DIGITIZATION AND ARTIFICIAL INTELLIGENCE FOR LEAN CUSTOMER EXPERIENCE MANAGEMENT

Christos G. Chatzopoulos[1], Marcel Weber[2]
[1] Commercial Excellence, Maastricht, the Netherlands
[2] 3CI Customer Co-Creation, Waalwijk, the Netherlands

Abstract: *In recent years, we increasingly encounter the use of "Lean" Customer Experience Management (CEM) by companies and practitioners, but with abstracted ways and incomprehensible approaches. Moreover, Lean CEM is hardly rooted in academic literature, providing an excellent opportunity to further investigate its theoretical and practical validity. Digitization, enhanced by Artificial Intelligence (AI), is analyzed as enabler for Lean CEM. This paper is a first step of a design science research, including systematic literature and practice review, and provides insights for design propositions for application instructions for Lean CEM.*
Key Words: *Digitization, Artificial Intelligence, Lean, Customer Experience Management, Personalization, Customization*

1. INTRODUCTION

In the past three years we noticed the use of terms "Lean Customer Experience" and "Lean Customer Experience Management" in literature and online web resources by companies and practitioners. This use caught our attention making us wonder what they exactly entail. A first online search on the terms "Lean Customer Experience Management" (Lean CEM) and "Lean Customer Experience" (Lean CX) confused us, because there are no clear definitions of the terms and how to apply them, and, in case they constitute a desirable management style, a technique, a philosophy or something else. Lean CEM according to the literature review is an approach, a technique, a principle, a synergy or a combination between Lean Thinking and CX, a new concept, a philosophy, application, a model or an idea. Is Lean CEM one of those or all of them or something else?

The main commonality we found is that all cited publications refer to the creation of a terrific CX or Customer's Journey through the implementation of Lean principles in conjunction with Digitization, and sometimes with AI. Artificial Intelligence (AI) is defined as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" [1]. Machine learning is often mistakenly

called AI; to be truly intelligent, a machine must be able to transfer and apply learning in another context [2]. This lack of a universally accepted and unequivocal definition and many questions like what is the framework for Lean CX or Lean CEM, what are the best practices for implementation, what are the benefits and the value from a potential synergy among CEM, CX, Lean Management, Digitization and AI are important for companies, provide a great opportunity for research and especially a design research [3].

This paper aims at providing a start for this research in the manner of systematic literature review in order to find the appropriate clues and lead to possible design propositions [4] that can be used for the final design: application instructions and procedures for Lean CEM, pointing out pitfalls and success factors.

2. RESEARCH METHODOLOGY AND PAPER STRUCTURE

This research is a design science research, which is a systematic literature review on the phenomenon of "Lean CEM", its principles, best practices to implement it and a successful synergy with "Digitization". We already observed that there is little academic research, so we have expanded our research in the field of practice, too. It is a comparison between academia and practitioners. We used internet research findings from web resources, websites, online articles, online newspapers and literature review findings from scientific journals, books and conference proceedings. The internet research was conducted through Google search engine and for the academic literature review through Google Scholars, both from an IP in the Netherlands between February 2020 and May 2020. The findings could be processed in the future to design propositions using the CIMO-logic [5].

In the next Sections 3 and 4, we elaborate on defining the synergy between Digitization and Lean Management, and Digitization and CEM, respectively, where findings from internet research, literature review and authors' personal experience are included. Section 5 introduces the "Lean CEM", discovers the unresearched area and proposes principles and best practices for "Lean CEM".

Section 6 initiates a discussion on how AI can enhance a Digitized Lean CEM. Section 7 includes the conclusion and the future research.

3. DIGITIZATION (AI) AND LEAN MANAGEMENT

During the last years Industry 4.0 is promoted as the fourth industrial revolution, and established Lean Production Systems will be possibly affected, but the question is how and in what degree. Due to this new undiscovered area a library method is developed to evaluate the synergy between principles of Lean Management and technologies of Industry 4.0 [6]. Digitization and AI substantiate the technologies of Industry 4.0. Process improvement can be achieved by the integration of Lean and Digitization even before the pursuit of Industry 4.0 [7]. According to the literature, most of the findings should refer to industrial appliance of Digitization in Lean Organizations [8] and less to service or administration or CEM although our findings show the opposite for the past 1,5 years. We conducted a literature review from 2019 till May 2020 and we found six types of synergy between Digitization and Lean Management. All findings are presented in Table 1 and grouped into the six synergy types.

