

**POLITECNICO DI TORINO**

MASTER OF SCIENCE IN ENGINEERING AND MANAGEMENT



**ANALYSIS OF QUALITY MANAGEMENT SYSTEM (QMS)  
APPLIED ON MANUFACTURING & DESIGN COMPANIES**

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## **ABSTRACT**

In today's business world, many manufacturing companies have found themselves in a great competition for survival; this has driven companies to constantly desire to improve the quality of their products and reduce cost. Manufacturers, around the globe, are thus compelled to adopt quality management systems that can ensure application of necessary processes and procedures on a project management level.

Generally, project managers are keen to focus all their energies on timely completion of projects with major focus on budget controlling and monitoring. Thus, underestimating the contribution of Quality Management Systems towards overall success of the project.

In this paperwork we are going to analyze in detail Quality Management Systems (QMS) that have been widely applied successfully by Dachi Srl to improve their process, increase profits and organizational performance.

The paperwork also discusses in detail the work that I have carried out during my thesis with company, that how we achieved savings on cost adopting outsourcing for the company's secondary activities.

The analysis concludes with detailed understanding of the QMS procedures and case studies that could help the company following the analysis for their future management of projects to comply with quality systems in detail.

## LIST OF ABBREVIATIONS

<b>TQM:</b>	Total Quality Management
<b>QMS:</b>	Quality Management Systems
<b>KPI:</b>	Key Performance Indicators
<b>HVAC:</b>	Heating, Ventilation and Air conditioning
<b>QFD:</b>	Quality Function Deployment
<b>SPC:</b>	Statistical Process Control
<b>FMEA:</b>	Failure Mode and Effect Analysis
<b>TPS:</b>	Toyota Production System
<b>CRM:</b>	Customer Relation Management
<b>API:</b>	Application Programming Interface
<b>DMAIC:</b>	Define, Measure, Analyze, Improve, Control

## LIST OF FIGURES

- Figure 1:** Dachí SRL Head office
- Figure 2:** Dachí's workshop facility
- Figure 3:** Ferrero's plant in Turkey by Dachí
- Figure 4:** Advantages of Lean Production
- Figure 5:** Kaizen Concept
- Figure 6:** Six Sigma
- Figure 7:** Lean Thinking
- Figure 8:** 8D Problem Solving Technique
- Figure 9:** 4 Stages of Quality Management
- Figure 10:** Office space in Pakistan
- Figure 11:** B2H machine for quality control
- Figure 12:** Updated website

# Table of Contents

I. Introduction .....	8
1. Introduction to Dachi Srl .....	10
1.1. From Quantity to Quality .....	14
1.2. Lean Production .....	16
1.3. Kaizen Concept .....	18
2. Problem-solving methodologies .....	21
2.1. Introduction .....	21
2.2. 4 stages of Quality Management .....	25
2.3. 4 Stages of Quality Organization .....	30
2.4. 4M Factors .....	34
3. Criticalities .....	39
3.1. Out-sourcing .....	39
3.2. E-commerce platform .....	41
4. Improvements .....	45
4.1. Implementation of out-sourcing .....	45
4.2. Implementation of e-commerce platform .....	48
5. Conclusion .....	51
6. References .....	54

# I. Introduction

In today's fast-paced and highly competitive business world, manufacturing companies face significant challenges in their quest for survival. The relentless pressure to improve product quality and reduce costs has become a fundamental driving force behind their operations. To thrive in this demanding environment, manufacturers worldwide are compelled to adopt quality management systems (QMS) that enable the effective application of necessary processes and procedures at the project management level. However, the tendency among project managers to prioritize timely project completion and budget control often leads to an underestimation of the invaluable contributions that QMS can make to the overall success of a project.

The purpose of this thesis is to undertake a comprehensive analysis of Quality Management Systems (QMS) that have been successfully implemented by Dachi Srl, a prominent manufacturing company. By examining the case of Dachi Srl, this thesis aims to shed light on how the adoption of QMS has facilitated significant improvements in their operational processes, increased profitability, and enhanced overall organizational performance. Furthermore, this paper will delve into the author's personal involvement with Dachi Srl during the thesis, providing a detailed account of the strategies employed to achieve cost savings through the outsourcing of the company's secondary activities.

By providing a thorough examination of the benefits and challenges associated with outsourcing secondary activities, this research aims to equip the management team with the necessary knowledge and understanding to make



informed decisions regarding the implementation of this improvement action. Furthermore, the findings and recommendations presented in this thesis seek to contribute to the existing body of knowledge on outsourcing practices and their potential to drive efficiency and cost-effectiveness within organizations.

The analysis also intended to provide an in-depth understanding of the intricacies of QMS procedures, highlighting their relevance and impact on project management. Through the presentation of relevant case studies, this study will offer valuable insights and recommendations for Dachi Srl and other manufacturing companies seeking to effectively manage future projects while ensuring compliance with comprehensive quality systems.

The procedures presented will contribute to the existing body of knowledge surrounding QMS and its pivotal role within the manufacturing industry and design industry. By addressing the common tendency to overlook the significance of QMS in project success, this study aims to raise awareness among project managers and stakeholders regarding the far-reaching benefits that can be derived from the integration of quality practices into every facet of project management.

Overall, this research serves as a timely and relevant contribution to the field of quality management in manufacturing. By elucidating the critical role of QMS in today's competitive business landscape, this study seeks to empower manufacturing companies with the knowledge and tools necessary to successfully navigate the challenges of improving product quality, reducing costs, and achieving overall organizational excellence.

# **1. Introduction to Dachì Srl**

Dachi Srl is a renowned Italian construction company known for its excellence in providing comprehensive construction and architectural services. With a strong presence in the Italian market, Dachì Srl has successfully undertaken and completed numerous projects across various sectors. According to the official website, “Leading company in mechanical constructions, which caters to the industrial sector, specifically: mechanical, medical, food, and energy. [\[1\]](#)” In this introduction, we will delve into the background of Dachì Srl, its expertise, and highlight some of its notable projects, showcasing the company's contributions to the construction industry.



Figure1: Dachì SRL Head office

Dachi Srl has a rich history of delivering high-quality construction projects since its establishment. The company has built a solid reputation based on its

commitment to professionalism, innovation, and client satisfaction. With a team of experienced professionals, including architects, engineers, and project managers, Dachi Srl possesses the expertise and resources to successfully execute projects of varying scales and complexities.

Dachi Srl's project portfolio reflects its versatility and ability to cater to diverse client needs. The company has undertaken projects in different sectors, including residential, commercial, industrial, and public infrastructure. From luxury residential properties to state-of-the-art commercial complexes, Dachi Srl has showcased its capabilities in delivering projects that align with client's vision and requirements.

