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Digital Transformation on Food Retail Industries-A Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Digital Transformation is defined as the use of technology to radically improve performance or reach of enterprises (Westerman et al., 2018) The existing literature on digitalization in the food industry is limited. Meanwhile, the literature suggests that digitalization is an issue that is unavoidable at some point in all industries and that companies must adapt in order to maintain their competitive position. The purpose of this research is to look into the digital technologies that are commonly used in the food industry in order to identify the challenges and opportunities that exist in digital transformation. In this study more than twenty five articles collected and reviewed. Recent published articles were collected from high impact journals which consist of the review related to digital transformation in food industry. When this study was completed, it was discovered that the food industry is lagging behind other sectors in terms of digitalization. The industry is confronted with enormous challenges and one of the most important challenges, as well as resistance to digitalization in the food industry, is its profitability. Digital transformation has increased traceability throughout the food industry and has also reduced labour costs and production time.

Keywords: Digital transformation; food industry; robotics; e-commerce and block chain.

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1. INTRODUCTION

Digital technology becomes the backbone of new products and services, new ways of operation, and new business models. Digital technologies influence every sector of national and global economies, including agriculture (for example, precision agriculture, drones and block chain tracing), food and beverage manufacturing (robotics), food retail and restaurants (e-commerce) and finance (e-payments). Digitalization has been described as the most important technological development currently affecting society and industry. Firms are under constant pressure nowadays to use emerging technology and adapt their business models to this modern reality. Digitalization of the economy and society is a transformative process that holds considerable promise but also raises challenges, including for the agriculture and food sectors .Digital transformation has various direct and indirect consequences, bringing innovation, changing market conditions and leading to new business models. Digital innovations are reshaping how different economic sectors and industries work and perform. The agri- food industry has also embraced digitalization, though acceptance and use of the technology is still in its infancy.

Digital transformation also affects agriculture as well as, the agro-food value chain, both of which are becoming increasingly data-intensive. The aim of this paper is to contribute to a better understanding of how the digital transformation is affecting the food system. It examines how new opportunities has built competitive advantage. Knowledge are influencing the digital transformation of the agriculture and food industries, as well as how this is integrating with the digital transformation of the rest of the economy.

The overall objective of the study was to analyse the scope, process and impact the digital transformation in food industry. The specific objectives are i) to investigate the prevailing digital technologies available in food industry, ii) to study the models for digitalization process in food retail industry, iii) to study how external factors will impact the digital transformation in food industry and to identify the benefits and challenges in the digital technologies available in food industry.

This review aims in identifying the technologies prevailing in the field of food industries and to create awareness about the available technologies and its benefits and challenges. Previous studies has only have theoretical view which has failed to explain the practical issues concerned. Most of the previous studies have also failed to cover the practical implementation and their outcomes in any particular technology at particular company.

2. MATERIALS AND METHODS

In this study, I have referred to articles related to digital transformation in the food industry, which have been around for one to two decades. More than twenty five articles have been collected and reviewed for this study. Recently published articles were collected from high-impact journals, which consist of reviews related to digital transformation in the food industry. Based on these sources, the objectives were framed and results were obtained.

2.1 Literature Review

Block chain technology:

Technologies	Article	Author	Findings
Block chain technology	Blockchain and Its Impacts on Agri-Food Supply Chain Network Management	Michael Paul kramer(2021)	Impacts of different blockchain technology platform types on digital agri- food business models
	Blockchain technology in food industry ecosystem	Dr.Ashok Chopra [1]	How block chain bases systems of food traceability are more suitable from speed, confidentiality and ease of implementation
	Blockchain Technology in the Food Industry: A Review of Potentials, Challenges and Future Research Directions	Abderahman Rejeb et al.,[2]	Discuss the theoretical and practical implications of research and present several ideas for future research..

	Incorporating Block Chain Technology in Food Supply Chain	Papri Ray et al.,[3]	Identifying the key variables that can have a significant effect on block chain implementation.

Artificial intelligence:

Internet of things(IoT)	Setbacks to IoT Implementation in the Function of FMCG Supply Chain Sustainability during COVID-19 Pandemic	Anet Rezek Jambrak (2020)	Set of measures and incentives was proposed that the competent institutions and the management of the FMCG - encourage the digitalization process
	An Intelligent IoT-Based Food Quality Monitoring Approach Using Low- Cost Sensors	Alexandru popa et al.,(2019)	Information is transmitted to a computer system providing an interface -user can observe the evolution of the product quality over time
	IO for Agriculture: Food Quality and Safety	Gunawan witjaksono et al., [4]	Applying IOT for agriculture to trace and track food quality and safety.