3.1. Six types of a successful synergy

How Industry 4.0, AI and Digitization affect the design and implementation of Lean Value Streams is not widely researched yet and only a little empirical evidence is found in the literature.

Table 1. *Findings on Digitization and Lean Management synergy.*

References grouped by synergy type		
Synergy Type	Literature Review – Academia	Internet Research – Practitioners
1: AI makes Lean Six Sigma tools smart.	[9], [10], [11]	
2: AI to realize Industry 4.0.	[9], [12], [13], [14]	[15]
3: AI and Lean Management as two different methods to improve business.	[16], [17], [18], [20]	[19], [21]
4: Digitization as tool for Lean Administration transformation.	[22], [24], [25], [29], [33], [34], [35]	[23], [26], [27], [28], [30], [31], [32]
5: AI as a technology for Control in the DMAIC method.	[37], [38]	
6: Lean principles and philosophy for AI tools development.	[42], [43], [44]	[41]

After our research findings, 6 types of synergy are defined. Synergy Type 4 is the most relevant to use for Lean CEM, although the others can also influence the customer satisfaction. Synergy Type 2 refers to Industry 4.0, which refers to the production and the shop floor, where the product is produced, and not to the touchpoints or any administration processes, online services, websites or on-line configurators, where the customer is or could be involved and interacts with the company. Industry 4.0 covers a part of Customer's Journey, which is the part of product's journey.

Customers' satisfaction can be influenced by Industrie 4.0 afterwards, because of providing a high quality product and a soon delivery servive due to Industry 4.0 and Lean Management implementation. As result, the experience of a fast delivery with no waiting time and the use of a qualitatve product increases customer's satisfaction.

3.2. Pitfalls and failures

Due to the fact that we struggled to find relevant references in literature review in order to cover this topic, we will mention some conditions from our observations and personal experience.

A common mistake could happen during improvement activities and especially implementing Lean Management is the "Suboptimization". The scope of such activities should be holistic from the beginning, "seeing the whole". Focusing on one part of a system or a process, it will improve and optimize this part, but not the whole system.

Another condition of unsuccessfulness is to digitize an ineffective, inefficient and not customer-oriented system or process. Therefore, Lean Management should be implemented prior to Digitization, so improve first and then digitize.

The last condition is when Top Management is not involved and committed to implement any type of synergy between Digitization (AI) and Lean Management This is also known in Lean Management and Change Management, where Top Management influences the outcome of such activities.

It is obvious that more conditions could exist and consequently a further research is needed.

4. DIGITIZATION (AI) AND CEM

Hafsi and Assar [45] identified four major groups of how digitization can transform customer experience: understanding the customer, enabling selling activities, managing customer touch points, and integrating digital technologies, the first three of these being customer interaction activities. Their findings show that the systematic management of digitization projects through enterprise architecture modeling (EAM) has the potential to support customer experience improvement projects.

An analysis [46] reveals that the influence of sales digitization technologies, which include digitization and artificial intelligence, is likely to be more significant and more far reaching than previous sales technologies because of its possibilities to process a lot of dynamic customer data. People in marketing or customer service have to deal with a large amount of data in order to interact in a personal way with their customers [47]. However, they can't always instantly access the right information without the support of automated, digitized or even AI.; the volume of data captured and used render databases like traditional CRM-systems obsolete.

Artificial intelligence has the powerful ability to acquire and analyze large volumes of data and provide decisions for action [47][48][49]. So, in the future, artificial intelligence (AI) appears likely to influence marketing strategies, including business models, sales processes, and customer service options, as well as customer behaviors [49][50] in ways of:

- Recommendation engines to select content based on an analysis of past behavior of users or similar users, better predicting the next best and personalized offer to show a consumer [51] [52] thereby streamlining marketing efforts and reducing costs of marketing research and general advertising [53][54];
- Content creation engines, automated customer service systems, and chatbots using natural language processing to perform contextual searches, streamline processes, and answer questions;
- Speech recognition to predict the most likely words someone is saying;
- Facial recognition that recognizes or identifies a person, in order to personalize the interaction.

