

INSTITUTO SUPERIOR DE ENGENHARIA DO PORTO

MESTRADO EM ENGENHARIA ELECTROTÉCNICA E DE COMPUTADORES



LEAN MANAGEMENT ? REVISÃO BIBLIOGRÁFICA 2017-2020

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A iluminar o meu caminho, a estrela mais brilhante...para mim.

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Quero deixar o meu sincero agradecimento para todos aqueles que fizeram parte não só desta investigação, mas também todos aquela que de forma direta ou indireta ajudaram no meu desenvolvimento pessoal e profissional.

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Resumo

O aumento crescente da competitividade entre as organizações, marcada pela globalização, a necessidade de análise e estudo das atividades logísticas e de melhoria contínua, identificando os problemas/limitações que provocam perdas e desperdícios na cadeia de valor são fatores preponderantes para a utilização de ferramentas de melhoria de processos na área da gestão. Torna-se fundamental reduzir os custos das empresas, encaminhando-as para obter melhores desempenhos, através da minimização/eliminação das atividades que não acrescentam valor nos processos empresariais.

Uma forma de alcançar estes objetivos é recorrendo a uma gestão da produção Lean. Esta filosofia de gestão está, frequentemente, associada à implementação de algumas metodologias e/ou ferramentas, nomeadamente, o Mapeamento do Fluxo de Valor, Value Stream Mapping, as metodologias Kaizen e 5“S”. Sendo que o Lean Management aplica estas ferramentas colocando o cliente em primeiro lugar, buscando a melhoria contínua, entregando o maior valor possível com o menor desperdício possível, seja de recurso ou tempo, A ideia central é maximizar o valor do cliente e minimizar o desperdício, com menos recursos.

O objetivo deste trabalho é apresentar a importância da filosofia do Lean Management e, baseado na revisão bibliográfica, realizar uma análise do impacto da aplicação desta metodologia, nos diferentes tipos indústria e sectores de atividade. O trabalho foi iniciado com uma revisão da literatura com a descrição do que é o Lean Management, os seus princípios, história e principais ferramentas. A partir da revisão da literatura , é feito um sistema de classificação baseada nos seguintes parâmetros: autores, ano, metodologia, área de aplicação, análise quantitativa, análise qualitativa, citações, que servirão para classificar e estruturar os artigos da revisão. Uma vez classificada e estruturada, a revisão

bibliográfica sobre a metodologia Lean Management esta por sua vez irá validar as metodologias utilizadas através do Excel, e da aplicação PowerBI.

As principais contribuições deste trabalho irão servir de base para um maior conhecimento da literatura existente atualmente sobre metodologias Lean e propor sugestões de pesquisas futuras na área.

Palavras-Chave

Lean Management, Lean Thinking, Lean Manufacturing, Operations, Culture, Industry, Industry 4.0, RH, *PowerBI*.

Abstract

The increasing competitiveness among organizations, marked by globalization, the need for analysis and study of logistical activities and continuous improvement, identifying the problems / limitations that cause losses and waste in the value chain are preponderant factors for the use of management tools. process improvement in the management area. It is essential to reduce the costs of companies, leading them to obtain better performances, through the minimization / elimination of activities that do not add value in the business processes.

One way to achieve these goals is by using Lean production management. This management philosophy is often associated with the implementation of some methodologies and or tools, namely, Value Stream Mapping, Kaizen and 5 “S” methodologies. Since Lean Management applies these tools by placing the customer first, seeking continuous improvement, delivering the highest possible value with the least possible waste, whether of resources or time, the central idea is to maximize the value of the customer and minimize waste , with fewer resources.

The objective of this work is to present the importance of the Lean Management philosophy and, based on the bibliographic review, carry out an analysis of the impact of the application of this methodology, in the different types of industry and sectors of activity. The work started with a literature review with a description of what Lean Management is, its principles, history, and main tools. Based on the literature review, a classification system based on the following parameters is made: authors, year, methodology, area of application, quantitative analysis, qualitative analysis, citations, which will serve to classify and structure the review articles. Once classified and structured, the literature review on the Lean Management methodology will in turn validate the methodologies used through Excel, and the Power BI application.

The main contributions of this work will serve as a basis for a greater knowledge of the currently existing literature on Lean methodologies and propose suggestions for future research in the area.

Keywords

Lean Management, Lean Thinking, Lean Manufacturing, Operations, Culture, Industry, Industry 4.0, HR, PowerBI.

