for customers and employees to effectively compete are in an ever-changing digital economy [6].

It can also be defined as the application of digital capabilities to processes, products, and assets to improve efficiency, enhance customer value, manage risk, and uncover new monetization opportunities [6].

The importance of digital transformation manifests in 3 points:

1. Proactive customer orientation- Customers today no longer only expect companies to respond to their expressed demands, but implicitly expect companies to anticipate and address their future needs before they themselves have realized them.

2. Changing customer behavior - Not only are customers less forgiving of mistakes and less loyal to a single company, they are also more informed, communicate more with other customers and are forming ever higher expectations regarding digital service provision that spans across all channels and industries.

3. Tougher competition -To add to the increased demands from customers, companies are facing ever tougher competition due to globalization [7].

Digital barriers:

Although most companies have realised the need to digitise, various challenges are inhibiting them from starting or benefitting from digital transformation these challenges are:

1. Insufficient IT structures.
2. Lack of technical skills.
3. Inadequate business processes.
4. High implementation risks and costs.
5. People's unwillingness to change [7].

3.2 Digital maturity of an organization

We found two maturity models for digital transformation which depict the multifaceted Depth of digitization:

1. Maturity model by Azhari et al.
2. Product lifecycle management (PLM) maturity model.(only one model is described)

Maturity model by Azhari et al.-

The maturity model, as shown in Fig.2, consists of 8 dimensions of digitization, namely strategy, leadership, products, operations, culture, people, governance and technology. These dimensions can be fulfilled to varying extents. Five levels of digital maturity are defined according to which companies can classify themselves:

1. **Unaware:** Companies in which there is no strategy for digital transformation, nor are there any digital competencies available. These companies do not yet offer any digital products or services, and are missing an overall organizational awareness for the need of digital transformation
2. **Conceptual:** Those which offer a few digital products, but are still without a digital strategy.
3. **Defined:** A culture of digital thinking is taking root in the company. The profitability of these partial strategies and the effects of the pilot implementations are assessed and used to develop an overall digital strategy.
4. **Integrated:** Where a clear digital strategy is developed.
5. **Transformed:** When this strategy has been implemented across all products and business processes [7].

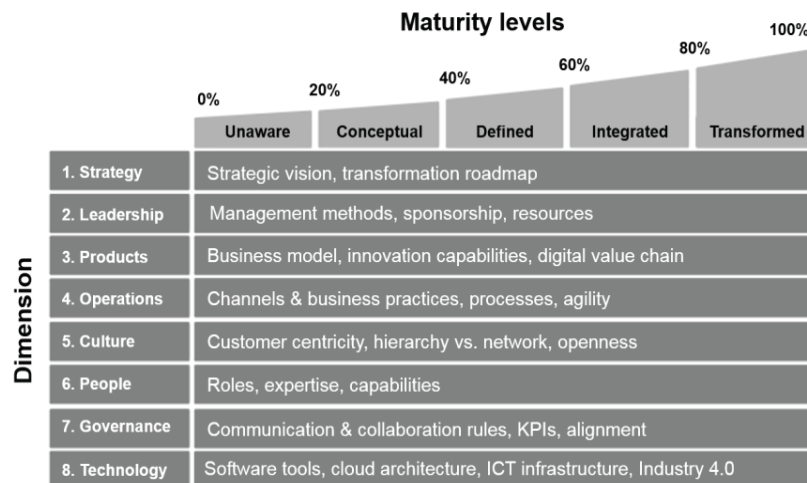


Figure 1: Digital maturity of an organization [7]

Whilst the maturity model provides a good way for companies to classify themselves into a category of digital maturity, it provides no guidance for increasing the maturity level.

Whilst literature fails to provide a defined method for becoming digital, experts are in agreement that digitization is not just about technologies, but rather that it requires a radical strategic and cultural change from within the company. Companies could therefore look towards strategic management models for a transformation method for digitisation. In section 4.3 strategic management models are described.

3.3 Strategic models

Many strategic planning and management models exist in the fields of process management and business planning which help companies manage business strategies and which could prove useful for digitization. Since digitization requires radical changes not only in terms of strategy, but also in terms of culture within the company, another branch of management models, namely radical change models, may also be considered for digital transformation, [7].