AI is allowing organizations to improve the productivity and value of customers' interaction with the organization [55], to "deliver an ad experience that is more personalized for each user, shapes the customer journey, influences purchasing decisions, and builds brand loyalty" [56][52] and to create a long-lasting relationship with the brand [57]. It seems that when a company succeeds in making customers feel valued it is a small step for customers to be engaged in co-creation [58].

4.1. Conditions for a successful synergy

The conditions to choose and adapt a digitization strategy with the application of AI which can successfully improve CX can be categorized in four categories.

First there is the economic category of conditions, which entails that investments in digitization and AI have to be budgeted as much for integration and adoption as for technology [59] and have to benefit economically [60]. So, companies must target their efforts and investments carefully [61], looking at not only the technological and organizational aspects of their investments, but also at the expected benefits in terms of CX improvements.

Next there is the technological category of conditions. Before embarking on an AI initiative, companies must understand which technologies perform what types of tasks, and the strengths and limitations of each [62] assessing its capability to interact with the customer before it's deployed [59][63] by starting small with one or a few pilots, before expanding [59]. One should also look into the condition whether systems are ready to process and deliver the required data [64]. Relevant data must be available and reliable to deliver personalized messages in the right channel at the right moment [48][65].

A third category of conditions consists of organizational conditions [48][59][64][66], like top management commitment [50][64][63], a cross-functional approach [64][59] where business and operational people work side by side with analytics experts. And when development teams involve end users in the design of applications, the chances of adoption increase dramatically [59]. And to ensure the adoption of AI, companies need to educate everyone, from the top leaders down [48][59] to master the required new skills for AI [67].

Our final category of conditions focuses on customer-directed conditions, which can also be categorized as "understanding the customer better" [63]. In order to really improve the CX, it is necessary that the customer's perspective is taken into account. It is recommended to make the customer a stakeholder to participate with their own inputs and benefits. But, from the customer's point of view, the technology is generally not apparent and obvious. Digital transparency is only one aspect of the transparency that some people want. The challenge is to seek consensus in a climate of renewed trust, to share value with customers better, to think about long-term relationships rather than short-term transactions, to be proactive and flexible with customers, equality between partners, respect for promises, the morality of duty and aspirations, equity, trust, a sense of responsibility and the commitment of multiple partners in relational exchanges [49]. Understanding and mapping customer journeys by collecting data will make it possible to evaluate and optimize systems and touchpoints [63]. Design skills must make the different physical and digital touchpoints homogeneous in order to facilitate the customer's transition from one touchpoint to another [67], reducing the irritability caused by the multiplicity of touchpoints throughout the customer's decision-making process, by creating fluidity between the touchpoints [68], increasing the level of customer satisfaction [69].

Finally, it is recommended that companies create a learning culture environment and infrastructure to learn continuously from the customer in order to provide better custom experience to the customer. Using inferred data from only current activities for future behavior may yield low accuracy in this complex interaction of customers and information, therefore yielding low ROI in the digital customer experience transformation [63].

Cases we can learn from are Vodafone [70] in the UK and Kickstart AI in the Netherlands [66]. Because of paper size limitations we will not discuss these cases in this paper.

4.2. Pitfalls and failures

Despite the promise of AI to improve CX, many organizations' efforts with it are falling short. A study surveyed thousands of executives about how their companies use and organize for AI and advanced analytics, and its data shows that only 8% of firms engage in all core practices that support widespread adoption [59]. Four studies[59] [62] [63][71] provide us with the most common reasons for failing in digitization with AI. Most of these failures in adopting AI are caused by failing to meet one or more conditions for success, mentioned above. One of the main problems is that there's a lot of debate about the "best organizational model". Whether to centralize or decentralize depends on

a firm's individual situation [59]. Deciding to get a few projects up and running, they begin investing millions in data infrastructure, AI software tools, data expertise, and model development. Some of the pilots manage to eke out small gains in pockets of organizations. Also, firms struggle to move from the pilots to companywide programs—and from a focus on discrete business problems, such as improved customer segmentation, to big business challenges, like optimizing the entire customer journey [59].