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Acrónimos

TPS	–	<i>Toyota Production System</i>
IoT	–	<i>Internet of Things</i>
JIT	–	<i>Just in Time</i>
KPI	–	<i>Key Performance indicator</i>
OEE	–	<i>Overall equipment efficiency</i>
PDCA	–	<i>Plan, Do, Check, Act</i>
PESTEL	–	<i>Macro Analysis</i>
5S	–	<i>Seiri, Seiton, Seiso, Seiketsu, Shitsuke</i>
7R	–	<i>7 Rights</i>
OEM	–	<i>Original Equipment Manufacturer</i>
SWOT	–	<i>Strengths, Weaknesses, Opportunities, Threats</i>
SLR	–	<i>Systematic Literature Review</i>
ECR	–	<i>Efficient customer response</i>
VMI	–	<i>Vendor Managed Inventory</i>
ERP	–	<i>Enterprise Resource Planning</i>
QRM	–	<i>Quick Response Manufacturing</i>
IA	–	<i>Inteligência Artificial</i>
COVID-19	–	<i>CO(Corona), VI (vírus), D (doença)</i>

1. INTRODUÇÃO

Esta tese tem como tema o Lean Management com todas as suas variantes e correspondente pesquisa bibliográfica desde 2017 a 2020, proporcionando uma perspetiva mais atual com as últimas publicações nestes últimos anos.

O Lean Management é na realidade uma *framework* que engloba várias perspetivas sobre as organizações sendo eles empresariais, privadas, públicas ou até de caráter social, pois a sua aplicabilidade se estende em todas estas vertentes.

1.1. CONTEXTUALIZAÇÃO

Este projeto advém da minha experiência profissional ter tido ao longo dos anos um grande enfoque sobre o Lean e as suas metodologias e ferramentas em conjunto com uma curiosidade sobre o que se tem vindo a desenvolver em diversas áreas empresarias e no mundo académico.

1.2. OBJETIVOS

O objetivo principal é proporcionar a estudantes, investigadores, professores e a demais interessados acesso a todo um conjunto de publicações recentes sobre Lean Management, com enfoque em *Lean Manufacturing* e na indústria 4.0 e uma análise rápida e atual das futuras tendências do *lean*, com o acesso a um *dashboard* em *PowerBI* que permita analisar todos os dados de acordo com o interesse do utilizador.

O scope foi alargado o mais possível a várias indústrias, serviços e áreas de aplicação de forma a proporcionar aos leitores, acesso rápido, por tema, palavras chaves aos endereços onde estas estão localizadas e de forma a proporcionar informação útil, atempada e adequada sobre os resultados da aplicação Lean, dos benefícios ou estudos comparativos feitos sobre as diferentes áreas de aplicação.

1.3. CALENDARIZAÇÃO

A pesquisa e a sua prossecução conduziu à calendarização apresentada na tabela 1.

Tabela 1 Calendarização do projeto

Itens	dez/19	jan/20	fev/20	mar/20	abr/20	mai/20	jun/20	jul/20	ago/20	set/20	out/20	nov/20
Escolha e decisão sobre o tema	X											
Análise da literatura		X	X	X	X							
Recolha e tratamento dos resultados da investigação						X	X	X				
Criação do Excel e Power BI									X	X	X	
Elaboração escrita da Tese											X	X

1.4. ORGANIZAÇÃO DO RELATÓRIO

O relatório é organizado em quatro capítulos. No Capítulo 1, o atual é apresentado os objetivos e contextualização do tema. No capítulo seguinte, 2, é apresentado o tema e o estado da arte do Lean Management. No capítulo 3 é feita a apresentação da investigação bibliográfica e o respetivo modo de classificação.

Finalmente, no capítulo 4 é identificado as conclusões e futuros enquadramentos.

2. ESTADO DA ARTE

O Lean Management é um conceito mais recente em que se foca em todo o processo de otimização por toda a cadeia de valor e não apenas no processo produtivo (Helmond e Samara, 2019), assim procura todas as ineficiências, colocando estas transparentes, à vista da organização e transformando se possível em atividades de valor acrescentado (Ohno, 1990); (Helmond e Terry, 2016).

Neste conceito a cadeia de valor é aumentada a montante, com os fornecedores e a jusante, nas vendas e marketing, chegando ao nível do cliente (Slack, 1995). As ineficiências neste caso, é tudo o que o cliente não está disposto a pagar e o cliente é o elemento central deste conceito. Segundo Ohno (Ohno, 1990), o principal objetivo do Lean Management é criar valor para o cliente otimizando os recursos e criar um fluxo de trabalho com início nos valores reais de procura do cliente. Ou seja procura a eliminação

de qualquer desperdício de tempo, esforço e dinheiro ao identificar em cada elemento do processo, revisitando e cortando passos que não criem real valor (Bertagnolli, 2018).

Este conceito tem origem no Japão e nas operações, mas neste momento está espalhado pelos cinco continentes e por todo o tipo de indústrias e serviços.