Technologies	Article	Author	Findings
Big data analytics	Practical Classification and Evaluation of Optically Recorded Food Data by Using Various Big-DataAnalysis Technologies	Tim jarschel et al.,(2020)	Describe the procedure for digitization of food data, & application of big data analytics in small- and medium-sized enterprises
	The Role of Analytics in Data-Driven Business Models of Multi-Sided Platforms: An exploration in the food industry	Diane isabell et al.,(2020)	Predict future value of their product and service offerings, and develop their partnerships.
	Big data in food safety:A review	Hans. J. P. Marvin et al., (2016)	Application of mobile phone as detection device for food safety.

Robotics:

Technologies	Article	Author	Findings
Robotics	Prospects of robotics in food industry	Jamshed Iqbal et al., [5]	Developments of ‘robo-food’ will stimulate more collaborations among the research community and contribute to further developments
	Application of robotics in dairy and food industries: a review	Subhash Prasad [6]	Broad range of potential applications for robotics in dairy and food industries.
	Robotics and Food Technology: A Mini Review	Gulzar Ahmad Nayik [7]	The challenge is to develop low- cost, flexible, hygienic and intelligent machines for the food industry

Additive manufacturing:

Technologies	Article	Author	Findings
Additive manufacturing	Additive Manufacturing – A step towards future for food industry	Harshit Chopra et al., [8]	3D technology theoretically correlated with food printing is addressed.
	Additive Manufacturing applications within Food industry: an actual overview and future opportunities	Claudia pinna et al.,(2016)	Finding out potential touching points between additive manufacturing technologies and food market
	Additive Manufacturing for the Food Industry - A review	Jeffrey I Lipton et al., [9]	Represent important steps to developing novel utility in 3D food printing

Cyper physical production system:

Technologies	Article	Author	Findings
Cyber physical production system	Food Supply Chains as Cyber-Physical Systems: a Path for More Sustainable Personalized Nutrition	Sergiy smetana et al.,(2020)	Data-integrated assessment systems allow transparency of chains, integration of nutritional and environmental properties, and construction of personalized nutrition technologies.

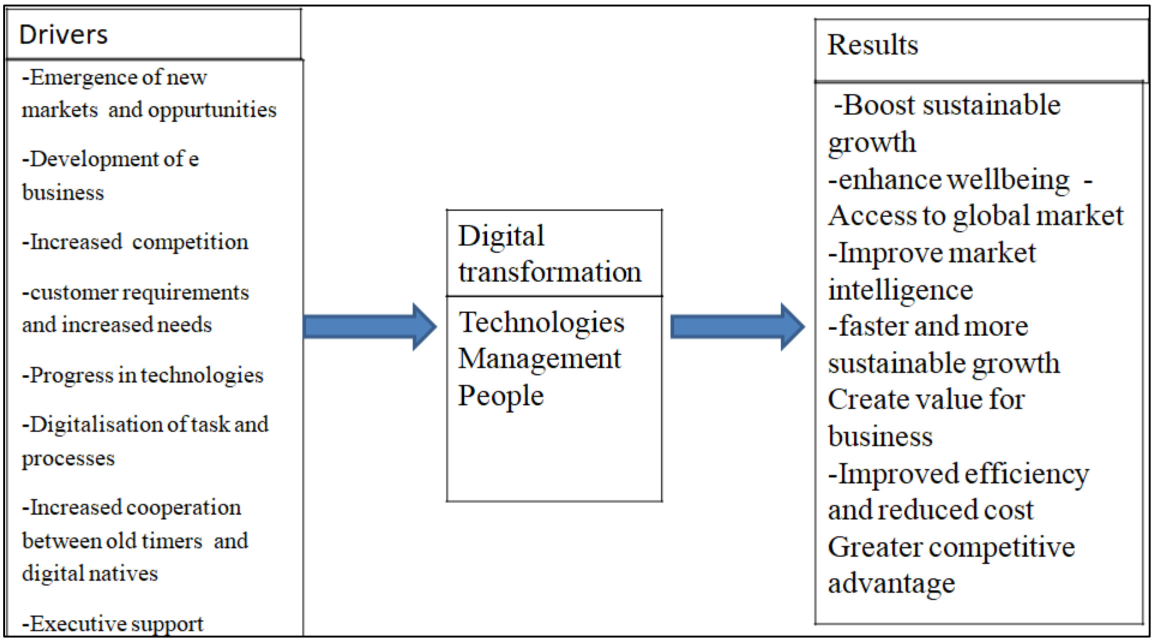

Fig. 1. Digital transformation
Source: Natalja verina (2019)

2.2 Technologies Used in Food Industry

2.2.1 Block chain technology

A block chain is a digital distributed ledger that is managed by a network of multiple computing machines in its most basic form. It keeps data in the form of block chain stable and immutable blocks.