Another study encountered several organizations that wasted time and money pursuing the wrong technology for the job at hand. Acquiring this understanding for the right technology requires ongoing research an education, usually within IT or an innovation group [62].

Collecting and using reliable data is a problem a study survey [63] discovered about the limited effort in grasping the fundamental or the core element of the digital transformation which is: "Understanding the customer". Gathering data of customer around the product, online activities, or related services do not give a company comprehensive information or profile about the customer. Customers embark and disembark easily at any point of their customer journey of a product because they have access to information and multiple choices at any stage of the journey [63].

But, nevertheless, most literature highlight mostly positive consequences of AI, without detailing the widespread, justifiable concerns associated with their use. However, AI might not deliver on all its promises, due to the challenges it introduces related to data privacy, ethics, and job security [50][49].

The great fear about cognitive technologies is that they will put masses of people out of work. However, a study [62] believes that most workers have little to fear at this point. The theory asserts that AI job replacement occurs fundamentally at the task level, rather than the job level, and for "lower" (easier for AI) intelligence tasks first [72]. On the other hand, another study [72] asserts that eventually, AI will be capable of performing even the intuitive and empathetic tasks, which enables innovative ways of human–machine integration for providing service but that will also result in a fundamental threat for human employment [72]. The problem of job reduction fears hasn't been decided on yet.

Companies should develop in line with the technological, social and environmental developments that have been highlighted, clear rules and strategies – such as transparency – to better reconcile business performance with respect for customers. A customer relationship manager could investigate the consequences of their actions and estimate their positive (satisfaction, well-being, etc.) and negative (frustrations, overconsumption, environmental impact, etc.) externalities. An annual reporting would make it possible to draw up a balance sheet and see how much the company has been able to improve the overall management of its customers. In other words, customer relationship management must now move beyond the logic of optimizing customer processes (acquisition, satisfaction, retention, enhancement) to explore new avenues that will allow it to reinvent itself [49].

5. LEAN MANAGEMENT AND CEM

Lean CEM is analyzed, principles and best practices are introduced to dissolve any conflicts and clarify the confusion captured by the literature review cited below.

5.1. Lean CEM

How is Lean CEM already conceived? Lean CEM is an already known term in the internet. The term is mentioned by practitioners, companies and corporations with their own way. No any standard way to describe the term is found through the internet research. Lean CEM are different notions, covers different areas and is applied differently.

The references from practitioners are more than academia, but still statistically not significant, due to the small numbers of references, see Table 2. This situation can be a research opportunity for the academia to open a discussion on Lean CEM and to contribute to the creation of a new concept, philosophy or model.

Table 2. *References on "Lean Customer Experience Management"*

Research sources	References on Lean Customer Experience Management
Internet Research – Practitioners	1. LCXM is a synergy and a new concept. AI is used [78]. 2. Philosophy based on Lean tools and Lean principles, which affect Customer [79]. 3. Lean and CEM as training courses [80] [81] [82]. 4. Lean applied to CEM [84]. 5. Business event for Lean CEM [83]. 6. Training course on Lean CEM.
Literature Review – Academia	1. Approach and technique [73] 2. Customer - oriented perfection and Customer Satisfaction can be created and developed continuously [76]

Due to the previous findings, we continued our investigation with the keywords "Lean Customer Experience" by following the same research methodology. The findings from the internet research are numerous with more details than those from academia, passing the race baton to practitioners. Practitioners are way ahead with Lean CX presenting 21 references instead of only 2 references from academia, see Table 3 below. There is a lack of a universally accepted definition and framework on what Lean CX is or could do, providing a great opportunity for research.

Table 3. *References on "Lean Customer Experience" or "Lean CX"*

Research findings	References on Lean Customer Experience or Lean CX
Internet Research – Practitioners	1. Mentions the term [89]. 2. Application of Lean principles [90]. 3. Methodology that rearranges

	resources and automates processes [91]. 4. Step by step framework for white-collar businesses [92]. 5. Very useful and promising combination [93]. 6. Lean Management and CX are two worlds and a tradeoff is needed [94]. 7. Application of "Lean 6 Sigma" to improve services [95]. 8. Optimization to improve contact center [96]. 9. Roadmap to achieve an End-to-End vision of the Customer Journey [97]. 10. Training course on combining Lean methodology and UX [98]. 11. "Lean customer experience platform" as an IT tool [99]. 12.-21. More references without technical details [100] [101] [102] [103] [104] [105] [106] [107] [108] [109].
Literature Review – Academia	1. Application of Lean Management [85]. 2. Lean as a tool to design Service and CX [88].