Management models

1. The Balanced Scorecard (BSC) Framework

Possibly one of the most well-known models for strategic planning and management is the Balanced Scorecard. The Balanced Scorecard is used to provide management with a quick, but thorough overview of the company's performance on a strategic level. From the balanced scorecard (BSC) framework, which encourages the use of both financial and non-financial measures of performance, allowing the firm to pinpoint its strategic objectives via balancing four perspectives to measure firm performance:

1. Financial 2. Customers 3. Internal business processes 4. Learning and growth

The effectiveness of the balanced scorecard is based on its capability to translate a firm's mission and strategy into a comprehensive set of performance measures (Kaplan and Norton, 1992; [18] Kaplan and Norton, 1996b) [19]

The balanced scorecard approach involves identifying the key components of operations, setting goals for them, and then exploring ways to measure progress toward achieving those goals. Taken together, the measures provide a holistic view of what is happening both inside and outside the firm or operational level, thus allowing each constituent of the firm to see how their activities contribute to attainment of the firm's overall mission [8].

Concluding remarks

Kaplan and Norton provide a very useful generic model in the form of their balanced business scorecard. As seen in a case study, the culture within the firm has to be of prime consideration in the construction of every case. Visual presentation of the model is crucial, as most employees will relate to a visual presentation far more readily than to text or tables or other forms of presentation Using the BSC as a measurement system allows all strategic business units and work groups to focus on the critical drivers of future success for them. This in turn contributes to the achievement of overall corporate objectives [8].

2. The Initialization Model:

Although companies are unclear about where to begin their digital transformation, "the focus of any transformation effort should be on the efficiency and effectiveness of the bottom line, which always connects to the customer". Digitization should therefore always be focused on improving customer (both internal and external) experiences.

This model developed built up as a continuous improvement change process, with built in triggers of innovation to be iteratively executed until digital and innovative thinking is embedded within the company culture, Fig.(6).

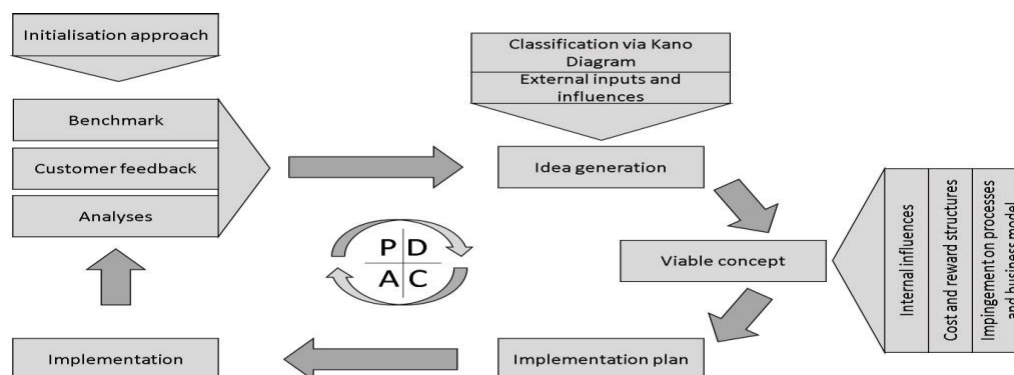


Figure 2: Conceptual model for initializing digitization and sustaining competitiveness [7]

The following guidelines provided for the triggering phase of innovation in an unsteady state were used in the development of the initialization model:

- Use multiple and alternative perspectives.

- Seek out potential new technologies;
- Tune in to distant market signals to detect trends early on;
- Generate ideas together with external perspectives; and
- Emphasize experimentation.

These points are used as guidelines to design the model for initializing digitization shown in Fig 6. The model was developed as a PDCA (Plan Do Check Act) Deming Cycle, in which iterative implementations will assist the company in developing a digital strategy and inducing a culture of change and digital thinking within the company[7].

Step in the models execution:

Step 1.

Define the initialization approach according to the specific industry i.e. whether to start with operational processes, the business model or the customer contact points. In the following step-

Analysis-multiple analyses are conducted. These include not only a customer analysis, market analysis and competitor analysis, but also an analysis of other branches. Analyzing other branches is vital, since one of the new customer behavior patterns caused by digitization is that they expect digital services they have experienced in one industry in every other industry as well.

Customer feedback - Since customer experience is the focal point of digitization and therefore the model, conducting a VOC (Voice of the Customer) is crucial.

Benchmark – This can allow a company to quickly orientate itself according to competitors, and determine how far behind or ahead they are in various aspects, and thereby identify areas where improvement is highly overdue.. Benchmarking on a regular basis will not only allow companies to identify their digitization level in relation to competitors, but may also spur innovation forward. Assessing one self and best practices may lead to the identification of areas in which no one has succeeded and may, with experience, lead to the generation of innovative ideas.