In the commercial sector, Dachi Srl has successfully completed projects such as office buildings, shopping centers, and hospitality establishments. These projects exemplify the company's ability to meet the unique requirements of commercial clients. Dachi Srl's architects and designers understand the importance of creating spaces that facilitate productivity, efficiency, and customer satisfaction. They apply their expertise to design modern and functional spaces that optimize the use of available areas while maintaining an appealing aesthetic. The company's commercial projects have garnered positive recognition for their seamless blend of practicality and design excellence.

Dachi Srl has also been involved in the construction of public infrastructure projects that contribute to the growth and development of local communities. These projects include educational institutions, healthcare facilities, and recreational centers. Dachi Srl understands the significance of these public spaces in fostering community engagement and enhancing the quality of life. The company's team works closely with stakeholders to ensure that the design and construction of these facilities meet the highest standards of safety, accessibility, and functionality. Dachi Srl's public infrastructure projects have

positively impacted the communities they serve, providing essential amenities and spaces for public use.

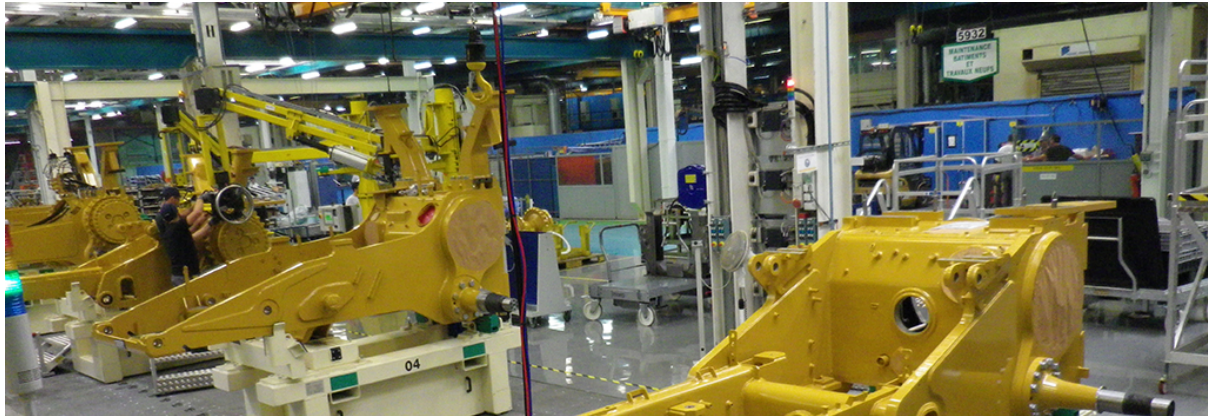


Figure 2: Dachi's workshop facility

In each project, Dachi Srl prioritizes quality, adhering to strict standards and employing skilled craftsmen and contractors. The company maintains strong relationships with suppliers and partners to ensure the availability of high-quality materials and resources. Dachi Srl's dedication to excellence and attention to detail have earned the company a reputation for delivering projects on time and within budget, exceeding client expectations.

In conclusion, Dachi Srl is a distinguished Italian construction company known for its expertise and successful execution of diverse projects. The company's portfolio includes luxurious residential properties, commercial complexes, and public infrastructure projects, each showcasing its commitment to quality, innovation, and client satisfaction. With its talented team of professionals, Dachi Srl continues to contribute to the growth and development of the construction industry in Italy.





Figure 3: Ferrero's plant in Turkey by Dachi

## 1.1. From Quantity to Quality

Dachi Srl recognized the importance of shifting focus from quantity to quality in order to meet the evolving demands of its customers and maintain a competitive edge in the market. Moving beyond simply producing a high volume of products or services, the company's aim is to deliver exceptional value and excellence in all aspects of its business operations.

Here are some key steps it will take to make transition from a quantity-driven approach to one centered on quality:

- **Redefining its Objectives:** The company will reassess the goals and objectives to prioritize quality as a fundamental aspect of business strategy. This includes aligning its mission statement, core values, and performance indicators with a quality-focused mindset.
- **Customer-Centric Approach:** Understanding the customers needs and expectations is crucial in delivering quality. Dachi will invest in market research, gather feedback, and actively engage with its customers to gain insights into their preferences and requirements. This information will guide its efforts to improve and enhance, products or services accordingly.
- **Robust Quality Assurance Processes:** Implementing rigorous quality assurance processes will be a key component for transition. This includes establishing quality control checkpoints at various stages of process operations, conducting regular audits, and continuously monitoring and improving different processes to ensure consistent quality.
- **Employee Training and Empowerment:** Workforce plays a vital role in delivering quality. Dachi will provide comprehensive training programs to

enhance the skills and knowledge of employees, enabling them to contribute effectively to quality objectives. Empowering staff to take ownership of quality and fostering a culture of continuous improvement will be essential.

- **Supplier Collaboration:** The company recognizes the importance of working closely with its suppliers to maintain high-quality standards. It will establish robust supplier evaluation processes, fostering partnerships with those who share commitments to quality. Regular communication and collaboration will help align objectives and ensure the delivery of superior materials and services.
- **Continuous Improvement:** Embracing a mindset of continuous improvement is critical for quality-focused journey. Which will encourage innovation, invest in research and development, and leverage new technologies to enhance products, services, and processes continually.
- **Transparent Communication:** Open and transparent communication will be vital in building trust with stakeholders. Dachi will effectively communicate commitments to quality, share progress, and address any concerns or feedback promptly.
- **Monitoring and Evaluation:** Dachi will establish key performance indicators (KPIs) to measure progress in the transition from quantity to quality. Regular monitoring and evaluation will allow to identify areas for improvement, make data-driven decisions, and ensure it to stay on track with its quality objectives.

By embracing this transition from quantity to quality, Dachi Srl will position itself as a leader in the market, providing exceptional products or services that meet and exceed customer expectations. It is committed to fostering a culture of

quality throughout the organization, driving sustainable growth and customer satisfaction in the long run.

## **1.2. Lean Production**

Dachi Srl has successfully implemented a range of cost reduction strategies across various areas of its operations. Through careful analysis and proactive measures, the company has achieved significant cost savings while maintaining operational excellence.

Here are some of the key initiatives that have been implemented:

**Procurement Optimization:** Dachi Srl diligently reviewed its procurement process, identifying opportunities to reduce costs without compromising quality. The company renegotiated contracts with suppliers, leveraging its purchasing power to secure better terms and pricing. By exploring alternative suppliers and materials, Dachi Srl successfully minimized costs while ensuring a reliable supply chain.

**Streamlined Operations:** The implementation of lean manufacturing principles has revolutionized Dachi Srl's operations. By reorganizing workflow processes and eliminating waste, the company has improved efficiency and reduced unnecessary expenses. Investing in automation technology has not only streamlined production but also resulted in significant labor cost savings.

