



# Operational Excellence Through Lean Management In Q2 Carwash Company, Uae

**A.A. Sathakathulla**

Principal, Cheran Colleges, Tamil Nadu, India.

**Abstract:** Carwash is an obligatory business in the UAE to adhere to policies and regulations. Operational excellence is a challenging process of any business and especially for the service sector. The Geowash technique was new to UAE and successfully implemented by the Q2 car wash company and running their business. The general cleaning company in Abu Dhabi is specialized with Gowash and introduced lean management concept in their business to achieve operational excellence. Their customer service, employee's commitment and affordability and extended service and less waiting time and eco-friendly carwash are their key parameters for success. Their service is endorsed by the government of UAE and achieved many awards for their service excellence across the world. Q2 car wash company ensures their systems remain efficient, safe, and competitive in the ever-changing landscape of car wash services.

**Keywords:** Carwash, operational excellence, lean management, service excellence, customer service.

## 1.0 Introduction

Operational excellence is an approach to business management that emphasizes continuous improvement across all aspects of the business. Lean management is a business methodology that is designed to increase quality and efficiency by eliminating wasted resources. Q2 carwash company is one of the pioneering car wash companies which has a huge volume of customers and a high number of employees with the largest on shore carwash company doing excellent customer service.

Carwash is an obligatory business model in the UAE due to the large number of cars on the road. Cars in UAE are from sedan type to high-end vehicles like Rolls Royce, Bugatti, Lamborghini and Tesla etc. In the UAE, cars outnumber the local population as cars are the most preferred mobilization vehicles for every individual.

The UAE government imposes strict rules on vehicles and roads to save human life and to beautify the nation. Hence cleanliness of vehicles is the chief parameter to reach elegance and dirty parked vehicles are penalized with hefty fine. Hence, carwash is an important business in the UAE. Q2 carwash company is one of the finest companies that introduced a new technique of mobile car wash at almost all-important car parking throughout the country. Their strategy of using minimum water and soap with a neighborhood friendly environment is the operational success story of the company where they impost a lean management concept to achieve this goal.

Lean or Lean manufacturing or Lean production is nothing but a systematic approach or process for elimination of waste in the manufacturing process. Reducing waste (Lean) is the key factor in operational excellence. This business process reaches excellence through channelizing operations, lean, continuous improvement in quality and productivity. The objective of business excellence is to reach maximum efficiency.

Lean is always a set of functional processes, called the PDCA cycle (Plan-Do-Check-Act model in lean) with improvement tools and techniques with little prominence on supporting the system that allows the lean tools to function efficiently. The importance of customers and their value is highly significant in lean production. The leader is the coach who creates the strategy, builds the team and develops their skills. (J. K. Liker and G. L. Convis, 2012). Lean leadership is not a standby for LPS nor is it an added feature. It is essential to achieve a continuous development of the LPS and all its processes. Lean leadership is the missing link between toolbox lean and the learning, and continuously improving organization of lean thinking. (C. Orr, 2005 and D. Mann, 2009 )

## 2.0 Literature Review

Many scholars highlighted in early years that operational excellence can only be attained over a span of period of building and sustaining development capabilities (Hayes and Wheelwright, 1984). Therefore, operational excellence is the establishments' sustained implementation of lean production that specifically requires steady, constant dedication (Pettersen, 2009). Operational excellence programs are often used to react to well-determined circumstances and to track a new preferred state, but they don't have a clear focus on the development of organization's agility competencies. Though change is constant and in fact happening, and there is significant improvement on business processes and their outcomes, the prominence often lies in meeting a predefined set of criteria (Steffen Eichl, Thomas Friedl 2021). The cultural pattern cannot be detached from the activities of an organization, and its effect raises stronger in straight proportionality with the power of the cultural context under which it is established. In this scenario, progress of a strategy will become more dependent on the existing organizational culture. This culture leads even to the risk of strategic apathy and resistance to strategic cultural change. Culture will lead an organization to stick with the politics they have used in the previous periods and to find answers within their framework, being able, in extreme cases, to "blind" managers and strategy makers to the shifting external atmosphere. The positioning of an organizational excellence program is dependent on strategic adoptions made in the scope. If they are not aligned with the current culture, it will be very problematic for them to be efficiently followed, limiting their scope and risking its results. (A.M Carvalho 2017).