Although CEM is focused only on company's performance during its customer's interactions referring to Touchpoints, Customer's Journey is not only that, but even more. It consists of everything that happens from the existence of customer's needs till the satisfaction of those needs. It is the whole time including not only the Touchpoints, but also the In-between Touchpoints, speaking for a Total CEM (TCEM) and a Total CX (TCX). This whole time is called Lead Time in Lean Six Sigma (LSS) – and in Lean Management. We will use the term "Lean CEM" referring also to "Lean Customer's Journey", "Lean CX", "Lean TCX" or "Lean TCEM", as we see them used by other authors for the same purpose.

5.2. Conditions for a successful Lean CEM

The sequential principles for Lean CEM will be the same principles with Lean Thinking [77] and advanced by Customer's Journey Map (CJM) [110] [111], CX – TCX and CEM – TCEM:

1. Specify Value for the customer in the whole Customer's Journey.
2. Identify the Value Stream in the whole Customer's Journey.
3. Establish data Flow in the whole Customer's Journey.
4. Establish data Pull in the whole Customer's Journey.
5. Seek for Perfection continually or continuously for a flawless, joyful and delightful wholistic Customer's Journey.

5.3. Best practice for Lean CEM.

In order to get the best results for Lean CEM implementation the following steps, which are not mandatory, should be taken into account.

1. Review the goals for the product or service.
2. Gather Voice of Customer (VOC) and research data, by customer interviews, contextual inquiry, customer surveys, customer support logs, web analytics, social media and competitive intelligence.
3. Map Customer's Journey as a timeline, where Awareness, Research, Options, Delivery and Follow up categories are illustrated and analyzed. Ordering and Production are captured by the Delivery part.
4. Analyze the previous categories into detailed tasks/steps that customer performs or need to perform.
5. List and illustrate customer touch-points and the channels where they occur, for example bay bill and channels are pay via mail, pay online or pay in person.
6. Empathy map, create it in each touch-point, depicts the various facets of a persona in a given scenario, how do you feel as a customer? What customer says, thinks, does, feels? Find the root causes of the patterns to understand the customer.
7. Illustrate Customer's Journey Map as a Value Steam Map (VSM), where tasks / steps are shown.
8. Identify value and non-value added steps.
9. Capture, calculate and illustrate the time spent in each value and non-value added steps.
10. Identify and illustrate bottlenecks and other types of waste on the VSM according to Lean Management.
11. Identify and illustrate where the pains - Empathy map - and where the negative emotions are or can be created in the whole Customer's Journey. Failure Modes and Effects Analysis (FMEA) from LSS can also be used to identify what can go wrong.
12. Brainstorm to come up with KAIZEN ideas and capture improvement opportunities. The goal is to eliminate or reduce the aforementioned in points 8-11 everywhere in Customer's Journey.
13. Affinity diagram to organize, group and score KAIZEN ideas by cost benefit, PICK-Chart and other prioritization analysis and techniques.
14. Design Future Customer's Journey, gather all effective, efficient and applicable ideas and get creative.
15. Refine Customer's Journey by establishing flow, so the whole Customer's Journey flows in time without interruptions, errors, negative emotions or pains.
16. Refine Customer's Journey by establishing pull, so the whole Customer's Journey is smoothly levelled, not blocked, stuck or hindered. Kanban Board tool for process management can be used.
17. Digitize where possible, see Sections 3 and 4 for more details.

18. Share with zeal.
19. Perfection through a sustainable continual or continuous improvement culture and management system. Methods like DMAIC, PDCA, and Process Management and Control can be used.

5.4. Pitfalls and failure conditions in Lean CEM

After defining Lean CEM , its principles and its best practices, we will mention some non-exhaustive pitfalls and failure conditions based on our observations and personal experience, due to the lack of references in the literature.