**Energy Efficiency:** Dachi Srl recognized the importance of energy conservation and took proactive steps to improve energy efficiency. Upgrading to energy-efficient equipment and optimizing HVAC systems has reduced energy consumption and lowered utility bills. Additionally, the company implemented energy-saving initiatives, such as motion sensors for lighting, further contributing to cost reduction.



**Overhead Expense Management:** Dachi Srl conducted a thorough review of all overhead expenses to identify areas for cost reduction. The company successfully renegotiated contracts for rent, utilities, insurance, and maintenance services, resulting in substantial savings. Moreover, Dachi Srl explored opportunities to downsize office space where feasible and embraced shared services to reduce costs.

**Inventory Management Optimization:** Through meticulous inventory management practices, Dachi Srl has achieved optimal stock levels. By closely monitoring demand patterns, optimizing order quantities, and establishing strong supplier relationships, company has minimized carrying costs and mitigated stockouts. This streamlined approach has generated cost savings and improved overall efficiency.

**Employee Productivity Enhancement:** Dachi Srl placed a strong emphasis on enhancing employee productivity. Through training programs and skill development initiatives, the company has empowered its workforce to perform at their best. Employees are incentivized to suggest cost-saving ideas and provide feedback on process improvements. This collaborative approach has resulted in increased productivity and a positive impact on the bottom line.

**Cost-effective Marketing Strategies:** Dachi Srl has transitioned to cost-effective marketing channels, capitalizing on digital platforms and social media.



Figure 4: Advantages of Lean Production

### 1.3. Kaizen Concept

Dachi Srl has embraced the Kaizen concept as a fundamental principle for continuous improvement throughout the organization. By adopting this philosophy, the company has fostered a culture of innovation, efficiency, and cost reduction.



Figure 5: Kaizen Concept

Here's how Kaizen has been implemented at Dachi Srl:

- **Employee Empowerment:** Dachi Srl recognizes that employees are the driving force behind improvement initiatives. Through Kaizen, employees are empowered to contribute their ideas and suggestions for process enhancements and cost savings. The company encourages open communication channels, providing a platform for employees to share their insights and actively participate in decision-making processes.
- **Small Incremental Improvements:** Kaizen emphasizes the importance of small, continuous improvements rather than drastic changes. Dachi Srl encourages its employees to identify even the smallest inefficiencies or bottlenecks and find practical solutions to address them. By focusing on incremental improvements, the company ensures that every aspect of its operations is continuously optimized for maximum efficiency and cost reduction.
- **Kaizen Events:** Dachi Srl periodically organizes Kaizen events, where cross-functional teams come together to tackle specific challenges or improvement projects. These events provide a dedicated platform for employees to brainstorm ideas, analyze processes, and implement changes that lead to cost savings. The structured approach of Kaizen events ensures focused efforts and tangible results.
- **Data-Driven Decision Making:** Kaizen promotes the use of data for decision making. Dachi Srl collects and analyzes relevant data to identify areas of improvement and measure the impact of implemented changes. By leveraging data, the company gains valuable insights into its processes, enabling evidence-based decision making and the identification of further opportunities for cost reduction.
- **Standardization and Documentation:** Kaizen emphasizes the importance of standardizing processes and documenting best practices. Dachi Srl

ensures that efficient processes and cost-saving measures are documented and shared across the organization. This promotes consistency and enables employees to replicate successful practices, creating a culture of continuous improvement and cost consciousness.

- **Kaizen Circles and Cross-Functional Collaboration:** Dachi Srl encourages the formation of Kaizen circles, where employees from different departments collaborate to identify and implement improvements. This cross-functional collaboration ensures a holistic approach to cost reduction, as diverse perspectives and expertise contribute to finding comprehensive solutions.
- **Continuous Training and Education:** To support the implementation of Kaizen, Dachi Srl provides ongoing training and education to its employees. This includes workshops on problem-solving techniques, process optimization, and lean principles. By equipping employees with the necessary skills and knowledge, the company ensures that Kaizen becomes ingrained in the organizational culture.

Through the implementation of the Kaizen concept, Dachi Srl has created a dynamic and continuously improving environment. By engaging employees, encouraging small improvements, and leveraging data-driven decision making, the company has successfully achieved cost reductions while driving overall operational excellence.

## **2. Problem-solving methodologies**

### **2.1. Introduction**

In today's complex and competitive business environment, organizations face a wide range of challenges and problems that require effective problem-solving methodologies. World-Class Problem-Solving methodologies are systematic approaches that enable organizations to identify, analyze, and resolve problems in a structured and efficient manner. These methodologies aim to drive continuous improvement, enhance organizational performance, and achieve sustainable success. This article provides an introduction to some of the key World-Class Problem-Solving methodologies, their principles, and their significance in addressing complex problems.

- **Six Sigma:**

Six Sigma is a data-driven problem-solving methodology that focuses on reducing process variation and improving overall performance. It originated at Motorola in the 1980s and gained widespread adoption across various industries. Six Sigma employs a structured approach known as DMAIC (Define, Measure, Analyze, Improve, Control) to tackle problems systematically. It emphasizes the importance of data analysis, statistical tools, and process improvement techniques to achieve measurable and sustainable results.



Figure 6: Six Sigma

Scholarly articles highlight the effectiveness of Six Sigma in problem-solving and process improvement. Research by Desai et al. (2008) [28] emphasizes the impact of Six Sigma on quality performance, cost reduction, and customer satisfaction. The authors discuss the integration of statistical tools and techniques within the Six Sigma framework to drive problem-solving and decision-making.

- **Lean Thinking:**

Lean Thinking, also known as Lean Manufacturing or simply Lean, is a problem-solving methodology that originated from the Toyota Production System (TPS). It aims to eliminate waste, improve efficiency, and maximize customer value. Lean focuses on continuous improvement, respect for people, and the relentless pursuit of perfection. The methodology emphasizes the identification and

elimination of various forms of waste, such as overproduction, waiting time, unnecessary transportation, and defects.



Figure 7: Lean Thinking

Scholarly articles provide insights into the application of Lean Thinking in problem-solving and process optimization. A study by Rahman et al. (2010) [\[29\]](#) highlights the impact of Lean principles on operational performance, cost reduction, and customer satisfaction. The authors discuss the significance of waste reduction, value stream mapping, and standardized work in Lean problem-solving.

- **A3 Problem Solving:**

A3 Problem Solving is a structured approach that guides problem-solving through the use of an A3-sized (11x17 inches) sheet of paper. It is derived from the Lean methodology and focuses on capturing the problem, analyzing the root causes, developing countermeasures, and establishing an action plan. The A3 format provides a concise and visual representation of the problem-solving

process, enabling effective communication and collaboration among team members.