Study on operational excellence in the evolving car wash industry (Anju S, Sourav Saha,2024) depicts the feasibility of incorporating automation, sustainable conveyance methods, and automotive electronics improvements to improve car wash efficiency while lowering environmental effect. Identifying the interactions and mutual exchanges between automation, sustainable mobility, and automotive to create best practices for next-generation vehicle washing systems.

The survey among literature reveals that there are several single case studies which offer unreliable evidence of the potential of adopting and success of lean (McQuade, 2008; Swank, 2003) but at the same time, some of the previous studies have shown that many attempts to integrate lean in manufacturing in businesses failed due to operational issues. (Bodek, 2008; Robinson and Schroeder, 2009). A poor communication among the operation team and mismanagement lead to failure of the entire business function. The commitment of top management is often cited in literatures of lean as a major reason for why some companies failed in implementing lean, and as a criterion for implementation of success (Suárez-Barraza and Ramis-Pujol, 2010). Leadership quality and associated issues are mentioned as enablers or inhibitors of lean implementation success in almost every academic (and practitioner) paper published in the field (Radnor, 2010; Suárez-Barraza and Ramis-Pujol, 2010). At the same time, there are indications to suggest that some lean implementation efforts failed even with top management commitment (Sim and Rogers, 2009). This forces the question of whether leadership commitment as such is not enough to confirm success in applying lean.

### 3.0 Geowash

The main aim of this Q2 carwash is concentrating the ideology of green carwash in the name of Geowash concentrating on water conservation by applying the lean concept in their carwash system with the help of MIS. An easy and powerful concept behind Geowash is that it offers a convenient experience to car owners without wasting their valuable time. No customer has to bring their cars for a carwash. The car wash comes to where the customer is. This method uses the idle times of vehicles at parking facilities, where the customers park their cars and go shopping or for work. Geowash washes cars with less than a quarter gallon of water on the average. This state-of-art carwash facility is based on the washing wagon technology that permits to spray a low pressure air mix of water and no foam biodegradable shampoo solution and a step by step cleaning method. Geowash has found the right equilibrium to protect the environment as well as to offer its customers an effective method to take care of their vehicle asset. Geowash has transfigured the traditional car washing business with an environmentally friendly and expedient car wash concept. Geowash is providing customers a time saving and value-added service: that is convenient, safe, organic and finest.

#### 3.1 Background

Q2 General Cleaning Services L.L.C., a member of the Khalifa Foundation for Enterprise Development (KFED) and a forerunner in presenting the latest eco-friendly car wash system in the UAE, established by a group of young Emirati businessmen who are committed to the environment and organic as well as reducing carbon. Q2 car wash is focusing on mobile car wash service, composed of full pledged specialized & fully trained management and service staff. Q2 carwash is the master franchisor of Geowash; an international mobile car wash service which currently exists in more than 25 countries. Geowash was introduced in the UAE by last 2008 and now serves in reputed shopping malls, offices, hotels, shopping centers and in major parking lots in different emirates. For example, Porsche Middle East & Africa FZE, Dubai, Yas Mall Abu Dhabi, The Address Downtown Dubai, Department of Transport Abu Dhabi etc. are their prime customers/locations for Q2 car wash in Dubai and Abu Dhabi.

The objectives of Q2 car wash are:

- ~ To become a chief local player in the car wash industry and general cleaning services.
- ~ Cultivate an inventive portfolio,
- ~ Be a renowned and the preferred and trust-worthy strategic partner for local investors.
- ~ Attract and retain the most qualified professionals

A modern car wash includes an assortment of mechanical devices such as pay systems, sensors, conveyors, drying equipment and presoak mechanisms placed in strategic locations in order to undertake various tasks before, during and after the wash. The water used for cleaning gets contaminated due to impurities in the form of dirt on the car and is not safe to be discharged into the environment. As a result, it's essential to strike a balance between caring for the environment while conserving energy and providing a high-quality wash. This can be achieved by water recycling and reuse. A **lean and green car** wash has to be designed in a way that minimizes use of water, takes the shortest time possible and conserves the environment by ensuring wash water is pre-treated before discharging it into the environment through the storm drain or sewer line.

#### 4.0 Objectives

The main objective of this study is to identify the success formula of Q2 carwash company which set up a unique model and progressed till date successfully and become a model for operational excellence. This study involves understanding the road map to operational excellence through lean management in Q2 car wash company.