Supply chains will be able to revitalize their management and handling because they will have accurate information on member profiles, providing a higher degree of assurance on food safety. QR codes and product labelling are used to demonstrate this to the customer. It can help avoid tainted food from entering the supply chain, as well as detect and eliminate it once it has reached the shelves. This is reassuring for customers because it alerts both retailers and suppliers of potentially hazardous food.

In the agricultural sector, block chain will aid inventory monitoring and shipping processes, lowering costs that would otherwise be paid to a third-party verifier. Via its open and automated multi-ledger scheme, block chain technology will aid in the fight against food theft and counterfeiters.

The fact that block chain is a public ledger is one of its biggest advantages. At any point in time in a food supply chain, all of the transactions for a single piece of food can be seen and validated.

The block chain keeps a permanent record of transactions, which are then organized into blocks that cannot be changed or tampered with. Fraud is more difficult to commit since transactions are validated and accepted by consensus among participants. It offers an open forum with no need for a third party to sanction transactions; instead, all participants must adhere to a set of guidelines.

2.2.2 Food traceability

Block chain technology is concerned with the capture, storage, and transmission of information about food items during the stages of the food supply chain in order to facilitate food quality and safety monitoring as well as backward and forward food tracking. Traceability is becoming more widely recognized as a critical component of delivering nutritious and wholesome food as well as ensuring customer loyalty and confidence. Consumers are emphasizing the importance of food traceability.

2.2.3 Food supply chain collaboration

More flexible knowledge exchange, a more unified consumer orientation, greater management of sales and demand fulfillment and less risks related to demand volatility have all resulted from increased supply chain cooperation and integration. Supply chain partnership boosts company profitability and lowers transaction costs. Since the agri-food industry structure is fundamentally complex, supply chain collaboration is critical in an FSC context. Multi-ingredient food goods, for example, typically have a complex supply chain involving many business organizations and various data exchanges.

2.3 Efficiency

Companies have benefited greatly from the digitization of supply chains, which has resulted in new opportunities and business models. The evolution of FSCs has necessitated the use of cutting-edge technology to automate processes and roles between information exchange partners. The adoption of blockchain technology can improve inbound efficiency and optimize planning decisions by providing reliable data and information and increasing the visibility of supply chain inventory and process.

2.4 Food Trading

The use of blockchain in business processes and roles between trading relationships improves efficiency and automation while also the confidence in trade transactions. Blockchain technology's auditability is a critical feature for FSCs to create an authoritative record for trade. Furthermore, by removing such trade barriers, blockchain will help to broaden food trade. It has the potential to speed up commercialization processes because blockchain ensures that all Food supply chain exchange partners have knowledge symmetry, integrity, and confidence.