Scholarly articles discuss the application of A3 Problem Solving in various industries, highlighting its effectiveness in problem identification, root cause analysis, and solution implementation.

- **8D Problem Solving:**

The 8D (Eight Disciplines) problem-solving methodology is widely used in industries such as automotive, aerospace, and manufacturing. It provides a systematic approach to problem-solving, focusing on root cause analysis, containment actions, and long-term solution implementation. The eight disciplines include problem description, containment actions, root cause analysis, corrective actions, preventive actions, verification, implementation, and team recognition.

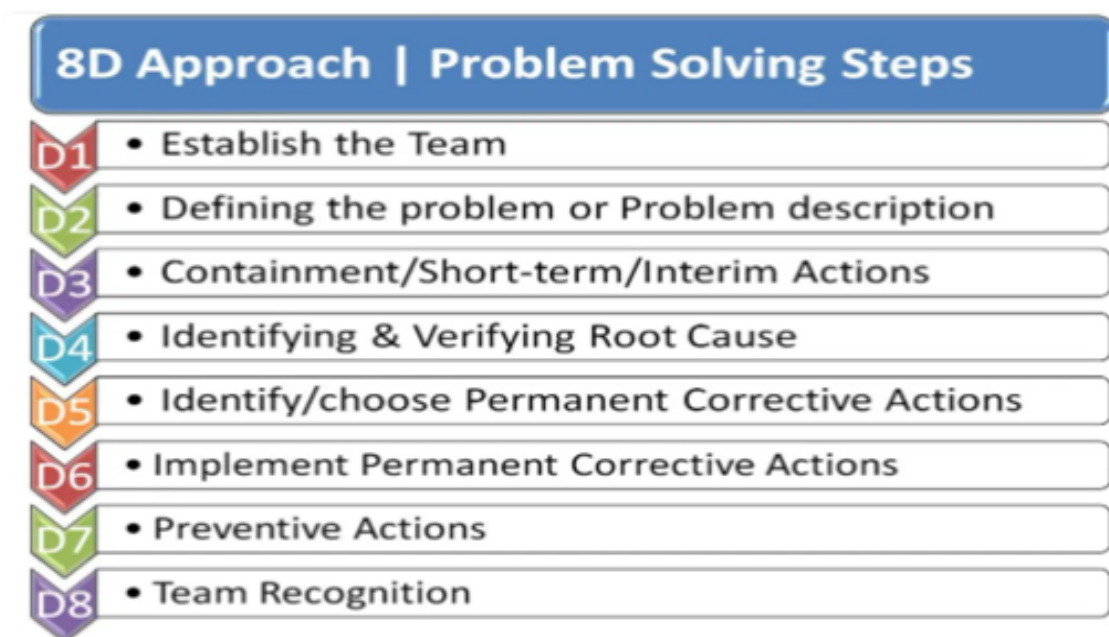


Figure 8: 8D Problem Solving Technique



Scholarly articles highlight the effectiveness of the 8D methodology in problem-solving and quality improvement. A study by Kaplik (2013) [30] discusses the application of the 8D approach in addressing quality issues and preventing their recurrence. The authors emphasize the structured problem-solving process and the collaborative nature of the 8D methodology.

## 2.2. 4 stages of Quality Management

Quality management is a systematic approach that organizations adopt to ensure that their products or services consistently meet or exceed customer expectations. It involves the integration of quality principles, processes, and techniques throughout the entire organization. Quality management can be divided into four distinct stages that form a continuous improvement cycle. This article provides a comprehensive overview of the four stages of quality management, highlighting their key elements, significance, and their impact on organizational performance. The four stage of Quality management are shown in figure 14 and explained further below:

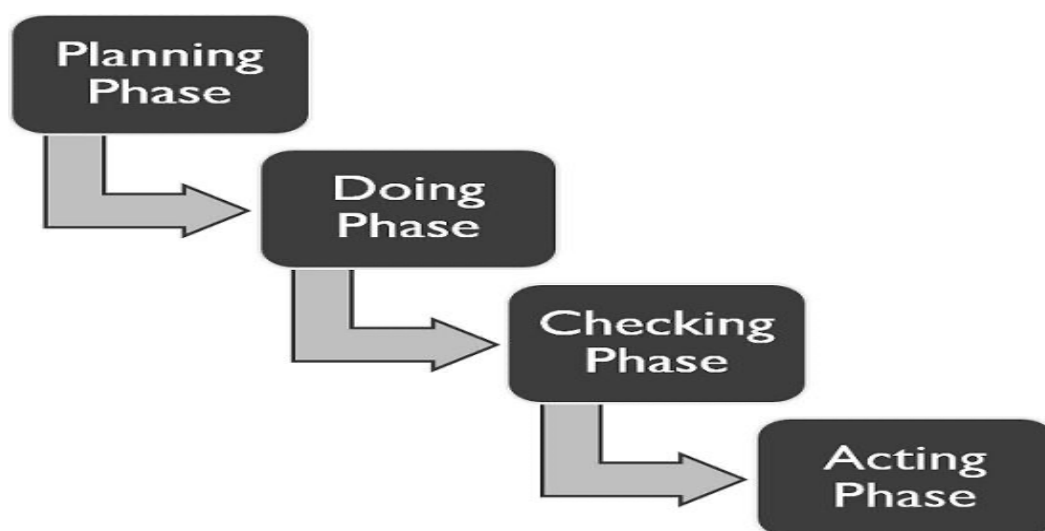


Figure 9: 4 Stages of Quality Management

- **Planning Stage:**

The planning stage serves as the foundation of quality management, where organizations establish their quality objectives, define processes, and develop strategies to achieve desired outcomes. Key elements of this stage include:

**a) Quality Policy and Objectives:** Organizations define their quality policy, which sets the overall direction and commitment to quality. Quality objectives are then established, aligning with the organization's mission and customer requirements.

**b) Quality Planning:** In this stage, organizations determine the processes, resources, and responsibilities necessary to achieve the established quality objectives. Quality planning involves identifying customer needs, defining product or service specifications, and establishing quality control measures.

**c) Quality Standards and Regulations:** Organizations identify and comply with relevant quality standards, regulations, and industry best practices. Compliance with standards such as ISO 9001 demonstrates a commitment to quality management and enhances customer confidence.

Scholarly articles provide insights into effective quality planning methodologies and frameworks. For example, research by Erdil et al. (2019) [\[31\]](#) discusses the application of Quality Function Deployment (QFD) as a tool for linking customer requirements with product design and development processes. The authors emphasize the importance of strategic planning to align organizational objectives with customer expectations.

- **Control Stage:**

The control stage focuses on implementing quality control measures to ensure that processes meet the established quality standards. This stage involves monitoring, measuring, and analyzing data to identify variations and deviations from the desired outcomes. Key elements of this stage include:

**a) Quality Assurance:** Organizations establish quality control processes, procedures, and standards to ensure consistency and compliance. Quality assurance activities include inspections, audits, and documentation of processes and procedures.