## 5.0 Material and methods

This study involves two-way analysis in both qualitative and quantitative research. Initially qualitative study through literature survey about operational excellence, Lena managements and Q2 carwash company and UAE car wash businesses and then as secondary qualitative survey through interviews with line managers and HR personnel of Q2 car wash company. The interview process deliberates the operational excellence, service excellence and lean management in Q2. Next, a quantitative study was undertaken through a feedback questionnaire obtained from customers and staff of the Q2 carwash company to ensure the promises and quality of the service kept in. Survey questionnaires were given to the participants and collected the feedback data with very simple and minimum questions to be answered within three minutes. The output results are tabled for further understanding.

### 5.1 Interview with line managers and HR personnel

- The designers, proprietors and operators of the Q2 auto car wash are guided by the core principles: time saving, economic considerations, space considerations, environmental protection, consistency in quality and reliability.
- The salient features of Q2 are:
  - ~ Helping customers to save time, providing additional unique options for a splendid shopping experience in malls and other such areas.
  - ~ Saving gasoline and time to and from car wash facilities
  - ~ Focusing more on pleasant activities while cars are getting serviced
  - ~ Added value service at a reasonable cost
  - ~ Service at parking lots, no need to move the vehicle
  - ~ No key required for car wash when need only outside wash
  - ~ Keeps clean and shiny wash more frequently at improved maintenance
  - ~ Safe and protection for paint work
- The ingredients used by Geowash's include Teflon and Carnauba Wax, premium quality waxes and sealant. Car's surface is protected against UV rays, pollution, salt, bird droppings and many more by the Geowash protection technology of carwash. They use newly designed formula that softens, lifts, emulsifies and liquefies dirt and other impurities on contact of the cars surface on exteriors and interiors, while customized polymers wrap around residual particles in a lubrication film
- Implementing lean in carwash by adhering to five factors: quality of water, temperature of water, chemicals used, time taken to wash and water cum air pressure generated by the equipment. These factors help the cars come out clean and shiny without the chance of paint damage.
- The distribution of business is designed on two levels. One on the base level floor the machine-driven service is performed and in the second on first floor the washing is done, with a deed time of 10 mins to raise and lower the vehicle. But the complete washing time is 46 mins with involvement of at least two people in all other carwash companies. (Survey was conducted in different car wash companies to benchmark, finding an average time of 27 mins per wash is identified through literature).
- Q2 Carwash Company reached its operational excellence in 2018 and sustaining. The parameters of milestone of excellence in service: promising quality, inventive products, process excellence, greater protection, headship of management, employee's involvement, strategic direction and focus and exceeding customer expectations.
- Commitment to Quality: Q2 carwash does the usual services like cleaning exterior with minimum water and soap and the quality of liquid spray used in the exterior cleaning gives a mirror finish dazzling look to the exteriors of the car as an added feature in their carwash. And interior vacuuming is their special feature that makes dirt free in all nooks and corners. Further, windows cleaning, tire dressing and additional services like

waxing and polishing. They keep less time to do all these activities and save the waiting time of customers. This added feature is advantageous for customers. Car wash offers cleanest, driest (at lesser time) and shiniest cars possible in a short period of time. The entire car wash works in synergies to reach the goal. Further, they offer inner aroma oil spills and/ spray to keep the interiors of the car to bring bliss to the customers. These fragrances are provided with more than fifteen varieties based on the customer's wish. They obtain every customer feedback to ensure their services have a star rating and they prioritize the customer satisfaction with happy mood departure to ensure they meet the quality standards for the customers.