Step 2. The idea generation -

External inputs and influences- Customers are not only valuable in the form of the feedback they give, but they could even have innovative ideas themselves. Such open innovation instances, i.e. collecting ideas from the external environment, can often add a refreshing and innovative outlook as opposed to that of the company and its employees. Other external influences which may influence the viability of ideas include factors such as legal restrictions.

Classification via Kano diagram - All ideas generated are then classified according to a model such as the Kano Diagram. Since customer experience is the central point, such a classification helps analyze the impact of an idea on customer satisfaction, and is a very good way of understanding the VOC. In the Kano model, ideas are classified into “must-haves” (things expected by the customer which, if not fulfilled, result in customer dissatisfaction), “one-dimensional” ideas (which have a linear relationship with customer satisfaction), and “attractive attributes” (unexpected add-ons which drastically increase customer satisfaction) .

Step 3 Viable concept –

After each idea from the idea pool is rated in terms of costs and rewards of

implementation, as well as the influences it may have on the current business model and processes of the company; internal influences such as budget, available resources and overall company vision are used to prioritise and select ideas for implementation.

In further iterations of the model, customer feedback is used for new inputs, and the benchmark as a relative measure. The company in question can assess how quickly or slowly they have progressed in their digital transformation in relation to their competitors. This again feeds back as an input: If all competitors are improving at a faster rate, the company in question needs to increase the rate of change, and if they are moving at a faster rate in comparison to competitors, they may choose to continue at this pace in the hope of overtaking competitors, or slow down and release some resources for other company tasks [7].

In the above section, the development of a model to initialise digital transformation was described. The model is by no means a roadmap to complete digitisation, but instead offers companies who have no clear digital strategy or vision, with a starting point and procedure to converge to a point where a digital strategy and vision can be formulated.

3.4 Collaboration information system

These systems aim to improve the way in which information is gathered, managed, distributed, and presented to people in key business functions and operations. Intelligent agents software components and/or hardware those are capable of acting exactly to accomplish tasks on behalf of its user and learn as they react and/or interact with their external environment (Nwana 1996).[20] Agent applications include personal information management, electronic commerce, business process management, message software, development tools, information management and retrieval, user interface, process control, workflow management, and network management (Jennings & Wooldridge, 1996).[21]

An Agent based modular approach (for product development)

In this products are built using standard modules by intelligent agents. This approach promises the benefits of high volume production, while at the same time, being able to produce a high variety of products that are customized for individual customers through distributed systems.

A modular product development is one in which the input and output relationships between components, that is, the component interfaces, in a product have been fully specified and standardized.

Modular products refer to products, assemblies and components that fulfill various functions through the combination of distinct modules (Pahl & Beitz, 1988).[22]

Modules refer to components whose functional, spatial, and other interface characteristics fall within the range of variations allowed by the specified standardized interfaces of a modular product development. The modular development of the products may lead to a large number of different products by creating distinct combinations of modules and components, thereby providing each product with distinctive functionality, features, and performance levels (Von Hippel, 1988; Sanchez & Ron, 1996). [23][24]

Modularity in a product development permits the processes of developing components for that design to be partitioned into tasks.

Thus, modular product development can lead to an important form of strategic flexibility (Sanchez & Sudharshan, 1993)[25], i.e., flexible product designs that allow a company to respond to changing markets and technologies by rapidly and inexpensively creating product variants derived from different combinations of existing or new modules[2].

Intelligent Collaborative Agent (ICA) system

In the ICA system, each ICA is able to perform one or more services (Fig.7). A service corresponds to some problem-solving activities of module combination. The simplest service (called a module combination job) represents a problem-solving atomic activity

endeavor in the ICA system, e.g., combining two modules into a higher level module. These atomic activities can be combined to form complex services. The nesting of services can be arbitrarily complex and at the topmost level the entire business process ultimately can be viewed as a service. Service requirements are issued either from other departments, e.g., market teams through an Intranet, or from external customers through the Internet. Services are associated with one or more agents that are responsible for the management and execution of those services. Each service is managed by one agent, although the execution of its sub-services may involve a number of other agents. Since agents are autonomous, there are no control dependencies between them. Therefore, if an agent requires a service, which is managed by another agent, it cannot simply instruct that agent to start the service. Rather, the agents must come to a mutually acceptable agreement about the terms and conditions under which the desired service will be performed. The mechanism for making agreements is negotiation—a joint decision-making process in which the parties verbalize their (possibly contradictory) demands and then move towards an agreement by a process of concession or search for new alternatives[2].

Architecture of an ICA

The activities of the agents involve the following:

- Selecting modules to satisfy the requirements of customers.
- Combining the modules into an integrated service.
- Coordinating and scheduling the processes intelligently[2].