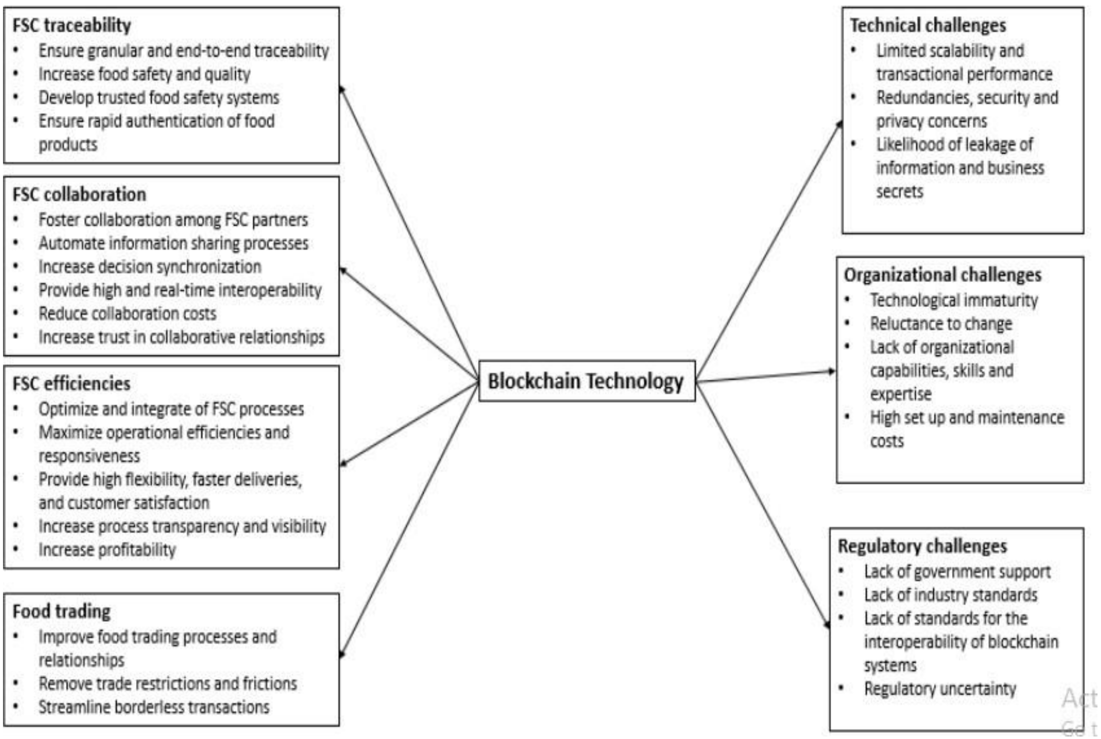

Fig. 2. Blockchain technology
Source: Dr. Ashok Chopra [1]

2.4.1 Artificial intelligence

Artificial intelligence is a term used to describe an artificially created human-like intelligence that can learn to think, plan, interpret, and process natural language. It is the study and development of computer systems capable of performing tasks that would normally require human intelligence, such as vision, speech recognition, decision-making, and language translation. Artificial intelligence is a branch of computer science that focuses on developing machines that behave like humans.

3. APPLICATION OF ARTIFICIAL INTELLIGENCE (AI) IN FOOD INDUSTRY SORTING FRESH PRODUCE

The unpredictability of feedstock supply is one of the most significant challenges that food processing plants face. Manual sorting is used in food processing plants to sift and sort vegetables, resulting in decreased productivity and higher costs.

Food processing companies can achieve substantial automation for food cataloguing using Artificial Intelligence, which uses a combination of cameras, lasers, and machine learning to allow more efficient food sorting. Artificial intelligence (AI) is being used to properly calibrate devices in order to handle several product sizes while reducing waste and costs.

4. EFFICIENT SUPPLY CHAIN MANAGEMENT

Food safety is monitored and tested at any stage of the supply chain to ensure that the product meets industry and customer standards. To control pricing and inventory, more accurate forecasting is required. AI-based image recognition technologies allow for more efficient and effective produce procurement. AI also aids in the effective and straightforward monitoring of produce from farm to market, increasing consumer trust.

5. FOOD SAFETY COMPLIANCE

In a food factory, AI-enabled cameras are used to ensure that food staff comply with safety regulations. This uses facial-recognition and object-recognition tools to assess if employees are following food-safety regulations about personal hygiene.

6. CLEANING FOOD PROCESSING EQUIPMENTS

Cleaning systems in operation are set up to clean appliances in timed cycles. This reduces human involvement, lowering the risk of cross contamination from food-borne pathogens. Using AI-enabled technologies (self-optimizing clean in place system (SOCIP)), which uses ultrasonic sensing and optical fluorescence. Imaging to measure food residue and microbial debris in a piece of equipment and then optimize the cleaning process. This results in water, time, and energy savings.

7. ANTICIPATING CONSUMER PREFERENCES

Food marketers use artificial intelligence-based solutions to anticipate and model their target customers' flavour preferences, as well as predict their reactions to novel flavours. Food producers will benefit from Artificial Intelligence-based predictive analytics in designing new food items that are closely matched with customer tastes and preferences

7.1 Internet of Things

The Internet of Things in its industrial or manufacturing form is known as the Industrial Internet of Things (IoT). It can be viewed as a systemic increase in automation and a gradual change in how machines interact with one another at manufacturing facilities. The Internet of Things is primarily concerned with human-object interaction. This allows users to keep track of the sequence of events and activities as they happen. These devices often allow users to remotely track and manage their devices.

7.2 Shelf Life Monitoring

Many sensors recording temperature, humidity, and pressure in coldchain items, as well as a new form of RFID, are used in a smart cold chain system to track food freshness. The system will track food items using a mobile code, ensuring that it can continue to provide services even though the backend system is down.

7.3 Traceability

Traceability mechanisms have been proposed to collect knowledge about product protection in the food chain as well as to enhance the logistics behind food goods. Food protection, food quality, and logistical details can all be shared using a traceability framework.

7.4 Food Packaging

IoT solution for improving food safety and quality in the food supply chain. Consumers may use smartphones to collect information from packaging that is already listed on the box (e.g. ingredients, allergies, and nutritional values) as well as other information such as product consistency, freshness, origin, and pesticides applied. Retailers, in addition to customers, can benefit from this system by forecasting product shelf life and comparing it to their own in order to enhance their logistics.

7.5 Enhanced Efficiency

Big Data enables us to improve every type of company and exploit new available strategies based on information gathered. Farmers can get weather forecasts, shippers can get transportation information, and restaurants can get customer reviews and pricing. Big Data allows for the detection of lucrative and preferred products in specific locations, which can then be marked for interested parties.