- The process excellence is obtained only through consistent operation functionality. The process of Operations takes the following tools: entrance area, queue lane, pre-wash area, wash tunnel, finishing area, exit area and payment and customer service area. They provide rest areas with high amenities and/or drive through facilities moreover facilities at malls. Customers drive into the mall with cars and drive away with new shining cleaned cars at an affordable price with zero waiting hours with valet services. Making the waiting time zero with eco-friendly wash is the significance of process excellence in Geowash technology.
- Q2 carwash ensures superior safety for each vehicle that comes under service. Predominantly the quality of water and chemicals used to wash the car is highly safe for the car and environment. Secondly, the wax used to polish and the fragrances used in interiors of the cars. They take utmost care about the detergent free chemical free shampoo with moderate foam nourishment with ease to wash with limited water. The shampoo used for washing ensures the car is painted in the long period and free from rust. The microfiber towel is often chosen in this company over a soft cloth. It absorbs more water, and a dry microfiber towel reduces the risk of leaving scratches on the cars compared to other soft materials like soft cloth etc. It kicks away all kinds of abrasive grime from the cleaned surfaces.
- The durability of the car impacts the operational efficiency of carwash and maintenance. Q2 service ensures high quality corrosion-resistant materials are used for car wash that ensures and enhances customer satisfaction by providing reliable and quality service.
- The attributes of Q2 leaders are: creating positive work culture, acting decisively, passion and pride, humanity and etiquette, and forward thinking.
- They have created positive work culture with a high happiness index of employees and their employee's retention is over 92%. The positive work culture is advantageous in their business process excellence. They have an inspection pilot team to visit the malls and the cleaning bays to understand the progress and to monitor operation functionality.
- Productivity is measured by the efficiency of employees' engagement. In Q2 the employee's productivity is measured by the service offered by an individual employee per day with the number of cars washed within a minimal time period. The employees' engagement is not just measured only by efficacy and productivity but also their commitment, involvement and work for the mission and vision. Employees experience summarizes everything from the workstation to organization and has tons of opportunities to make it positive. The leader's decision is vital in employees' engagement to make sure that the workplace is the best one.
- Commitment: Q2 car wash made the employees feel their company as second home with ultimate satisfaction and commitment. The key factors of achievement:
  - ~ Gathered feedback from employees regularly
  - ~ They acted on their feedback and resolved issues swiftly
  - ~ Put extra focus on the on-board operation process
  - ~ Used eNPS survey (Employees net promoter score) from time to time to catch all short forms and metrics of the organization.
  - ~ Provided positive opinions from leadership
  - ~ Focused on well-beings of the employees by providing extra fringe benefits
  - ~ Supported work station timing and other amenities and services for the employees

Resulted high efficacy of employee engagement. Moreover, the company changed policy to benefit the employees sharing with higher profit rate by thinning their profit. Furthermore, the leadership management offered

- ~ Visiting workstations and motivating employees by meeting them in person and getting customer surveys in the presence of employees.
  - ~ Team leaders involved in more front-line initiatives.
  - ~ Employees are encouraged to join happy hours and similar team-building events.
- Team leader empowerment: Having an effective, empathetic leadership is a crucial part of feeling engaged as an employee. The continuous monitoring of employee's performance along with their well-being and extra fringe benefits increased their engagement and productivity to reach the milestone. It plays an important role as a game changer in employee experience in organizational excellence.
  - Exceeding customer expectations on a regular basis is the best way to retain their loyalty. A surprise more than their normal expectation always pays back as customer retention. It gives relief from stress and reduces their burden and time-consuming work. The main objective of Q2 carwash is to provide excellent customer service at every opportunity. So, they designed the carwash business in such a way that customers do not require to spend any extra time and effort to do this. They planned offering services at every possible opportunity to satisfy customers and to fulfill customer needs. In addition, providing value-added services beyond the usual basic car wash, surprises the customer and exceeds their expectations. At some point, cleaning personnel help the customers to load and unload luggage in the cargo section, door operation assisting in every activity like a host makes the customer feel comfortable with service. The additional host service and freebies are add-on services by the Q2 car wash to meet the customer satisfaction and retain loyal customers. The enhanced service fosters a one-stop solution for customers, heightening their convenience and satisfaction.
  - Lean (Leadership) Management: Q2 car wash strictly followed the concept of Flow, one of the principles of lean. Further, stepping the flow is demand from the customer is fulfilled through a process of minimum waste. Lean is reducing not only waste but also improved quality on the process itself. Trimming the inventory, time and proper planning makes the functionality of operation towards excellence. The strategic lean process involves:
    - ~ Avoiding extra labor and cleaning equipment at parking in Malls
    - ~ Utilize time on hand to reduce queue size and waiting time.
    - ~ Unwanted transportation
    - ~ Reducing process time and job allocation using through a perfect scheduling
    - ~ Reducing stock on hand (inventory). Unwanted quantity of cleaning products
    - ~ Controlling unwanted movement of staff and cleaning vehicles.
    - ~ Avoiding defective products. Quality concerned with zero waste concept.

## 6.0 Customer Feedback

A successful model is always noticed by the people in the business sector to update their business strategy and acquire customer satisfaction and customer retention. Hence, this Q2 carwash catches the eyes of fellow concerns. Hence, the business model helps to reform a particular business sector and leads to business decision making and policy making. So, a model to help policy making needs to be analyzed well before the same to be placed on the table. Affordability and availability and their service along with courteous staff with timely and services eye catching the people and business. Professionalism is a key to success.