**b) Statistical Process Control (SPC):** SPC is a key tool used in the control stage to monitor and analyze process data. It involves statistical techniques to identify process variations and take corrective actions.

**c) Quality Metrics and Key Performance Indicators (KPIs):** Organizations establish quality metrics and KPIs to measure performance and track progress towards quality objectives. Metrics such as defect rates, customer satisfaction scores, and on-time delivery are used to evaluate process effectiveness.

Scholarly articles provide insights into the application of control tools and techniques. In an article, authors highlight the role of control charts, acceptance sampling, and process capability analysis in ensuring consistent quality and process control.

- **Assurance Stage:**

The assurance stage focuses on verifying and validating the effectiveness of quality management systems and processes. It ensures that the organization's efforts are aligned with customer expectations and regulatory requirements. Key elements of this stage include:

**a) Quality Audits:** Internal and external audits are conducted to evaluate the effectiveness of quality management systems and processes. Audits help identify areas of improvement, ensure compliance with standards, and provide assurance to stakeholders.

**b) Supplier Management:** Organizations establish processes to evaluate and monitor the performance of suppliers and vendors. Supplier audits and assessments are conducted to ensure that external providers meet quality requirements.

**c) Continuous Improvement:** The assurance stage emphasizes the importance of continuous improvement through feedback loops, corrective actions, and preventive measures. Organizations analyze data, identify root causes of problems, and implement actions to prevent recurrence.

Scholarly articles provide insights into effective assurance practices. For example, a study by Yang et al. (2018) discusses the role of quality audits in ensuring compliance with quality standards and identifying areas for improvement. The authors emphasize the importance of regular audits in

evaluating the effectiveness of quality management systems and driving continuous improvement.

- **Improvement Stage:**

The improvement stage focuses on driving continuous improvement by identifying opportunities for enhancement and implementing changes to achieve better quality outcomes. This stage involves proactive problem-solving, innovation, and the implementation of best practices. Key elements of this stage include:

**a) Root Cause Analysis:** Organizations use various problem-solving methodologies, such as the 5 Whys, Fishbone Diagram, or Failure Mode and Effects Analysis (FMEA), to identify the root causes of quality issues. By addressing root causes, organizations can prevent recurring problems and improve overall quality performance.

**b) Process Optimization:** Continuous improvement involves optimizing processes to eliminate waste, reduce variability, and enhance efficiency. Lean and Six Sigma methodologies are often employed to streamline processes and improve quality.

**c) Innovation and Best Practices:** Organizations foster a culture of innovation by encouraging employees to generate new ideas, explore new technologies, and adopt best practices. Innovation and the adoption of best practices contribute to enhancing quality performance and gaining a competitive edge.

Scholarly articles provide valuable insights into improvement methodologies and practices. Many Authors have discussed the application of Lean Six Sigma in

driving continuous improvement and achieving operational excellence. The authors highlight the importance of process optimization, waste reduction, and data-driven decision-making in improving quality performance.

The four stages of quality management, including planning, control, assurance, and improvement, form a continuous improvement cycle that helps organizations achieve and maintain high-quality standards. Planning establishes quality objectives and strategies, while control ensures adherence to standards and the identification of process variations. Assurance verifies the effectiveness of quality management systems, while improvement focuses on driving continuous improvement through problem-solving and innovation.

### **2.3. 4 Stages of Quality Organization**

Quality management approaches play a crucial role in organizations' efforts to ensure consistent product and service quality. These approaches provide frameworks for organizing and implementing quality management systems. This article provides a comprehensive overview of four key quality management approaches: vertical management, matrix management, horizontal management, and network management. It outlines their characteristics, significance, and their impact on organizational performance.

- **Vertical Management:**

Vertical management is a traditional hierarchical approach to quality management, where decision-making authority flows from top to bottom within an organization. Key characteristics of vertical management include:

**a) Centralized Decision-Making:** In vertical management, decision-making authority rests primarily with top-level executives and managers. They establish quality policies, set objectives, and allocate resources.

**b) Clear Chain of Command:** Vertical management follows a clear chain of command, with each level of management having specific responsibilities and reporting relationships.

**c) Top-Down Communication:** Communication primarily flows from top to bottom within the organization, with top-level management disseminating information and directives to lower levels.

Vertical management can provide clear direction and accountability. However, it may limit employee empowerment and responsiveness to customer needs. Scholars have studied the impact of vertical management on quality management. Researcher has explored the relationship between vertical management and quality management practices, highlighting the importance of effective top management support in driving quality improvement initiatives.

- **Matrix Management:**

Matrix management is an organizational structure that brings together employees from different functional areas to work on cross-functional projects or initiatives. Key characteristics of matrix management include:

**a) Dual Reporting Lines:** In matrix management, employees report to both functional managers and project managers. This allows for expertise from different functions to be utilized efficiently.

**b) Cross-Functional Collaboration:** Matrix management promotes collaboration and teamwork across functional boundaries. It encourages sharing of knowledge, skills, and resources to achieve project goals.

**c) Flexible Resource Allocation:** Matrix management allows for flexible resource allocation, as employees can be assigned to projects based on their expertise and availability.

Matrix management can foster innovation, collaboration, and effective utilization of resources. However, it can also lead to role confusion, power struggles, and conflicts between functional managers and project managers. Scholarly articles provide insights into matrix management and its impact on quality management. The role of matrix management in quality improvement initiatives, and the need for effective communication and collaboration among team members is quite evident.

- **Horizontal Management:**

Horizontal management, also known as team-based management, focuses on empowering self-managed teams to make decisions and take ownership of quality improvement efforts. Key characteristics of horizontal management include:

**a) Empowered Teams:** In horizontal management, teams are given autonomy and authority to make decisions related to quality improvement. They have a high degree of responsibility for achieving quality objectives.



**b) Cross-Functional Collaboration:** Horizontal management promotes cross-functional collaboration within teams. It encourages sharing of knowledge, skills, and perspectives to address quality issues and implement improvements.

**c) Continuous Learning and Development:** Horizontal management emphasizes continuous learning and skill development within teams. It encourages training, mentoring, and knowledge sharing to enhance team capabilities.

Horizontal management can promote employee engagement, creativity, and agility. However, it requires a supportive organizational culture and effective communication mechanisms. Scholarly articles offer insights into horizontal management and its impact on quality management. For instance, research by He et al. (2020) explores the relationship between horizontal management practices and quality performance, highlighting the role of team empowerment and knowledge sharing in achieving quality objectives.