7.6 Cloud Manufacturing

Cloud manufacturing (CM) is the cloud computing technology that is applied to the manufacturing area. Cloud Manufacturing is a customer centric manufacturing model that exploits on-demand access to a shared collection of diversified and distributed manufacturing resources to form temporary and reconfigurable production lines that enhance efficiency, reduce product lifecycle costs, and allow for optimal resource loading in response to variable-demand customer generated tasking demand customer tasking.

Data can be shared across connected devices to the same cloud in milliseconds or less using cloud computing. This means that the manufacturing system's cyber-physical structures can be intelligently connected in real time with the aid of cloud systems. Cloud computing is a method of delivering computing services such as servers, storage, databases, networking, apps, analytics, and other applications over the Internet using visualised and scalable tools.

7.7 Robotics

Food production has evolved into a series of increasingly complex processes that include preparation, cooking, processing, packaging, and palletizing. Industrial robots are becoming more widely incorporated to save time and space while also improving cleanliness and protection. Dispensing, feed positioning, cutting, packaging or casing of food, pick-and-place items into containers, and sorting are all typical uses for food manufacturing robots. Newer technologies also allow for order picking, in which an employee or customer may electronically place an order, and the food robot will automatically fill it.

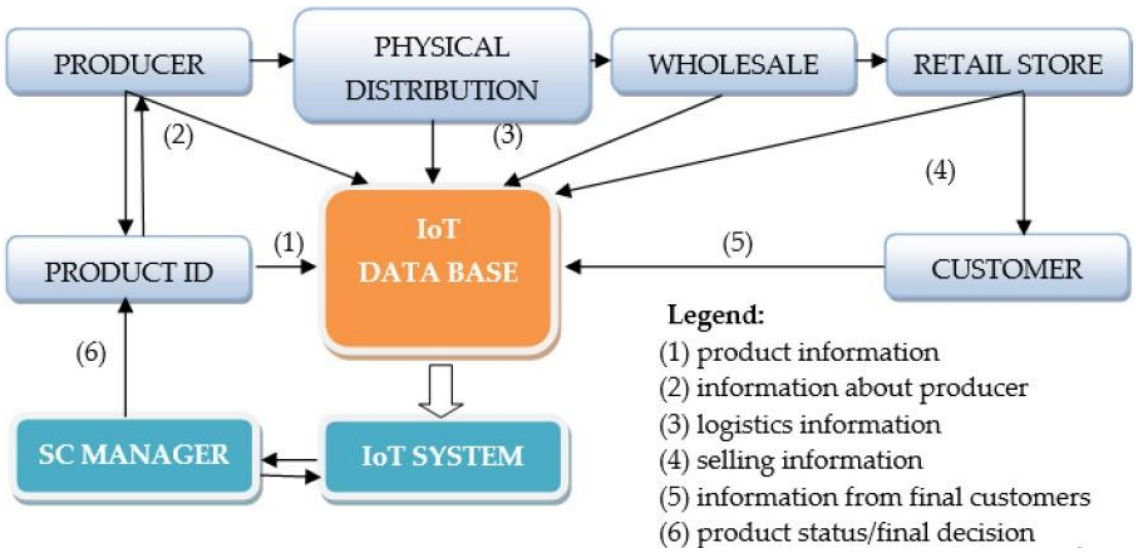

Fig. 3. Internet of things

Source: Jelena Koncar (2020)

When it comes to food packaging, where speed, consistency, and high levels of repetition are essential, food robots almost always outperform humans. Robots are equipped with intelligent vision systems that allow for extremely precise product placement on a conveyor belt. Sorting by colour, form, or size is also done with vision system robots.

7.8 Hygiene

Food protection is critical, and food and beverage products must be processed without contact with humans to prevent the spread of germs and bacteria. Hygienic construction of robotic manipulators, vision systems, and end effectors or grippers is a must in the food industry because of these stringent criteria.

7.9 Productivity

In the food preparation, storage, and manufacturing industries, as well as in the food serving industry, the demand for productivity has increased. The robots' primary emphasis is on food preparation and handling. Due to highly agile robotic systems and incorporated control schemes, fast operational pick and place speeds are possible. The rate of robot assisted production has exceeded that of operator-assisted manual production.

8. ADDITIVE MANUFACTURING

Additive manufacturing refers to a category of technologies, whose first appearance occurred in the early and defined by a layer upon.Creation of layers based on Computer-Aided Design. Additive Manufacturing Technologies (AMT) may make a significant contribution to specific sectors, and will most likely be the driving force behind the development of AMT in food applications. It's worth looking into the role of a Product Lifecycle Management (PLM) solution in assisting these technologies in the company's digitalization process. In reality, PLM solutions make it possible to keep information consistent and organised, to collaborate internationally, to promote new product concepts and portfolios, to simplify packaging and recipe requirements, and to manage production planning and supply chain information.