2.1. ORIGENS

O *Lean Manufacturing*, tem como base o *Toyota Production System*, doravante designado como TPS. O TPS foi criado no Japão, na indústria automóvel, pelo OEM Toyota, pelos colaboradores *Taiichi Ohno* e *Eiji Toyoda* entre 1947 e 1975, um sistema eficiente de produção, cujas filosofias principais são o *Just-in-time* (JIT) e o *Jidoka*, ou seja a Toyota produz um carro de cada vez com eficiência, com toda a qualidade e que satisfaz todos os requisitos que o cliente pretende (TPS).

A casa TPS, ilustra a base, os pilares e objetivos:

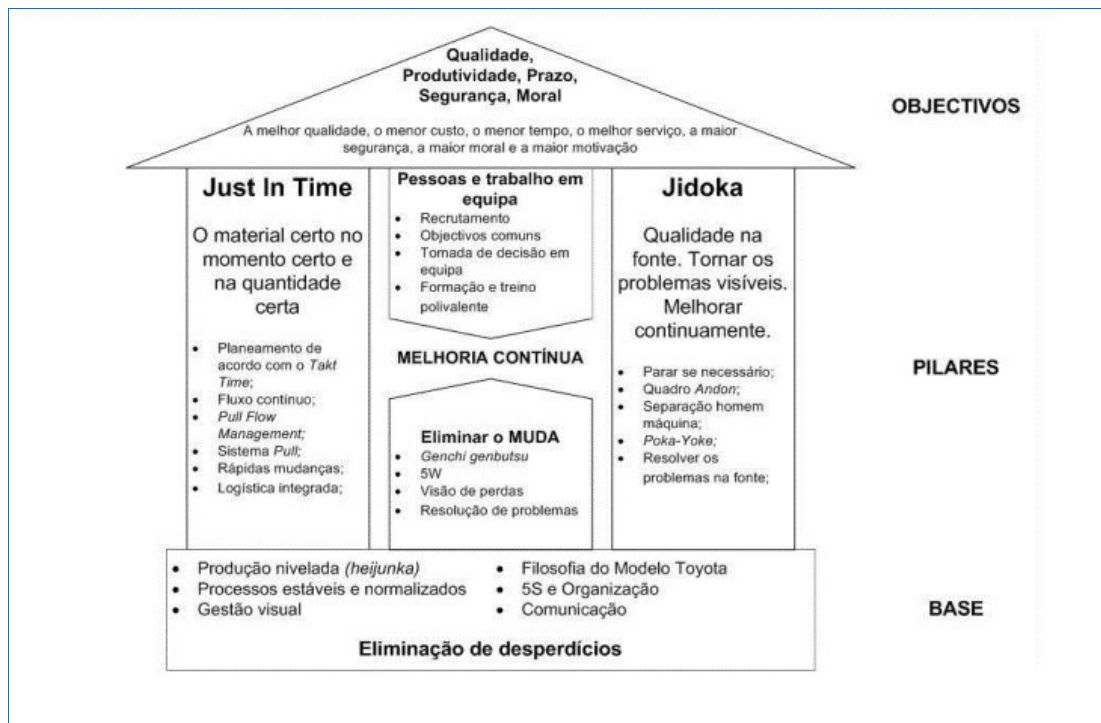


Figura 1 A casa TPS, House of Toyota (adaptado de (Liker et al, 2004)

É a partir daqui que surge o conceito Lean thinking e mais tarde o conceito Lean Management que se foca sobretudo em:

- Colocar o cliente como o foco de toda a operação
- Definição de valor e de adição de valor do ponto de vista do cliente final
- Eliminação de todo o desperdício em todas as áreas da cadeia de valor
- Melhoria contínua (*Kaizen*) em todos os processos, produtos, propósitos e pessoas
- Colocar as pessoas no centro de todas as atividades e processos de adição de valor

O Lean Management facilita a liderança e responsabilidade conjunta e a melhoria contínua assegura o contributo de todos os colaboradores para o processo de melhoria.

Assim os cinco princípios do Lean Thinking ou Toyota Way são:

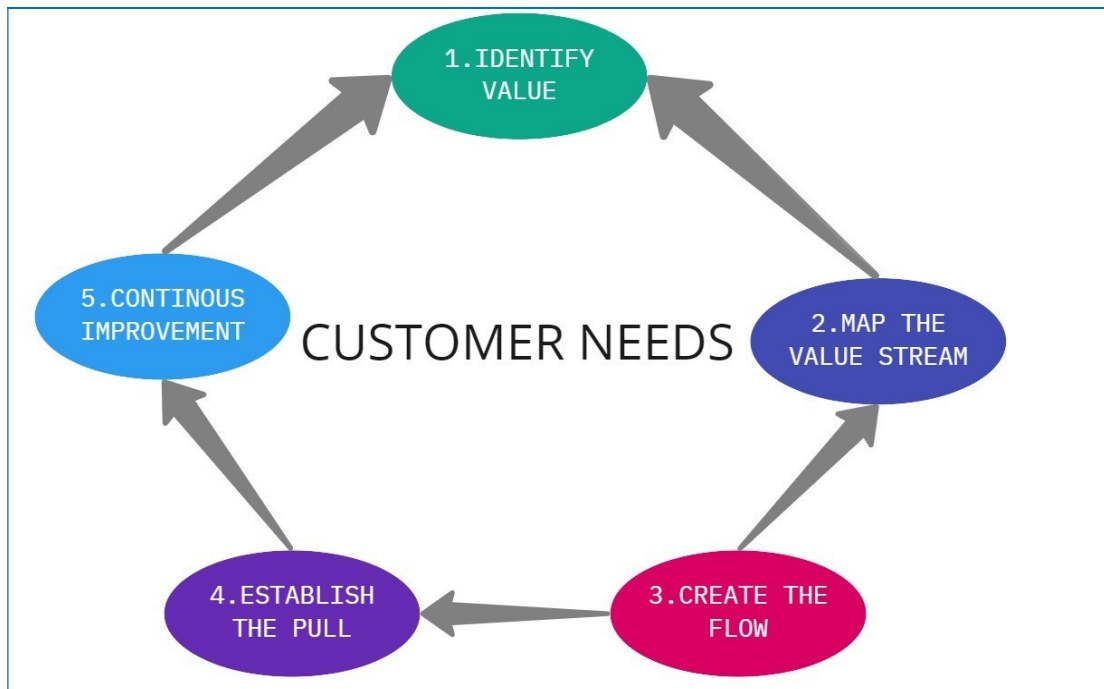


Figura 2 Lean Thinking 5 Principles

1. Identificação de valor em todos os processos da cadeia de valor
2. Conduzir atividades como Value Stream Mapping
3. Criar um fluxo contínuo de trabalho

4. Estabelecer um sistema pull em que os clientes são o foco
5. Encorajar e manter uma cultura de melhoria contínua

O primeiro princípio é identificar o valor gerado em todos os processos da cadeia de valor, o que significa encontrar a solução para o problema que o cliente precisa resolver e para isso produzimos esse produto para ser a solução. Especificamente este é o produto que o cliente está disposto a pagar. Assim qualquer processo ou atividade que não adicione valor, utilidade e importância ao produto final não é considerado pelo cliente e, portanto, o cliente não paga, por isso é desperdício e eliminado.

O segundo é a atividade de mapear todos os processos da empresa, incluindo todas as pessoas e ações que contribuem para o processo de criação e entrega o produto final ao cliente. Estes mapas ajudam a equipa de management a visualizar e identificar tudo que não identifica valor para os processos da cadeia de valor, assim como quais os processos que são liderados por que equipas e quais os responsáveis das mesmas por medir, avaliar e melhorar cada parte do processo.

O terceiro princípio significa que ao criar um fluxo contínuo de trabalho temos todas as equipas a progredir sem interrupções e gargalos que podem ocorrer quando existe equipas multifuncionais. O *Kanban* é uma técnica que utiliza uma pista visual para despoletar ação e é usado para melhorar a comunicação entre equipas de forma a que tratem o que é necessário tratar no momento adequado. Assim partir os processos, em processos mais pequenos ajuda a identificar o que provoca interrupções e gargalos a um processo específico.

O quarto princípio implica que ao desenvolver um sistema pull temos um fluxo contínuo de trabalho, que é feito com menos esforço e maior rapidez por parte das equipas. Esta técnica Pull implica que diminuámos o desperdício porque só produzimos quando o cliente precisa, reduzindo stocks e minimizando sobrecargas.

O último princípio e o mais importante é aquele que é mais difícil de fazer, que é manter uma série de técnicas que identificam na empresa o que fez, o que é preciso ser feito, possíveis obstáculos que possam surgir e como todos os colaboradores podem fazer o seu trabalho e melhorar os seus processos. A gestão da empresa tem que implementar uma cultura e ambiente aos colaboradores que promova implementação destes cinco princípios.

2.2. LEAN MANAGEMENT NO PRESENTE

No mundo atual o Lean management é objeto de estudo pelo mundo todo e devido ao sucesso da Toyota, cada vez mais empresas implementam este conceito com diversos twists próprios a cada indústria e produto. Esta procura fez com que exista inúmeros livros e textos na imprensa específica que já não estão apenas na produção, mas também na logística e distribuição, retalho, saúde, manutenção, etc.