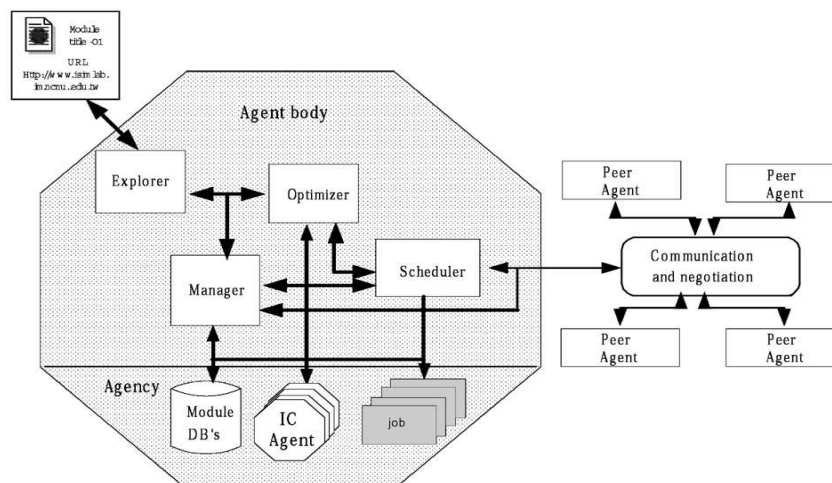


Figure 3: The ICA architecture (adopted from Jennings et al.) [2]

3.5 Supply Chain

Supply Chain: A sequence of organization –their facilities, functions and activities –that are involved in producing and delivering a product or service.

Supply Chain Management: The strategic coordination of the supply chain for the purpose of integrating supply and demand management [9].

Supply Chain Models

1. SCOR(Supply-Chain-Operation-Reference) Model

One common and very effective model is the Supply Chain Operations Reference (SCOR) model, developed by the Supply Chain Council to enable managers to address, improve and communicate supply chain management practices effectively.[10]. The

SCOR model runs through five supply chain stages: Plan, Source, Make, Deliver, and Return.

Stage 1. Plan

Planning involves a wide range of activities. Companies must first decide on their operations strategy. Whether to manufacture a product or component or buy it from a supplier is a major decision. “ Companies must weigh the benefits and disadvantages of different options presented by international supply chains”.

Stage 2. Source

This aspect of supply chain management involves organizing the procurement of raw materials and components. Procurement is the acquisition of goods and services at the best possible price, in the right quantity and at the right time.[10].

Stage 3. Make

This stage is concerned with scheduling of production activities, testing of products, packing and release. Companies must also manage rules for performance, data that must be stored, facilities and regulatory compliance[10].

Stage 4. Deliver

The delivery stage encompasses all the steps from processing customer inquiries to selecting distribution strategies and transportation options. Companies must also manage warehousing and inventory or pay for a service provider to manage these tasks for them. The delivery stage includes any trial period or warranty period, customers or retail sites must be invoiced and payments received, and companies must manage import and export requirements for the finished product[10].

Stage 5. Return

Return is associated with managing all returns of defective products, including identifying the product condition, authorizing returns, scheduling product shipments, replacing defective products and providing refunds. Returns also include “end-of-life” products (those that are in the end of their product lifetime and a vendor will no longer be marketing, selling, or promoting a particular product and may also be limiting or ending support for the product). Companies must establish rules for the following: Product returns Monitoring performance and costs Managing inventory of return product [10].

2. Michael Porter Model

Primary activities

- Operations: concerned with managing the process that converts inputs (in the forms of raw materials, labor, and energy) into outputs (in the form of goods and/or services).
- Outbound Logistics: is the process related to the storage and movement of the final product and the related information flows from the end of the production line to the end user.
- Marketing and Sales: selling a product or service and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large.
- Service: includes all the activities required to keep the product/service working effectively for the buyer after it is sold and delivered, [11] Fig.(8).

Support activities

- Infrastructure: These are a company's support systems, and the functions that allow it to maintain daily operations. Accounting, legal, administrative, and general

management are examples of necessary infrastructure that businesses can use to their advantage.

- Technological Development: It pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.
- Human Resources Management: It consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.
- Procurement: the acquisition of goods, services or works from an outside external source [11].