- **Network Management:**

Network management, also known as collaborative management, focuses on building strategic partnerships and alliances with external stakeholders to enhance quality performance. Key characteristics of network management include:

**a) Collaboration and Partnerships:** Network management emphasizes collaboration and partnerships with suppliers, customers, and other external stakeholders. Organizations work together to share knowledge, resources, and expertise to achieve mutual quality objectives.

**b) Supply Chain Integration:** Network management involves integrating the supply chain by fostering close relationships with suppliers and ensuring quality standards are met throughout the entire supply chain process.

**c) Continuous Improvement across Networks:** Network management promotes continuous improvement across the entire network by sharing best practices, benchmarking, and jointly addressing quality challenges.

Network management allows organizations to leverage the expertise and resources of external partners, leading to improved quality performance. However, it requires effective coordination, trust, and mutual understanding among network participants. Scholarly articles offer insights into network management and its impact on quality management.

The four stages of quality management approaches, including vertical management, matrix management, horizontal management, and network management, provide organizations with diverse frameworks to organize and implement quality management systems. Each approach has its own characteristics, advantages, and challenges. While vertical management provides clear direction and accountability, matrix management facilitates cross-functional collaboration. Horizontal management empowers teams and promotes continuous learning, while network management allows organizations to tap into external resources and expertise.

## **2.4. 4M Factors**

Project management involves coordinating various elements to achieve project objectives efficiently. Four essential factors that significantly impact project success are Material, Method, Manpower, and Machine. These factors encompass the resources, processes, human capital, and technology required to

execute projects effectively. This article explores the significance of Material, Method, Manpower, and Machine in project management, highlighting their individual contributions and their interconnectedness.

- **Material:**

The "Material" factor refers to the physical resources necessary for project execution. It includes raw materials, equipment, tools, supplies, and any tangible assets required to complete the project. Key considerations related to the "Material" factor include:

**a). Resource Availability:** Ensuring that the required materials are accessible when needed is crucial. Efficient procurement, inventory management, and supply chain coordination help avoid delays and ensure a smooth workflow.

**b.) Quality Control:** Maintaining the quality of materials is vital for project success. Implementing quality control measures, inspections, and testing procedures guarantees that the materials meet the required standards and specifications.

**c). Resource Optimization:** Maximizing the utilization of materials minimizes waste, reduces costs, and enhances project efficiency. Proper planning and resource allocation techniques help optimize material usage throughout the project lifecycle.

- **Method:**

The "Method" factor focuses on the processes, methodologies, and techniques employed to execute the project. A well-defined and structured approach enhances project efficiency and minimizes risks. Key considerations related to the "Method" factor include:

**a). Project Planning:** Developing a comprehensive project plan that encompasses tasks, timelines, milestones, and dependencies is essential. A well-thought-out plan provides clarity, sets expectations, and guides project execution.

**b). Process Standardization:** Establishing standardized processes and workflows streamlines project activities. Consistent methodologies promote efficiency, improve collaboration, and facilitate knowledge transfer within the project team.

**c). Risk Management:** Implementing effective risk management practices helps identify, assess, and mitigate potential risks. Proactive risk management ensures that project challenges are anticipated, addressed promptly, and minimized.

- **Manpower:**

The "Manpower" factor refers to the human resources involved in the project, including project managers, team members, stakeholders, and end-users. Managing human capital is crucial as it directly impacts project dynamics and outcomes. Key considerations related to the "Manpower" factor include:

**a). Team Composition:** Assembling a skilled and diverse project team ensures that the required expertise is available to accomplish project tasks effectively. Balancing skill sets, experience, and roles within the team optimizes performance.

**b). Leadership and Communication:** Effective project leadership establishes clear communication channels, facilitates collaboration, and provides guidance to the project team. Strong leadership fosters motivation, resolves conflicts, and promotes a positive work culture.

**c). Talent Development:** Investing in the development of team members enhances their capabilities, fosters growth, and ensures their readiness for future projects. Providing training, mentoring, and performance feedback nurtures talent within the project team.

- **Machine:**

The "Machine" factor refers to the technology, tools, and equipment utilized in project execution. It includes both physical and virtual resources that enable efficient project management. Key considerations related to the "Machine" factor include:

**a). Technology Infrastructure:** Implementing appropriate technology infrastructure supports seamless communication, collaboration, and data management within the project. Utilizing project management software, virtual collaboration tools, and automation enhances productivity.

**b). Equipment and Tools:** The availability of suitable equipment and tools is crucial for executing project tasks effectively. Proper maintenance, timely upgrades, and access to reliable resources ensure smooth project operations.

**c). Safety and Compliance:** Adhering to safety regulations and industry standards is essential when utilizing machinery and equipment. Ensuring compliance with safety protocols protects project team members

## **3. Criticalities**

### **3.1. Out-sourcing**

#### **3.1.1 Objective**

Out-sourcing in general, is to delegate certain tasks or functions to external parties, typically for the purpose of gaining cost efficiencies, accessing specialized expertise, improving focus on core activities, or increasing flexibility in resource allocation. Outsourcing can be applied to various areas of an organization, such as IT services, manufacturing, customer support, research, and more.

#### **3.1.2 Benefits of Out-sourcing**

**1. Access to Global Talent:** By hiring people globally, company gains access to a vast talent pool with diverse skill sets and experiences. This enables the company to bring in specialized expertise and capabilities that may not be readily available locally. It opens up opportunities for innovation and fresh perspectives within the organization.

**2. Cost Savings:** Outsourcing to hire people globally can often result in cost savings. Depending on the location, labor costs may be lower in certain regions, allowing the company to obtain quality talent at a more affordable price. This cost advantage can be particularly beneficial for non-core functions or specialized roles.

**3. Round-the-Clock Operations:** Hiring people globally establish, round-the-clock operations by leveraging different time zones. With teams distributed

across different locations, the company can ensure continuous service and support, leading to improved customer satisfaction and operational efficiency.

**4. Expanded Market Presence:** When hiring people globally, company can tap into local market knowledge and establish a presence in new regions. Employees with local expertise can help the company navigate cultural nuances, understand market dynamics, and adapt its products or services to meet the specific needs of different markets.

**5. Flexibility and Scalability:** Outsourcing allows company to be more flexible and scalable in its operations. The company can quickly adjust its workforce size and composition based on changing business needs. This agility is particularly valuable during periods of growth or when entering new markets.

**6. Focus on Core Competencies:** By outsourcing non-core functions to global hires, company can focus its internal resources on core competencies and strategic initiatives. This improves the company's ability to allocate resources effectively and concentrate on areas that drive competitive advantage and value creation.

### **3.1.3 Dachi's need for out-sourcing**

During my stay in the company as trainee, I have noticed that company is hiring personnel physically for short term duration (6 months) to complete the 2D drawings of ongoing projects. And continue the same process every time for the same reason.

Following were the main problems which I have noticed, and which needed an improvement action.