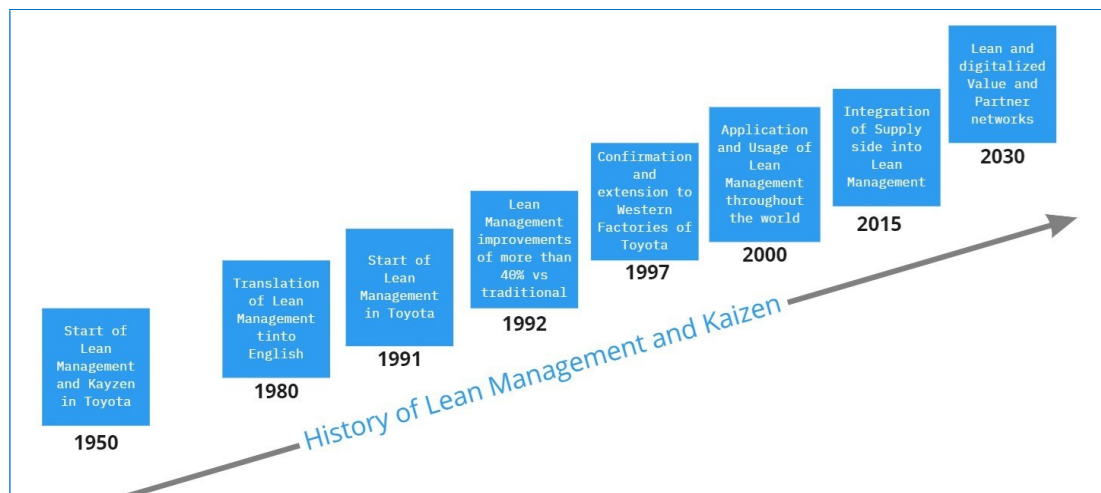


Figura 3 Historia do *Lean Management*

2.3. LEAN NOS RECURSOS HUMANOS

O fator humano numa empresa é crucial, pois não importa planear, criar instruções de trabalho e depois não ter pessoas capazes de o fazer. Por isso a empresa tem que implementar a estratégia e a cultura da empresa de forma a que centre as pessoas na organização.

A cultura de falha numa empresa Lean tem que ser promovida de forma a criar a aprendizagem através da experiência e da tentativa-erro. O objetivo é criar procedimentos que permitam promover inovação, melhoramentos e de forma contínua.

A promoção da alteração de gestão (*Change Management*) permite a implementação de estratégias que permitem a mudança, o seu controle e ajuda as pessoas na sua adaptação.

Neste caso, a comunicação é extremamente importante na capacidade de implementar eficazmente o *Lean Management* na empresa e evita sobretudo a resistência dos colaboradores à mudança se for bem dirigida, comunicada, assertiva e nos canais adequados.

O *Empowerment* e *bottom up Culture* que a área de recursos humanos deve implementar, é na realidade levar em consideração as opiniões dos colaboradores do chão de fábrica ao topo da hierarquia, promover as mesmas, implementar melhoramentos propostos por estes, promove eficazmente a responsabilidade pela qualidade do produto e ou serviço.

Outro enfoque está no *Job Design* que faz com que cada tarefa seja desenhada de forma a específica a cada posto de trabalho, adaptada e com detalhe de como, onde e com que equipamentos as tarefas têm que ser realizadas pelos colaboradores, em todo processo Lean. Isto permite que qualquer departamento saiba o que fazer e com quem interagir, assim como promove o atingimento da excelência operacional.

A gestão do chão de fábrica *Lean* ou *Shopfloor management*, tem que assegurar em *Lean Management* que todos os colaboradores sabem quais são as suas funções, se comportar e o que se espera deles, por isso são incentivados a eliminar o desperdício e a envolverem-se em atividades de melhoria contínua (círculos de controle de qualidade, esquemas de sugestão) e promover a rotação do trabalho, permitindo adquirir outras capacidades e trabalho em equipa.

Em última a motivação é um fator crucial na implementação do *Lean Management*, pois só com colaboradores motivados existe melhoria contínua.



Figura 4 *Lean Management*

2.4. CULTURA E COMPORTAMENTO ORGANIZACIONAL

Para uma eficaz implementação de processos Lean, mesmo com efeitos positivos na qualidade, custo e entrega é preciso estabelecer infraestruturas para assegurar a sua eficácia. Segundo *Gerry Johnson e Kevan Scholes [Managing Strategic Change]*, é preciso olhar e alterar a cultura da organização. A infraestrutura precisa de alinhar os vários elementos organizacionais e com a estratégia da empresa.

A infraestrutura precisa de ter elementos culturais de forma a identificar quais os valores e normas que sustentam processos Lean de forma a que não entrem em conflito com a cultura da empresa, pois retardam a implementação e a performance.