To ensure their success we preferred to add two small quantitative surveys one from customers and the other from employees of the Q2 Company. Prepared a questionnaire with limited questions and the survey was conducted from a very small group at random. Findings are placed for discussion. Continually winning the bid and obtaining the contract from Both Dubai and Abu Dhabi government for Mall's car cleaning itself evidence for their error free service with highest rate of customer satisfaction. More than 12 years they are renewing contracts without any hiccups from both government itself, significance for their service and operational Excellence.

## 6.1 Survey and results from customer

A small quick survey was conducted from customers who utilized Q2 car wash in malls using a smart device to register their feedback with very limited questions that did not take more than two minutes. Customers were selected on a random basis invariably of the gender and nationality. 15 customers from Dubai and another 15 customers from Abu Dhabi, one mall from each emirate. This survey is purely random to check the feedback of customers to ensure the promises of Q2 carwash company.

**Rate the following on a scale of 1 (lowest rating) to 5 (highest rating) stars**

Questions	Rating					Overall Score
	1	2	3	4	5	
Was the Q2 carwash staff friendly and courteous?	--	--	--	--	30	<b>5</b>
Rating for the exterior cleanliness of your Car	--	--	--	--	30	<b>5</b>
Rating for the interior cleanliness of your Car	--	--	--	--	30	<b>5</b>
Rate overall cleanliness of Q2 carwash facilities	--	--	--	2	28	<b>4.94</b>
Overall, how would you rate the services of Q2 provided to you?	--	--	--	--	30	<b>5</b>
Would you recommend Q2 carwash to friends & family? / Will you use their service again	--	--	--	1	29	<b>4.97</b>
Rate the add-on services	--	--	--	--	30	<b>5</b>

Customer feedback does not surprise as promised by Q2. Almost all customers are happy with their service and staff behavior etc.

## 6.3 Employees feedback

Employees' feedback was collected only from cleaning personnel at Malls from Dubai and Abu Dhabi. A Total of 32 employees were involved in this survey and all the employees were taken to Q2 carwash service from four Malls two each from Dubai and Abu Dhabi. Survey was conducted by two language assistants and used an iPad device online survey from all employees from different nationalities. We used Likert five-point scale to assess their feedback but there are different scaling based on the question type. The questions and number of respondents are provided below for better understanding.

How long you have been working in this company?	# of respondents
New (Less than a year but more than six months)	4
1 – 2 years	6
3 – 5 years	8
6 – 10 years	7
More than 10 Years	7

Overall, job satisfaction with this company?	# of respondents
Extremely Dissatisfied	--
Dissatisfied	--
Neither	--
Satisfied	--
Extremely Satisfied	32

**3. Questions about supervisor**

	# of respondents				
	Strongly disagree	disagree	Neither Agree or disagree	Agree	Strongly Agree
Proper trains is provided and supports me whenever necessary	--	--	--	00	32
Listens my suggestion and gives time	--	--	--	01	31
Appreciates my contribution	--	--	--	02	30
He is knowledgeable about work and Environment	--	--	--	01	31
Kind and courteous	--	--	--	11	21

How well do you believe your manager lives by your company's ethics?	# of respondents
Extremely well	30
Very well	02
Sometimes does, sometimes doesn't	--
Not very well	--
Doesn't abide by own philosophy at all	--

**5. Questions about employee benefits and policies of organization.**

	# of respondents					
	Not All Satisfied	At Satisfied	Somewhat Dissatisfied	Neither Satisfied nor Dissatisfied	Somewhat Satisfied	Very Satisfied
Salary reviews	--	--	--	--	01	31
Health care benefits	--	--	--	--	00	32
Leaves of absence and travel package	--	--	--	--	00	32
End of service benefits	--	--	--	--	01	31
Listening to the concerns	--	--	--	--	01	31
Fringe benefits	--	--	--	--	01	31

## 6. Do you think your good work gets rewarded

Yes	No
32	00

The employees' feedback is highly positive resulting in extreme satisfaction with their work culture, environment and benefits as well as job satisfaction and happiness. This is strong evidence that Q2 car wash keeps labor policy fair and favorable enough as well as care for the employees' wellbeing. This also adds evidence to their organizational excellence functionality.

## 7.0 Conclusion

This study attempted to validate the organizational excellence through lean leadership of Q2 car wash company in UAE. This case study evidences that lean management/leadership become the chief parameter to reach organizational excellence and sustaining for more than a decade. This Q2 carwash used the concept of 4P's – the people, process, place and product or service. The rewards received by Q2 car wash is a token of recognition for their service, customer satisfaction and retention. Their performance is proven through a sample survey study from the customers and employees and managers opinions are strongly supporting their excellence parameters to meet the requirements. Q2 car wash company ensures that their system remains efficient, safe, and competitive in the ever-changing landscape of car wash services.