- Company was spending too much budget on hiring new people for short-term duration as trainees, and cost of these trainees was too much.
- Was using competent permanent manpower for the training purpose of trainees every time they hire new people.
- There was delay mostly in core activities because the manpower was busy training the trainees.

I suggested the management team regarding these problems and suggested to out-source secondary activities.

## **3.2. E-commerce platform**

### **3.2.1 Objective**

An ecommerce website is a very effective way to market the company and its products globally. With the aim to attract more and more clients, an ecommerce website was generated with its own domain and hosting service.

The objective of an ecommerce platform is to create a robust online marketplace that enables businesses to effectively sell their products or services, provide a positive customer experience, and drive revenue growth.

Developing an e-commerce website allows the company to enhance customer satisfaction and meet their needs more effectively. The website can provide a convenient platform for customers to browse products, place orders, and track their shipments. By incorporating customer feedback mechanisms and user-friendly features, the company can continuously improve the online shopping experience and meet customer expectations.

### 3.2.2 Benefits of e-commerce platform

1. **Enable Online Sales:** The primary benefit of an ecommerce platform is to provide a digital platform where businesses can showcase and sell their products or services to customers over the internet. It aims to create a seamless and convenient online shopping experience for customers.
2. **Expand Market Reach:** Ecommerce platforms enable businesses to reach a wider audience beyond their physical location or traditional brick-and-mortar stores. By having an online presence, businesses can attract customers from different geographic regions, expanding their market reach and potentially increasing sales.
3. **Improve Customer Convenience:** Ecommerce platforms aim to provide customers with convenience and flexibility in making purchases. Customers can browse products, compare prices, and make purchases anytime, anywhere, using various devices such as computers, smartphones, or tablets. This objective includes offering user-friendly interfaces, secure payment options, and efficient order processing and delivery.
4. **Enhance Customer Experience:** Ecommerce platforms focus on providing an excellent customer experience. This includes features such as personalized recommendations, customer reviews and ratings, easy navigation, search functionality, and responsive customer support. By offering a positive and satisfactory experience, businesses aim to build customer loyalty and encourage repeat purchases.
5. **Increase Sales and Revenue:** Ecommerce platforms are designed to drive sales and generate revenue for businesses. They provide tools and features to optimize product listings, promotional campaigns, and upselling or cross-selling opportunities. The objective is to attract potential customers, convert

them into buyers, and maximize the average order value to boost sales and revenue.

6. **Streamline Operations and Efficiency:** Ecommerce platforms aim to streamline various operational processes, such as inventory management, order fulfillment, payment processing, and customer data management. By integrating these functions into a centralized platform, businesses can improve operational efficiency, reduce errors, and optimize resource utilization.
7. **Data Analysis and Insights:** Ecommerce platforms often provide analytics and reporting features to gather and analyze data related to customer behavior, purchase patterns, sales performance, and other key metrics. The objective is to gain insights into customer preferences, market trends, and overall business performance, enabling businesses to make data-driven decisions and refine their strategies.
8. **Integration with Other Systems:** Ecommerce platforms often integrate with other business systems, such as customer relationship management (CRM), inventory management, accounting, and marketing automation tools. The objective is to create a seamless flow of information and streamline processes across different departments or functions within the organization.

### **3.2.3 Dachi's need for e-commerce platform**

Dachi manufactured different kind of machines, which can detect micro leaks during packaging of food products.

The company has a new control method for the packaging with enhanced features such as:

- High sensitivity at low pressures
- Detection also of micro leaks
- Also effective on paper and compostable films
- Fully automated testing
- Removing possible human errors
- Speed of test execution
- Possibility of frequent and regular checks
- Drastic reduction of production waste

During meeting with management team, they had showed the urge to sell these machines worldwide, where I came up with the idea of creating ecommerce platform, through which the company can sell these machines online across the globe. After thorough discussion with management team, I took the responsibility of creating ecommerce platform.

## 4. Improvements

### 4.1. Implementation of out-sourcing

After detailed discussion, company assigned me the task to carry on my work on founding a company to outsource our secondary activities, where I started with market research.

#### 4.1.1 Market research

1. **Cost Factors:** I started my research on cost of employees in different countries, including wages, benefits, and overhead expenses, in different potential outsourcing destinations. Consider currency exchange rates, inflation rates, and any potential cost savings that can be achieved by outsourcing to a particular country.
2. **Skilled Workforce:** I started assessing the availability of a skilled and educated workforce in the different countries. Look for information on the quality of education, technical skills, language proficiency, and the size of the talent pool.
3. **Infrastructure:** started examining the infrastructure in terms of transportation, logistics, telecommunications, and technological capabilities. Adequate infrastructure is crucial for smooth operations and effective communication between the outsourcing partner and your organization.

4. **Legal and Regulatory Environment:** Understand the legal and regulatory environment in the country I was considering. Research factors such as intellectual property protection, data security and privacy regulations, labor laws, and the overall ease of doing business.
5. **Cultural Compatibility:** Assess the cultural compatibility between your organization and the potential outsourcing country. Factors such as language, work culture, and business practices should align with your organization's values and requirements.
6. **Time Zone and Geographical Proximity:** Evaluate the time zone difference between your organization and the outsourcing destination. Consider the impact on communication, collaboration, and project management. Geographical proximity can also be advantageous for travel and face-to-face meetings if required.

Being a national of Pakistan, I had the edge of more accurate insights of the above-mentioned requirements for market research, I choose Pakistan to find a small company which later the management team accepted my proposal.

#### **4.1.2. Recruiting competent personnel and workplace**

Next step was to find competent candidates and renting small studio for the office in Pakistan for performing different outsourced activities, I contacted local famous agencies dealing with the workforce and made interviews for the selections process, finally we selected two resources on long term contract basis to work and rented the office with all the required needs.

### **4.1.3. Empowerment of new resources**

I have been able to organize physical training for one month with the collaboration of Dachi, for newly selected resources to train about the outsourced activities.

#### **4.1.3.1 Goals achieved**

1. After outsourcing the secondary activities, we have seen huge difference in cost estimate at completion and time estimate at completion. The company gained 5% increase in profits and got huge advantage on cost savings.
2. Company's focus shifted back to core activities.
3. Standardization of secondary activities.



Figure 10: Office space in Pakistan

## **4.2. Implementation of e-commerce platform**

### **4.2.1 Existing inefficiencies in current model**

After studying the existing model of Dachi, I have found many factors that were not aligned to the company's best interest, cost reduction while maintaining the best quality outcomes. I have noticed the following anomalies in the model

- 1. Incurring cost on non-effective marketing:** Dachi's existing model was using hired personnel for marketing of their products physically using product pamphlets, which was resulting in no sales after spending too much money.
- 2. Lack of detailed product manual:** A detailed product manual is necessary to get to know the product and to get attention from interested customers to buy the product.
- 3. Data collection of the interested customers:** With the existing model there was no effective way to collect data of the customers for better management of clients and their need.
- 4. Nonuser friendly website:** Dachi's existing website lacks product specification and missing important information about the product itself, its functionalities and usage.