Se for preciso mudança é necessário analisar esses elementos, pois o propósito da Cultura Lean é assegurar o futuro da empresa unindo todos os colaboradores para entregar a voz

do cliente. Este tipo de cultura altera a forma de pensar da empresa de um modo de “apagar fogos”, para uma organização que faz planeamento, em que a prevenção é normal em vez de aceitar o falhanço como regra. O foco da empresa é a longo prazo e com continuidade, junto com a capacidade de resolver taticamente problemas imediatos. Culturalmente a empresa deve ter como regra a compensação aos colaboradores que cooperam ativamente numa organização matricial. Para isto acontecer, a liderança é crucial e existem princípios que um líder deve ter para promover a mudança cultural Lean numa empresa:

- Desafiar as pessoas a pensar
- Liderar pelo exemplo
- Criar um ambiente seguro para dizer OK à falha
- Mostrar respeito por todos
- Motivar as pessoas
- Ensinar
- Encorajar a contribuição de qualquer um dos colaboradores
- Desenvolver ambiente de equipa

Outro dos comportamentos que a organização dever ter é uma mente aberta e crítica (*Chiiku*), que significa dominar e desenvolver conhecimento intelectual, pois para um negócio se manter é preciso entender as suas necessidades e prioridades e depois de encontrar recursos, pode começar a inovar.

2.5. ESTRATÉGIA CORPORATIVA

O Lean management tem que existir integralmente dentro da estratégia corporativa, pois segundo *Helmond e Samara (Helmond e Samara, 2019)*, a gestão estratégica é lidar e reconhecer mudanças que vão de encontro à missão e visão Lean usando para isso os recursos e meios da forma mais eficiente. A planificação estratégica e a capacidade de decisão estão dentro deste *framework* e ligadas à gestão diária da operação. Como a gestão estratégica é fundamental para o sucesso a longo prazo, é claro que o planeamento e o Lean são fatores chaves para desencadear ações como entrar em novos

mercados, em novos serviços, decisão de fornecedores, fazer ou comprar, alinhamentos, etc.

A estratégia pode-se dividir em várias fases: a análise Lean, a escolha Lean e implementação *Lean*, em que é respondido as seguintes questões: Como estamos em termos de *Lean Management*, Para onde queremos ir e como o vamos alcançar?

Para fazer isso, precisamos de compreender vários elementos, e para isso são usadas várias ferramentas tais como, a análise *PESTEL* (macro), a análise da indústria (micro), a análise *SWOT*, análise Cultural, análise *Benchmarking* e inclusive análise dos acionistas.

Existem vários métodos para fazer a escolha final, mas é dependente de vários fatores, mas especialmente dos acionistas e do management que irão avaliar qual das várias alternativas gera mais valor, exemplo: crescimento, aquisição, diversificação, depois é avaliado a sua viabilidade até à escolha final.

A implementação está relacionada com a transferência do plano para a ação e é dependente de vários fatores, como a expectativa do acionista, dos colaboradores, da cultura da companhia e por isso a maneira como os gestores e colaboradores cooperam determinam em muitos casos, senão em todos o sucesso da estratégia. As competências disponíveis, a transformar ou a necessidade de novas determinam o sucesso da implementação, por isso deve ser contemplado no plano de implementação.

Uma ferramenta que traduz a estratégia corporativa é a pirâmide estratégica que posiciona a empresa a longo prazo, normalmente a 3 e 5 anos e que mostra no topo a Missão e a Visão da empresa.



Figura 5 Pirâmide *Lean Management*

2.6. LIDERANÇA

A liderança é definida segundo *Helmond & Samara (Helmond e Samara, 2019)*, como a forma como motivamos e lideramos um grupo de pessoas para trabalhar em conjunto de forma a atingir objetivos e valores comuns. O líder tem que ser uma pessoa com uma combinação ótima de personalidade e competências de liderança que fazem com que os outros membros do mesmo grupo o queiram seguir e a liderança implica maneiras formais e informais de distribuição do poder.

O líder ao longo do tempo, da experiência e maturidade das equipas e dependendo dos níveis de decisão na empresa, pode ter uma liderança que vai de um papel mais centrado, que comunica uma decisão para um líder centrado em um grupo que apresenta o problema e o grupo decide ou o próprio grupo define o problema e o grupo decide, indo

de encontro aos princípios de liderança no *Lean Management*. Claro que este tipo de liderança em que o líder abdica da formalidade de uma decisão, se encontra normalmente ao nível da administração das empresa, por exemplo abaixo do *Chief Executive Officer*, encontramos Chefes de divisão que têm imensa autonomia na decisão de como executar a estratégia da empresa.