Additive manufacturing used a computer model, such as a complex 3D CAD model data, to create a product in a fully automated process using 3D printing or similar technologies.

AM printers would facilitate the implementation of a build-to-order strategy with low overriding costs and production facilities located closer to the final customer. This would result in customized food products brought to consumers within a shorter time, together with an acceptable price as fewer resources have been used.

The most impactful benefit of AFM is the capability to allow personalised food design, both in form and nutritional quality AFM can allow a precise control of people’s diet, and ensure to meet the needs and desires of those who are affected by the disease allergies intolerances (e.g. gluten free diet). In this scenario, even food is a factor. stuff that is well-known as an ingredient Unique formulations require properties that are customised to them. based on the manufacturing processes.

9. CYPER PRODUCTION PHYSICAL SYSTEM (CPPS)

On and across all levels of production, from processes to machines to production and logistics networks, CPPS is made up of autonomous and cooperative components and subsystems that communicate with each other in situation-dependent ways. Modeling their function and predicting their emergent behaviour raises a slew of basic and applied research questions, not to mention the regulation of these systems at any stage. The main issue is how to investigate the relationships between autonomy, collaboration, optimization, and responsiveness.

CPPS deviates from the conventional automation pyramid in several ways The traditional control and field levels still exist, with popular PLCs near to the technical processes to provide the best output for important control loops, while the higher levels of the hierarchy are characterised by a more decentralised way of working in CPPS.

CPPS is a crucial technology for achieving Smart Manufacturing, and it is being researched in tandem with other technologies.

10. PLUG AND PRODUCE

Since the idea is product-centric, product instances control their own output, eliminating the need for central coordination. Intelligent production units that can configure themselves make up production systems, which require very little engineering effort at this stage.

i) Concrete production workflows for goods are automatically calculated by matching their production plans or recipes with the production resources in a given Cyber-Physical Production System; ii) Cyber-Physical Production Systems, as well as production processes, are formally modelled; Product instances control their own output, allowing a CPPS to handle individualised production in the face of fluctuating demand.

11. MATCHING OF SKILLS

The following tasks are involved in skill matching. i) Determine whether there is a possibility of collaboration between Cyber Physical Production Equipment (CPPE); ii) Determine whether there are any potential resource conflicts; iii) Determine all constraints; and iv) Gather matched skills.

12. SMART PRODUCTS

One of the central concepts of Industry 4.0 is to equip goods and components with embedded systems capable of collecting, communicating, and networking data. Chips and micro-processors, as well as embedded systems, are needed to achieve this goal. These modules allow i)the storage of configuration data on a component to speed up the start-up of machinery and production equipment, eliminating the need for manual configuration measures, and (ii) the storage of runtime data, such as from operations, to improve the product or use the data for predictive maintenance.

13. TRENDS IN DIGITAL TRANSFORMATION

External impact factors: Trends

Trends is the external view, where manufacturing problems that affect the manufacturing environment are identified. This segment provides background information on the issues facing the food industry. Trends are concerned with the industry's present trajectory as well as major changes in the industry.

Table 1. External impact factors: Trends

External Impact Factors: Trends	Description
Environmental sustainability	Environmental sustainability means using natural resources at a rate that is lower than natural regeneration or using a replacement, emitting low levels of pollution, and not engaging in practises that degrade the ecosystem
Focus on health and wellness	Education, safe living and inclusion accelerate. Lifestyles that support “living well within the limits of one planet” are essential
Food safety and quality excellence	The food industry has ushered in a slew of reforms and has made food protection a top priority on its policy agenda. Safety is characterised as the state of not being exposed to or causing damage, injury, or loss. The guarantee that the product meets the agreed-upon specifications. Quality assurance is a guarantee that the agreed-upon requirements have been met.
Globalization vs Localization	Globalization has changed how companies provide goods to consumers, and as a result, the artefacts that are studied, whether it's a business, a production network, or a supply chain.
Market competitiveness	The global industry is currently facing an increasing increase in the competitiveness that forces companies to implement and establish new strategies and methods of production
Price pressure of raw materials	Industrial raw material prices have soared to all-time highs on global markets over the last year. These raw materials are important inputs into the manufacturing process.
Product portfolio diversification	Mass personalization is a new development. Products with a unique attribute associated with the customer, such as a logo, are made in the context of mass customization.
Regulatory constraints	Quality refers to the basic purpose criteria established by current legislation to ensure that foods are safe and pollutant-free from a regulatory or customer perspective.
Social Sustainability	Social sustainability entails actively supporting the retention and development of skills and capabilities for future generations, as well as promoting wellness and promoting equal opportunity.