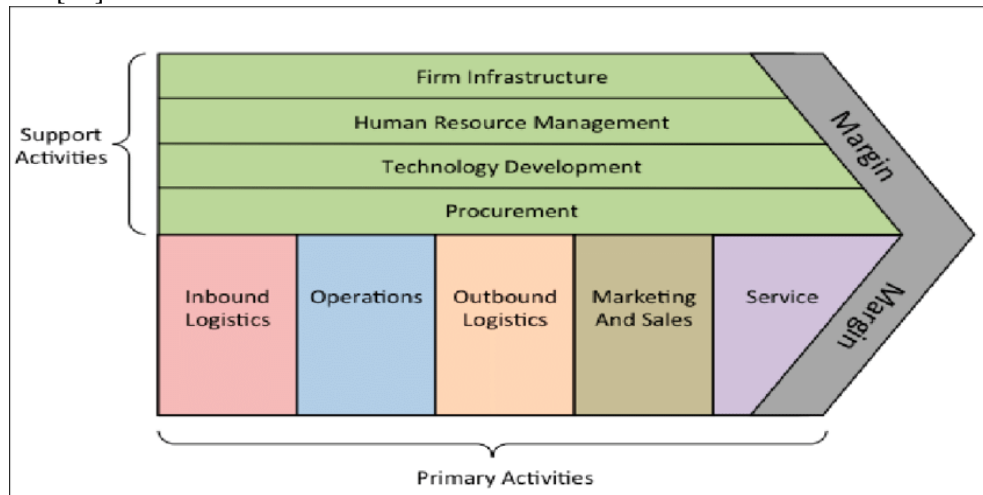


Figure 4:Michael Porter Model [11]

2. Global Model for Supply Chain

The first objective of this study is to identify the list of Sustainable Supply Chain Process (SSCPs) from supply chain management literature. Content analysis is used to extract relevant material from the literature that uses supply chain process for improving the sustainability performance along the supply chain. Although notable SSCPs can be identified from the literature, the fact remains that different stakeholders (or firms) may have different preferences about SSCPsuses concerning importance of resource deployment to improve the tripe bottom line(3BL) performance of their supply chain.

Hence, the second objective of this study is to prepare a shortlist of important SSCPs based on stakeholder preferences, resource deployment, and their3BL performance and to identify the industries that operate through these SSCPs.

The methods used are a semi-structured interview and the analysis of stakeholders' responses by means of a regression analysis where the SSCP performance is used as the dependent variable, stakeholder preference is used as the independent variable, and firm resource deployment is used as a moderator. Industries are identified based on significant resource deployment. Considering, the use of a SSCP may have different impact on different industries and consequently hold a specific importance for an industry. Thus, a set of feasible SSCPs need to be ranked to manage their uses in different industries[13].

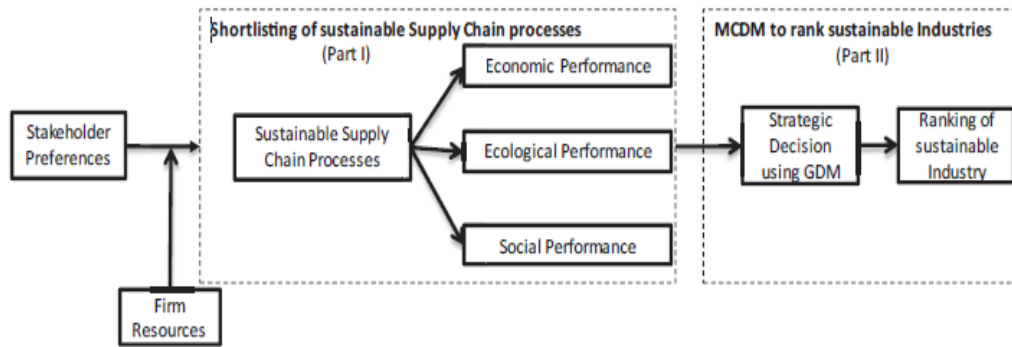


Figure 5: Framework of Global Model [13]

Table 1. Objective and theoretical perspective of SSCPs. [13]

SSCP	Sustainable Supply Chain Processes	Process Objective	Theoretical View
1.	Sustainable Design and Development of Green Products (SSCP 1)	Design and development of green products primarily from ecological and economic benefits perspective	RBV
2.	Sustainable Product Development and Commercialization (SSCP2)	Conceptualizing the product design from user utility with 3BL performance measure criteria.	RBV and Stakeholder Theory
3.	Sustainable Product Returns and Recycling (SSCP 3)	Design of Effective end of life product utility through reuse, remanufacturing, recycling etc. and developing effective return methods to enhance the availability of virgin raw material for longer time	RBV and Stakeholder Theory
4.	Sustainable Demand Management (SSCP 4)	Demand management using appropriate marketing tools to synchronize with supply (issues like inventory, supplier selection etc.) in SC to improve 3BL performance	Stakeholder Theory
5.	Sustainable Customer Relationship Management (SSCP 5)	Understanding customer needs including social issues of products/services and communicating to groups responsible for design in the SC.	Stakeholder Theory
6.	Sustainable Sourcing and Procurement (SSCP 6)	Framing appropriate guidelines for identifying appropriate suppliers and corresponding procurement policies/principles to improve the sustainability measures in SSC	RBV
7.	Sustainable Supplier Collaboration and Ethical practice (SSCP7)	Collaborating with suppliers to improve their 3BL performance measures leading to SSC improvements	RBV and Stakeholder Theory