O *empowerment* e o *Jidoka* são fundamentais no conceito Lean, pois o *empowerment* irá promover ideias, criatividade e inovação de todas as equipas e deve ser promovido através de alterações organizacionais e culturais dentro da empresa. O *Jidoka*, o “*Right at first time*”, é um exemplo do *empowerment* que cada operador, neste caso referindo-nos à produção, em que um operador de linha é responsável pela qualidade na fonte, ou seja é capacitado para a entrega de material com qualidade ao seu cliente.

2.7. LEAN PERFORMANCE

A performance é importante para avaliar a organização e o sucesso da implementação da estratégia e objetivos e é natural existir ajustamentos e melhoramentos. A gestão da performance gere a parte da análise e mensuração (plano), a ação e implementação (fazer), o controle (verificar) e os melhoramentos e ajustamentos (ação), normalmente visualizado na ferramenta PDCA (*Plan, Do, Check, Act*) e que é uma ferramenta iterativa.

Indicadores de desempenho ou *Key Performance Indicators (KPI)*, são um conjunto de indicadores quantificáveis que uma companhia usa para avaliar o seu desempenho e mede o progresso da empresa em relação aos seus objetivos estratégicos, operacionais e financeiros. Existem KPI's na gestão de topo, mas também a nível departamental.

2.8. OPERAÇÕES E FUNÇÕES DE SUPORTE

As operações é a área de gestão cujo foco é desenhar ou redesenhar e controlar todo o processo de produção que faz a transformação de bens e serviços, de forma a usar o menor número de recursos necessários e de forma a satisfazer os requisitos do cliente.

As operações estão presentes em todos os setores, desde o setor bancário, hospitais, empresas industriais, de serviços, tecnológicas..., requer tanto capacidade estratégica, como capacidade de lidar com o dia a dia e para isso é usado o princípio dos sete *rights* (7R's)(Tabela 2). Este princípio é fundamental nas operações, pois implica a entrega do produto/serviço correto, no momento e quantidade exata, com a qualidade, pessoas e custo necessários. A tabela seguinte exemplifica o significado e o critério por trás que é ter:

Tabela 2 7 Rights Princípio

Objetivos	Critérios
<i>Right Part</i>	<i>Needed part</i> (Produto correto)
<i>Right Time</i>	<i>Now</i> (Agora)
<i>Right Place</i>	<i>Here</i> (local correto)
<i>Right Quantity</i>	<i>One piece</i>
<i>Right Quality</i>	<i>Zero defect</i> (defeito 0)
<i>Right Employee</i>	<i>Qualification</i> (operador treinado)

As operações têm que estar e estão no seu dia a dia presentes na produção, ao que os japoneses chamam de ir ao local, ao *Gemba*, pois é aí que a verdadeira atividade da empresa acontece (*Gembutsu*) e retirar fatos concretos (*Genjitsu*), através da observação (*Genchi*).

Assim, segundo o modelo da cadeia de valor de *Porter* [*Porter,1980*] , as operações fazem parte da cadeia de valor e encontram-se no meio, entre o fornecimento e as vendas& marketing. Como atividades de suporte os Recursos Humanos, as Compras, o desenvolvimento de produto e tecnologia, a área financeira e IT.