"Suboptimization" can happen in Lean CEM. Lack of Top Management's involvement and commitment. Qualifications, skills, knowledge and experience of the resources, who implement Lean CEM can influence Lean CEM's outcome.

6. DIGITIZATION (AI) AND LEAN CEM

After analyzing the synergy between Digitization (AI) and Lean Management, and the synergy between Digitization and CEM, we intend to introduce a discussion on Digitization (AI) and Lean CEM. Our intention is to analyze the synergy between Digitization (AI) and Lean CEM.

6.1. Conditions for a successful synergy

We conclude that Synergy Types 1, 2, 4 and 5 mentioned in section 3.1, together with the conditions from section 4.1 are the conditions for a successful synergy between Digitization (AI) and Lean CEM:

1. LSS tools are used by the best practices for Lean CEM, and AI makes those tools smart, so Synergy Type 1 is a successful synergy.
2. Industry 4.0 is referred to production process, which influences the lead time in Customer's Journey, and AI realizes Industry 4.0. Therefore, Synergy Type 2 is considered as another successful synergy.
3. Administration processes need to be transformed into Lean Administration processes and Digitization is a tool for this transformation. Hence, Synergy Type 4 is another successful synergy.
4. After designing and creating a Lean Customer Journey, controlling and managing the journey is the next step. AI as a technology for Control in the DMAIC method is another successful synergy, see number 19 of best practices for Lean CEM. So, Synergy Type 5 is a successful synergy between Digitization and Lean CEM.
5. Review investments for Digitization technologies and AI for their benefits in terms of CX improvement.
6. Review systems whether they are ready to process and deliver the required data in the Customer's Journey and improve them inherently. Data must be available and reliable to deliver personalized content and processes to the customer.
7. Avoid a fully engineered tool with all capabilities, but follow a pilot-approach of small tools easy to complete.

8. Take a cross-functional approach, with business, operational, analytical people and end users (in some cases the customer) working together at broad organizational issues.
9. Educate and train all employees that are involved.
10. Be aware of a need for cultural change in the organization.
11. Be transparent to customers and involve them to enhance adoption and use.
12. Use customer data to personalize offerings, predict future behavior and improve the customer journey for every touchpoint.

6.2. Pitfalls and failure conditions

We conclude with some non-exhaustive pitfalls and failure conditions derived from section 3, 4 and 5 for Digitization (AI) and Lean CEM:

1. Where AI and analytics capabilities should reside inside the organization, what is the best organizational model.
2. Use of wrong technology to digitize customer experience.
3. Collecting and using the right data to improve customer experience.
4. Data privacy, integrity, ethics and job security
5. "Suboptimization" of Customer's Journey during the Lean CEM's best practices implementation. "Seeing the whole" is needed as a strategy when implement the Lean CEM's best practices.
6. Digitize a non Lean Customer's Journey. Customer's Journey should be Lean and then digitized. Lean CEM prior to Digitization (AI) is needed as a strategy and the sequence of Lean CEM's best practices should ensure that.
7. Lack of Top Management involvement and commitment is another important condition.
8. Unqualified and non-experienced resources, who implement Digitization (AI) and Lean CEM is another condition of an unsuccessful synergy.

7. CONCLUSION AND FUTURE RESEARCH

We conclude that Digitization is a tool and Lean Management is a Philosophy with principles and tools, although some practitioners will disagree. Digitization can enhance tools of Lean Management to design, control and manage a process or a system. We defined "Lean CEM", its principles and its best practices. We defined conditions for successful and unsuccessful synergies between Digitization (AI) and Lean, Digitization (AI) and CEM, and Digitization (AI) and Lean CEM through a literature review, internet research, author's observations and personal experience. We will continue observing the research activities in order to understand as many different synergies as possible with the goal to build the framework for a successful Digitization (AI) and Lean CEM synergy.

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CORRESPONDENCE

Dr. Christos G. Chatzopoulos,
Commercial Excellence,
6221 JM Maastricht,
the Netherlands
cchatzop@gmail.com

Dr. Marcel Weber
3CI Customer Co-Creation,
5141 HB Waalwijk,
the Netherlands
marcelweber4@gmail.com