8.	Sustainable Manufacturing Flow Management (SSCP 8)	Indicating manufacturing operations using tools/techniques to reduce wastage and enhancing sustainability at various value adding activities in SSC.	RBV
9.	Sustainable Use of Environment Friendly Technologies (SSCP 9)	Identifies ecological friendly/sustainable technologies in various operational processes to improve 3BL performance measures	RBV and Stakeholder Theory
10.	Sustainable Logistics(SSCP 10)	Providing Design-For-Logistics product and appropriate logistics network and distribution strategies to improve sustainability practices in SSC	RBV
11.	Sustainable Order Fulfillment(SSCP 11)	Development of strategies and processes to reduce customers' lead time and improve customers' order fill rate	Stakeholder Theory
12.	Sustainable Green Warehousing (SSCP12)	Enhancing warehousing practice, e.g., eco packaging, reduced inventory, facilitate use of renewable energy, helps in efficient utilization of space with green and sustainable warehousing practices.	RBV and Stakeholder Theory
13.	Sustainable Customer Service Management(SSCP 13)	Development of strategies with sustainability aspects leading to improved customer sales/after sales service	Stakeholder Theory
14.	Periodic Evaluation of Supply Chains'Environmental Performance(SSCP 14)	Evaluating the ecological performance and risk associated across various processes such as quality, audit of operational processes, emission issues, waste management practices etc.	RBV and Stakeholder Theory
15.	Sustainable Waste Management (SSCP 15)	Planning effective waste management strategies of converting waste to valuable resources through public private partnership model, waste recycling etc.	RBV and Stakeholder Theory
16.	Carbon Trading and Antipollution Policy (SSCP 16)	Proposing steps/policies to reduce emissions through technological innovation in lieu of economic incentives through carbon credits and its trading in markets.	RBV
17.	Less Impactful Emission(SSCP 17)	Designing mitigation plans for socio ecological catastrophes, regulatory action. Additionally, understands link between materials and land management and green gas emissions etc.	RBV and Stakeholder Theory

Table 2. Classification of SSCPs and application of MCDM methods. [13]

SSCP	Sustainable Supply Chain Processes	MCDM methods used	Industry/ Case
1.	Sustainable Design and Development of Green Products (SSCP 1)	AHP /SUAR models based on ANN and Genetic Algorithm	Construction industry Furniture manufacturer
2.	Sustainable Product Development and Commercialization (SSCP2)	AHP / AHP with TOPSIS/ SAFT with Fuzzy AHP and Shammon's entropy formula	Indian Plastics manufacturer Hydrogen production Aircraft End-of-Life Recycling
3.	Sustainable Product Returns and Recycling (SSCP 3)	Fuzzy AHP with VIKOR Mix of MCDM tools	Electronics company in India
4.	Sustainable Demand Management (SSCP 4)	AHP Linear weighted multi-objective programming	Computer manufacturer in Taiwan
5.	Sustainable Customer Relationship Management(SSCP 5)	Mix of MCDM tools	Hypothetical Example
6.	Sustainable Sourcing and Procurement (SSCP 6)	FST (capturing linguistic preference), Fuzzy TOPSIS	Hypothetical Example
7.	Sustainable Supplier Collaboration and Ethical practice (SSCP7)	Fuzzy AHP with VIKOR	Electronics company in India
8.	Sustainable Manufacturing Flow Management (SSCP 8)	AHP	Manufacturing SMEs
9.	Sustainable Use of Environment Friendly Technologies (SSCP 9)	AHP	Energy sector in Iran
10.	Sustainable Logistics (SSCP 10)	ELECTRA III/IV	Logistics industry in Poland
11.	Sustainable Order Fulfillment(SSCP 11)	Fuzzy multi objective Optimization	Scheduling in German hospitals
12.	Sustainable Green Warehousing (SSCP12)	ELECTRA III/IV	Logistics industry in Poland
13.	Sustainable Customer Service Management	Fuzzy AHP and fuzzy	Sustainability practices in Indian