### References:

- [1] Alberto Muñoz, Andrea Briceño (2024) "Lean Operations Optimization Model Under the TQM and SLP in the Carwash Sector: Case of a SME in Peru", Proceedings of the International Conference on Industrial Engineering and Operations Management, DOI: 10.46254/AN14.20240531
- [2] Bodek, N. (2008), "Leadership is critical to lean", Manufacturing Engineering, Vol. 140, No. 3, pp. 145.
- [3] C. Orr, "Lean Leadership in Construction," Proceedings of the 13th Annual Conference of the International Group for Lean Construction (IGLC- 13), pp. 345-351, 2005
- [4] D. Mann, "The Missing Link: Lean Leadership," Frontiers of Health Services Management, pp. 15- 26, 2009.
- [5] Drickhamer, David, (2012), LEAN MANAGEMENT CASE STUDY SERIES:
- [6] Fabio Ramazzini Bechara & Paulo C. Goldschmidt Lessons of Operation Car Wash: A Legal, Institutional and Economic Analysis ISBN: 978-1-7359401-1-3 November 2020
- [7] Farhang Khallaghdoost Nejati, Kourosch Rajeiyan, Reza Hajati, Hamid Reza Safari,
- [8] Hayes, R.H. and Wheelwright, S.C. (1984), "Restoring Our Competitive Edge: Competing through manufacturing, administrative science quarterly", John Wiley & Sons, New York, NY, available at: <https://www.jstor.org/stable/2393118?origin=crossref> (accessed 18 December 2019).
- [9] <https://agiletestenea.wordpress.com/>
- [10] J. K. Liker and G. L. Convis, The Toyota Way to Lean Leadership - Achieving and sustaining excellence through leadership development, New York: McGraw Hill, 2012.
- [11] James P Womack, John Shook, (2006) Lean management and the Role of lean Leadership, Lean enterprise Institute ,
- [12] Mcquade, D. (2008), "New development: Leading lean action to transform housing services", Public Money & Management, Vol. 28, No. 1, pp. 57-60.
- [13] Mohammad Rashed, Relationship between management information systems (mis) and lean management, Singaporean journal of business economics, and management studies vol.1, no.10, 2013
- [14] Moisés Tapia-Esquivias, Manuel Darío Hernández-Ripalda, José Antonio Vázquez-López and Alicia Luna-González Troubleshooting a Lean Environment, J. L. García-Alcaraz et al. (eds.), Lean Manufacturing in the Developing World, DOI: 10.1007/978-3-319-04951-9\_2, \_ Springer International Publishing Switzerland 2014

- [15] Pettersen, J. (2009), "Defining lean production: Some conceptual and practical issues", The TQM Journal, Vol. 21, No. 2, pp. 127-42. <http://dx.doi.org/10.1108/17542730910938137>.
- [16] Radnor, Z. (2010), "Transferring lean into government", Journal of Manufacturing Technology Management, Vol. 21, No. 3, pp. 411-428.
- [17] Sim, K. L. & Rogers, J. W. (2009), "Implementing lean production systems: Barriers to change", Management Research News, Vol. 32, No. 1, pp. 37-49.
- [18] Suárez-Barraza, M. F. & Ramis-Pujol, J. (2010), "Implementation of lean-kaizen in the human resource service process", Journal of Manufacturing Technology Management, Vol. 21, No. 3, pp. 388-410.
- [19] U. Dombrowskia , T. Mielkea Lean Leadership fundamental principles and their application , Forty Sixth CIRP Conference on Manufacturing Systems 2013, Procedia CIRP 7 ( 2013 ) 569 – 574
- [20] Wen-Hui Kuan A Review of On-Site Carwash Wastewater Treatment, May 2022 Sustainability 14(10):5764
- [21] Will Charpentier , Demand Media, Role of a Lean Leader, Leadership for Lean Operations, Frontiers in Leadership Research, spring 2010 Malin Holm (malin.holm@hhs.se)
- [22] [www.hitachiconsulting.com](http://www.hitachiconsulting.com) Case Study Sustaining Operational Excellence through Lean Leadership,
- [23] [www.q2wash.com](http://www.q2wash.com)