### **4.2.3 Improvements**

- 1. Designed user-friendly website:** After collaborating with the company's management team, I have been able to update the existing website with



complete product details and added a product manual, I have also updated the detailed video of the product for its usage.

- 2. Integrating website with ecommerce platform:** Existing website has many flaws with respect to selling products on ecommerce platform. The website was not integrated to various API's necessary for online selling, which needed an integration, after studying in detailed I had been able to integrate it with the necessary API's and made it available for customers to buy the products through secure online payments.



Figure 11: B2H machine for quality control

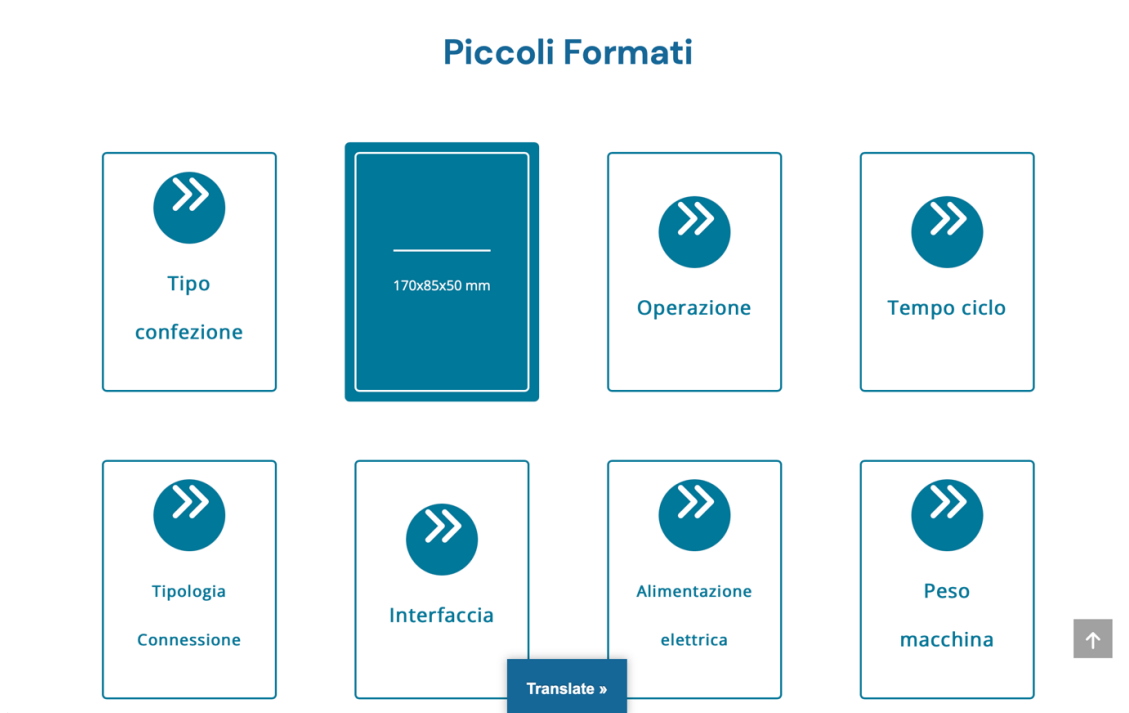


Figure 12: Updated website

#### 4.2.4 Proposed strategies

- Integrating the platform with SAP:** After creating and updating website and ecommerce platform I have noticed it still lack integration of platform with companies existing SAP software, I have suggested the following outcome the company can achieve after the integration.
  1. Better management of customers data for shipping and marketing purposed
  2. Better inventory management
  3. Tracking sales and revenue data
  4. Keeping record for communication with customers

## **5. Conclusion**

Dachi SRL serves as an exemplary model of a mechanical construction company that prioritizes quality, problem-solving, and continuous improvement. Their adherence to ISO 9001 standards, utilization of problem-solving tools and methodologies, and focus on employee engagement highlight their commitment to delivering exceptional results. As a result, Dachi SRL continues to excel in the design and manufacturing of food factories, earning a reputation as a trusted partner in the industry.

The utilization of Kaizen concept and other tools such as the 5 Whys, 5W1H, enables them to identify root causes, find effective solutions, and enhance efficiency and productivity. These problem-solving approaches, combined with a culture of continuous improvement, contribute to Dachi SRL's ability to adapt to changing customer needs and market demands.

Dachi SRL's emphasis on employee engagement, training, and creating a culture of continuous improvement is commendable. By encouraging employees to actively participate in problem-solving initiatives, Dachi SRL harnesses the collective intelligence and expertise of its workforce. This approach fosters innovation, ownership, and a sense of pride among employees, ultimately driving the company towards achieving its objectives and exceeding customer expectations.

The company understands the importance of quality management in delivering high-quality food factories to their clients. By adopting a systematic approach to problem solving, they effectively identify and address challenges specific to food factory design and manufacturing. The implementation of ISO 9001 standards further strengthens their quality systems, ensuring compliance with

international standards and customer satisfaction. Furthermore, the implementation of world-class problem-solving methodologies, coupled with the application of quality control pillars, ensures that Dachi SRL maintains a competitive edge in the industry. By consistently monitoring performance, identifying areas for improvement, and investing in technological advancements, Dachi SRL remains at the forefront of innovation and efficiency in food factory design and manufacturing.

By hiring people globally, Dachi SRL can tap into a broader talent pool with specialized skills and knowledge in various areas of the mechanical construction industry. This enables them to bring in individuals who possess specific expertise that may not be readily available locally. Through this approach, Dachi SRL can access the best talent, regardless of geographical boundaries, and enhance their overall capabilities.

Global hiring also provides Dachi SRL with the advantage of cultural diversity and different perspectives. By having a team of professionals from various backgrounds, they can foster a creative and innovative work environment. Diverse perspectives can lead to unique problem-solving approaches, improved decision-making processes, and enhanced creativity, ultimately driving the company's success. Furthermore, hiring people globally allows Dachi SRL to expand their operations and reach a wider market. By establishing a global workforce, they can cater to the needs of clients from different regions, understanding their unique requirements and providing tailored solutions. This global presence not only enhances their reputation but also opens up new opportunities for growth and business expansion.

The Ecommerce website (B2BSRL) established is well in line with the Total Quality Management perspective and it enables the company to better pitch its product to the world. Customer Satisfaction and involvement in supply process

is ensured through this ecommerce website and it will help the company grow more and more as the industry of mechanical manufacturing grow.

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