	(SSCP 13)	TOPSIS	banking services
14.	Periodic Evaluation of Supply Chains Environmental Performance(SSCP 14)	FST, VIKOR ,Fuzzy VIKOR FST, ANP and DEMATEL	Laptop manufacturer in Malaysia Health care services provider
15.	Sustainable Waste Management (SSCP 15)	Interpretive Structural Modeling (ISM), fuzzy AHP, fuzzy TOPSIS	Healthcare in India
16.	Carbon Trading and Antipollution Policy (SSCP 16)	Zero One Goal Programming (ZOGP)	Public transport infrastructure in Taiwan
17.	Less Impactful Emission(SSCP 17)	ELECTRA	Energy sector in Chile, China, Israel, Kenya and Thailand

3.6 Customer Satisfaction

Customer:

The customer is who the organization is willing to affect his behavior by the values that are created.

Customer Satisfaction:

Customer satisfaction is defined as customer's feelings or attitude towards a product or service after use. Customer satisfaction leads to the increase of income and profits through repeat purchase, the purchase of new goods and the purchase of goods by customers who have been encouraged by satisfied customer[14].

Recent Measure Model Of Customer Satisfaction:

1.CSAT Scores:

CSAT is a broad term that describes many different types of customer service survey questions. The goal of any CSAT score is to measure a customer's satisfaction level with company's product, service or interaction. CSAT score is often determined by asking customers a single question, a set of queries, or a long survey to access their experiences, for example:

Q: How would you describe your overall satisfaction with this product?

1.Very dissatisfied 2.Somewhat dissatisfied 3.Neither satisfied nor dissatisfied

4.Somewhat satisfied 5.Very satisfied

Measurement: The answers are quantified, then expressed as a percentage between 0 and 100%. A high percentage indicates that your customers are highly satisfied.

Pros: CSAT's best asset is versatility because it allows you to ask customers a variety of questions. CSAT score allows for the most customized survey questions, so you can delve into different strengths and weaknesses, which lets you focus on finding the best ways to meet your customers' needs.

Cons: This method doesn't take into account that people who are either somewhat dissatisfied or somewhat satisfied are unlikely to complete surveys, which is known

to skew results. The CSAT is the weakest predictor of future behavior because it often limits its scope to a single interaction. The CSAT score is also a poor predictor of any type of loyalty; although a low CSAT score can predict attrition, but a high CSAT doesn't accurately predict repeat business[15].

2.Net Promoter Score (NPS)

The NPS score, has garnered a lot of attention lately as the go-to customer satisfaction metric. At its core, NPS embodies the fundamental idea that all of a company's customers fall into one of three categories: promoters, passives, or detractors. Promoters are dedicated, repeat customers who enthusiastically recommend your products or services to others. Passives are customers who are satisfied, but lack any enthusiasm or loyalty; passives could easily switch to a competitor. Detractors are customers who are decidedly unsatisfied with your company.

Measurement: The numerical scores to categorize each customer: Detractors have scores in the 0-6 scores range; Passives are in the 7-8 range; Promoters have scores in the 9-10 range.

Calculate your NPS by starting with the percentage of customers who are promoters and subtract the percentage who are detractors. The larger the difference is between the number of promoters and detractors, the higher your company's NPS.

Pros: NPS only requires a customer to respond to one simple question, which makes it easy to complete and more likely the customer will do so.

Cons: The main criticism for NPS is that asking just a single question is one-dimensional, so it gives only a narrow perspective of customer satisfaction. Additionally, there's no proof that promoters will actually recommend your company to those in their lives, so the score doesn't necessarily correlate with a boost in real world business [15].

3.Customer Effort Score (CES)

The CES looks at how much effort a customer must exert to have their needs met by a company. Q: How much effort did you personally have to put forth to handle your request on a scale of 1-5?

A: Choose between 1 and 5. 1 indicates very low effort and 5 indicates very high effort.

Measurement: After aggregating the replies, a low number indicates that your company is making things easy for the consumer. A very high number means that customers are putting in way too much work to interact with your company.

Pros: One benefit of the CES is that it keeps solutions focused on a single element – customer effort. The sole goal of calculating a CES is to eliminate or minimize any barriers for customer service. CES has been proven to be the best indicator of customer loyalty.

customers have any issues in the first place or what those obstacles may be.

Ultimately, all three systems of measurement useful for evaluating the effectiveness of changes in processes, products, or services on customer satisfaction; Company's can compare a score before and after implementing a new protocol to measure the impact. Additionally, these metrics are designed specifically to help businesses identify their strengths and weaknesses. The whole purpose of consumer research is to translate those insights into action items that will in turn improve your customer's experience overall [15].