Source: Melissa Demartini [10]

Internal impact factor: implications

The internal impact factors are used to reflect the manufacturing company's priorities and strategies. Finally, the aim of the first step is to create a target.

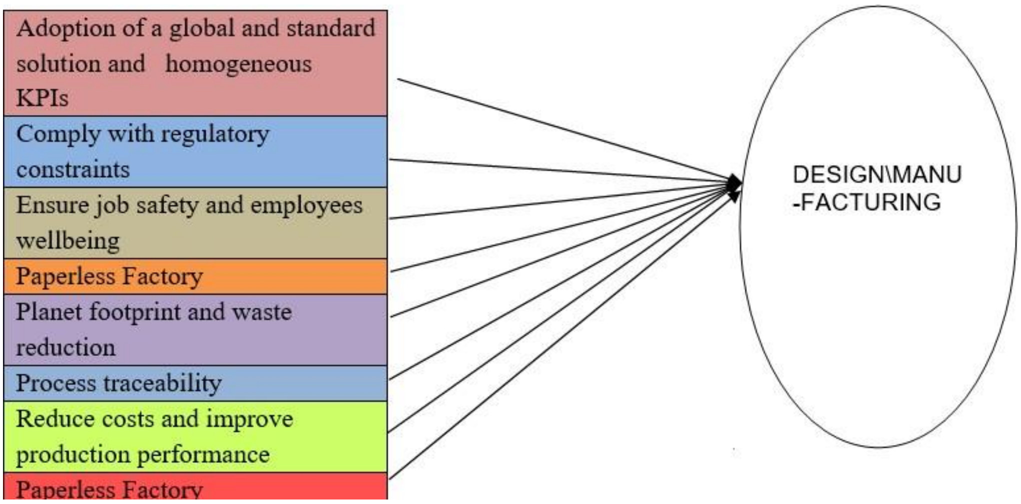

Fig. 4. Internal Impact Factors: Implications Phase
Source: Melissa Demartini [10]

As previously said, opportunities are used as implications to define a company's internal processes and enable to identifying: i)the company's response to an issue implication-related opportunity or danger, and ii) action taken to seize an opportunity or mitigate a risk.

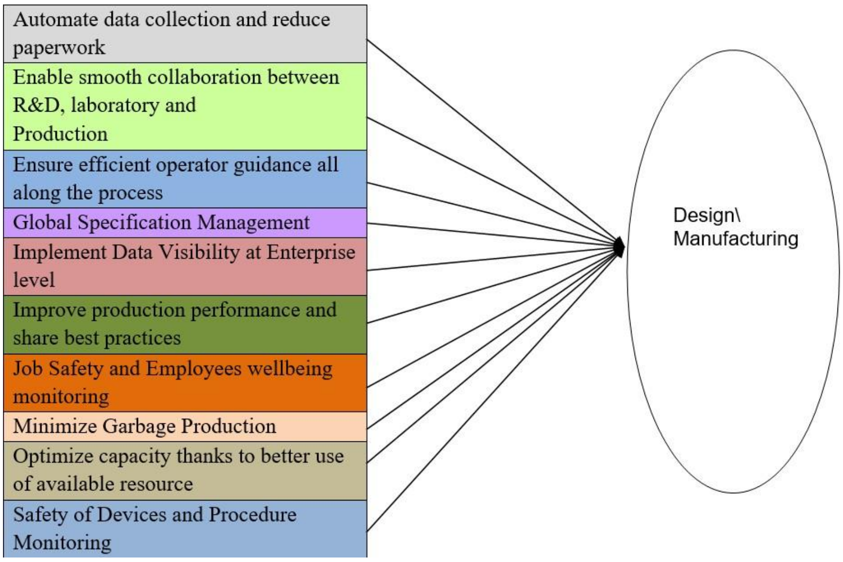

Fig. 5. Internal impact factors: Opportunities
Source: Melissa Demartini [10]

14. INTERNAL IMPACT FACTORS PHASE

14.1 Benefits in digital transformation

Betterment of food safety: The Internet of Things enables Digital Transformation Solutions in the Food Industry, allowing businesses to remain flexible when displaying the latest top-of-the-line goods.

Various types of monitoring sensors, such as temperature sensors and humidity sensors, are used to regulate the required production condition, shipping time, and so on in vessels to ensure that food products are stored in a suitable climate. Organizations can closely track different data points in terms of food safety using real-time temperature sensors, ensuring live cold chain management.

When data gathered from sensors alerts staff to possible issues or infringements, this activates staff to perform and review the necessary food safety check-up. Recently, food packaging has been labelled with Multiple sensors are linked to a large supply-chain network in the food packaging industry, assisting inspectors with the entire monitoring process and significantly reducing the time and effort spent on it.