3.7 Impact of Supply chain dimensions on customer satisfaction

There are four main characters in the supply chain which include suppliers, manufacturers, distributors and customers. Thus, understanding the relationship between the mentioned groups and efforts to optimize this relationship is the major issue in companies. Perhaps the difficult and important issue in supply chain management is to manage relations between the four main characters, because they have the tremendous effect on all aspects of supply chain and its function level. See Fig.(11)

According to conducted research by Brian Fynes, Chris Voss and Sean de Burca (2005) [26] various dimensions of relationships quality with supply chain are:

1- Communication: is defined sharing formal and informal of important information between partners. Communication is essential for partners' success.

2- Trust: is one of the important structures in the analysis of exchange relations. In marketing literature, trust is the sense of confidence in the relationship which increases the cooperation of two sides.

3- Conformity: Compatibility of suppliers with the basic needs of customers and also, matching customers with the capabilities of suppliers is called conformity of suppliers' relationship. Conformity is occurred by investments in product, process technology and human resources.

4- Dependence: Dependence refers to the partners wanted to maintain relationships to achieve desired goals. Dependence between two companies is the function of transaction amount a company with another company and the amount of benefit which a company receives another company cooperation.

5- Commitment: Commitment can be defined as a desire to maintain mutually valuable relationships. Therefore, to achieve commitment, the strategy of organization should be customer-oriented, long-term and base on mutual benefits.

6-Cooperation: is defined as relations between the two companies to achieve the ultimate goals and exchange the Isolation behavior to partnership. Exchange information on production, processing and analysis of products can reduce production costs and improve the innovation of new product process [14].

3.9 UserExperience

User Experience evaluation methods

UX evaluation methods are focused on determining how users feel about the targeted system. UX evaluation allows designers to understand and gain insight into how users perceive and value products. Having this understanding will help in achieving positive UX and desirable products. Depending on what one wants to evaluate, UX evaluation methods can be classified into four categories: (1) field studies, (2) laboratories studies, (3) online studies, and (4) questionnaires and scales. Since UX extends the usability concept, some UX aspects may be accessed through usability evaluation methods, such as heuristic evaluation according to heuristics that cover some of the UX dimensions. However, evaluating all UX aspects is much more challenging. Performing user tests is very critical and important in evaluating UX [5].

3.10 Customer Experiences as Drivers of Customer Satisfaction

As indicated by Brakus et al. (2009) [27] the five types of experience are closely related to previous authors' categorizations of experiences, such as Dewey(1922) [28], and Pinker (1997) [29].See Fig.(12);

Sense: The 'sense' experience is related to aesthetic and sensory aspects of the marketing offer, such as color, shape, touch, sound and smell.

Feel: It experiences encompass feelings, moods and emotions generated by the marketing offer.

Think: It experiences, on the other hand, represent cognitive thinking evoked by contact with the marketing offer.

Act: ‘Act’ experiences refer to actions or changes in lifestyle induced by the marketing offer.

Relate: The ‘relate’ experience refers to connections the customer forms with others thanks to the brand or product [17].

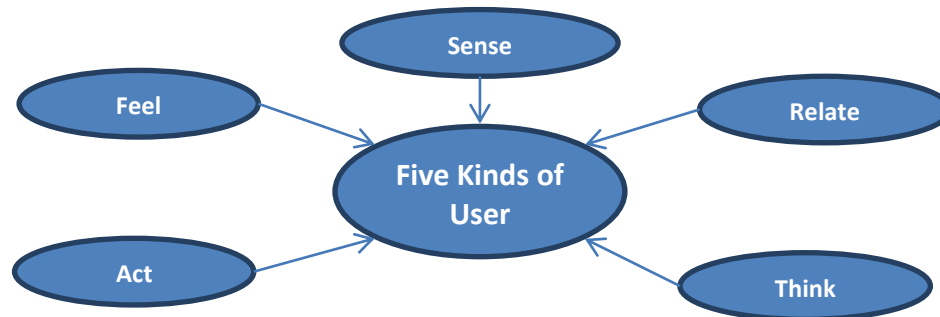


Figure 6: Five kinds of user experiences

4. CONCLUSION AND PRESPECTIVE:

In this research work different models for Digital Transformation and Supply Chain are presented. We have presented the impact of supply chain agility on customer satisfaction and models for measuring the customer satisfaction and how agent based collaborative information system can be used for modular product development. We have find user experience is a driver of customer satisfaction.

The models presented in this research should be integrated & provided a complete roadmap to complete Digitalization of an industry. Models should be validated in different industries and after that Global model should be generated for Digital Transformation of an industry to lead Customer Satisfaction.

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