14.2 Smooth Operation Management

Operation Management is a critical component of any manufacturer's business, especially in the Food industry. By incorporating workflows and reducing manual processes, the operational process can be escalated and smoothed, connecting all business units and structures and streamlining processes to make the best decisions possible. It will also aid in the implementation of process improvements aimed at converting development into income.

Aside from that, Digital Transformation has boosted automated retailing and helped to minimise operating costs by allowing vending machine systems to identify and recommend actions for issues such as food and consumer behaviour prediction. It will submit reminders to remove expired food on time, as well as notifications to replenish the machines more effectively

14.3 Distinct Supply Chain Process

In the Food Industry, the Supply Chain Management Process provides transparency and traceability, which aids in customer loyalty and establishes trust between the company and its customers. As a result, both businesses and consumers can monitor their purchases. The whole process can be made more fitting and eloquent by digital transformation.

14.4 Efficient Logistics Performance

In their logistics activities, food companies will use Internet of Things and Artificial Intelligence technologies. The Logistics IoT Solutions help Food industries not only monitor stock and inventory at the right time, but they can also be used for shipments automation on requests or restoration predictions.

14.5 Provide Consumer Traceability and Quality

Poor quality, tainted, mislabeled, or counterfeit products can have a major impact on a company, destroying faith in the brand. End-to-end traceability and quality documentation are digitised to prevent suspect goods from reaching markets, to ensure adherence to quality and safety regulatory enforcement requirements, and to protect brand equity while increasing customer trust and satisfaction

14.6 Recipe Agility

Digital recipe management, manufacturers can stay flexible in the face of changing market demands. By securely increasing the number of product variants, reducing time to market for new product and packaging variations, and speeding up the process of new product introductions, we help manufacturers maintain a competitive advantage in the food and beverage industry.

14.7 Asset Reliability

Manufacturers can better handle capital expenditure constraints and improve production performance from existing assets by improving asset reliability. By minimising unplanned downtime, enhancing machinery effectiveness, and rising efficiency while reducing waste, manufacturers have been able to postpone expensive investments in new properties.

14.8 Challenges

Data complexity: When digital technologies are successfully implemented in an organisation, a large amount of data is produced. Policymakers and decision makers will use this big data to make informed decisions. However, due to its structure, this data can be very complicated. This can make it difficult for decision-makers to process the information.. This is due to a lack of structured frameworks that distribute or calculate the use and impact of big data in decision-making. Furthermore, observed these issues among managers in terms of locating and selecting relevant information.

14.9 Lack of Essential Improvements

Another factor affecting the adoption of new technology is a lack of necessary upgrades. There will be two forms of critical changes discussed. First and foremost, we are conducting research into more applicable technical infrastructures within businesses in order to increase profit. They did conclude, however, that higher-level types of organisations must improve in order to realise the benefit that digital technologies promise. Another form of change can be found in the technology's services. Companies use online calendar services for a variety of purposes, including reminders, scheduling, and monitoring. However, these programmes tend to be relatively weak today, and they must be strengthened in order for them to continue to be used.

14.10 Lack of Services

A lack of institutions has been mentioned as an obstacle to implementing digital technology in the implementation of digitalization. However, a shortage of institutional resources appears to be an obstacle in the use of digitalization.

14.11 High Costs

The high cost of access to digitalization can be an obstacle to adoption. These expenses were broken down into three categories: equipment, repair, and networking. Many areas have the potential to become impoverished. In order to expand infrastructure, decision-makers must first understand the costs of purchasing, building, and maintaining it. They can't afford to upgrade their infrastructure because, for the most part, they're broke. *(Katarzyna Kosior 2018).*

14.12 Lack of Appropriate Incentives

Another factor that may prevent people from taking advantage of digitalization is a lack of adequate incentives. Digital initiatives must be implemented by organizations and individuals with the right incentives to collaborate in groups. Adoption rates are often poor due to behavioural causes, which can be addressed with sufficient incentives.

15. CONCLUSION

Digital technologies implemented are the game-changers in today's world which also act as an added competitive advantage to the industry. Digital transformation has increased the traceability throughout the food industry and has also reduced the labour cost and production time. This implies the reduction in overall cost of the product which can increase the purchase of the end consumer. This leads to the increase in the sales of the product. The main limitation of the digital transformation is their high investment cost and requirement of high skilled labour which could only be beared by large scale industries. This is the reason because of which small scale industries could not adapt the digital technologies.

Government has taken considerable initiatives to implement digital technologies in small and medium scale food industries.

16. FUTURE PROSPECTS

The field of digital transformation has lot of scope in research. The research can throw the light in areas of implementation of digital technologies in small scale industries, lag in adaptation time and perception of employees and the technologies implemented, the gap between the technologies available and executing it.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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