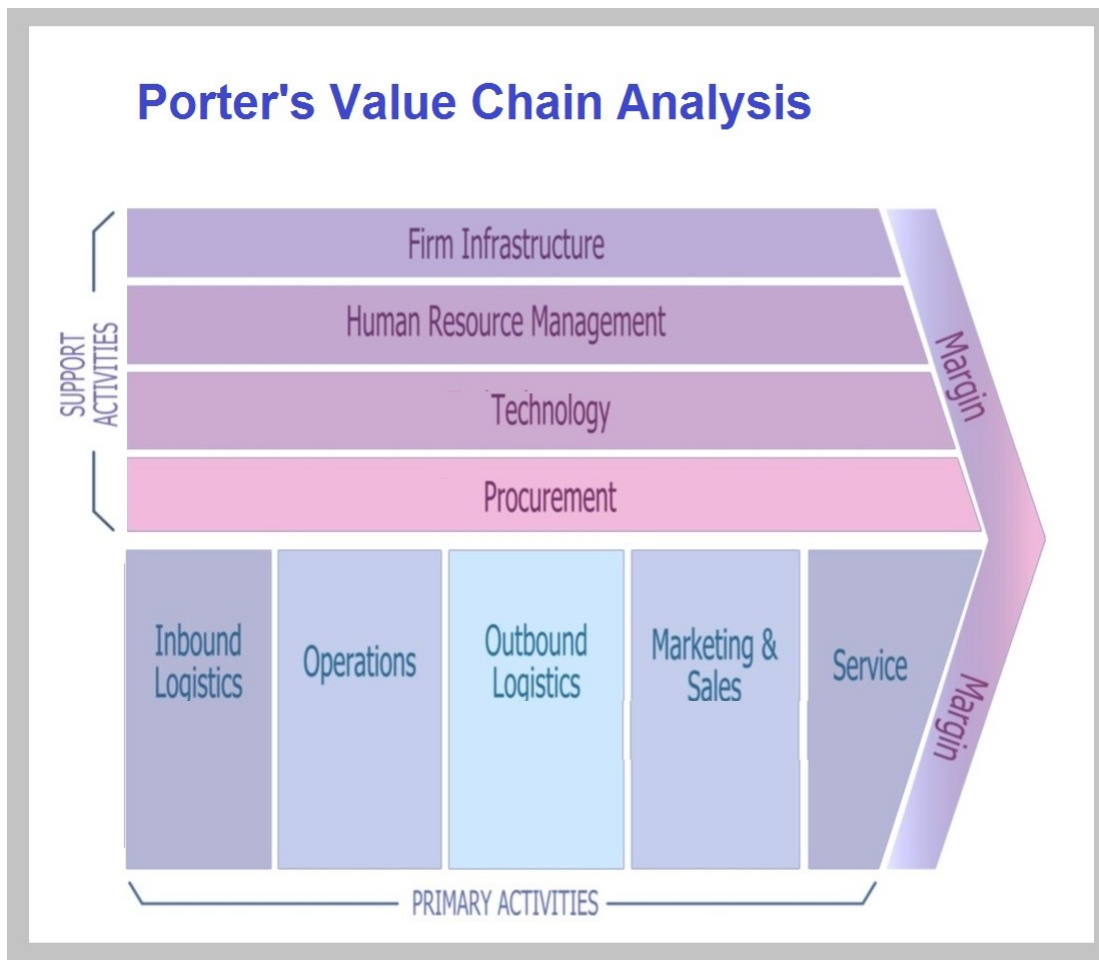


Figura 6 Cadeia de Valor de *Porter* (Porter,1980)

A influência do *Lean Management* nas atividades de suporte implica que ao longo do tempo e da maturidade da empresa, esta influência passe a ser extra empresa e passa a ser incorporado tanto em fornecedores, como em clientes, pelas atividades e influência *Lean* desenvolvidas pelas compras, como pelas equipas de vendas e marketing como exemplificado na Figura 6 (17).

Vejamos, o termo *Compras* é substituído nos últimos anos pela palavra gestão de cadeias de fornecimento ou em inglês pela palavra *Supply Management*, que está enquadrado pelo termo presente na cadeia de valor de *Porter* (Porter,1980). Atualmente o fato de que a maioria das empresas têm mais de 80% da sua cadeia de valor em empresas externas faz com que seja cada vez mais relevante estas funções numa empresa e se pensarmos que estes departamentos são muitas vezes estanques e independentes das restantes funções da empresa é natural que existam muitas ineficiências e desperdícios.

O aumento da concorrência nas últimas décadas, obriga a que muitas empresas concentrem a sua atividade nas suas competências centrais e que externalizem parte da sua atividade, que pode ser a produção ou parte dela seja transferida para fornecedores externos. Esta situação implica uma mudança nas relações entre os intervenientes e respetivas cadeias de fornecimento, criando nomes tais, como *Supply Chain* ou *Supply Networks*, em que estas são cada vez mais internacionais e complexas. O aumento nas cadeias de valor, *Upstream* devido à pressão da globalização implicou um aumento do risco associado, o que significou alterar a gestão e aplicar metodologias e ferramentas de forma a criar resiliência nas cadeias de abastecimento. Afinal disrupções podem e têm implicações financeiras graves, assim como grave prejuízo na imagem da empresa.

Assim as ferramentas derivadas da produção e filosofia *Lean* são ajustadas e recriadas para esta área, exemplo são os 7R's que se tornam os seus principais objetivos.

O produto certo refere-se às especificações e requisitos corretos exigidos pelo cliente. Os produtos devem ter as dimensões exigidas, layout, material, cor, etc. A qualidade certa é saber todos os requisitos em termos de qualidade, medida por fatores difíceis, como não conformidades ou defeitos no recebimento (defeitos 0 km). A quantidade certa é a colocação de uma quantidade de pedido específica acionada por pedidos internos e do cliente. O *Supply Chain management* deve transferir os pedidos do cliente e da empresa para as redes de abastecimento. O momento certo significa que os produtos encomendados devem estar na localização pedida pelo comprador a tempo, nem muito cedo nem muito tarde. A gestão de suprimentos deve reconhecer os prazos de entrega dos fornecedores. O tempo de espera para qualquer produto começa no pedido até o recebimento físico da mercadoria no comprador. A localização certa pode ser definido como o local onde os produtos são necessários. As pessoas certas, significa que os fornecedores globais precisam ter os vendedores, gestores de projeto e operários necessários para suprimir todos os critérios pedidos. E claro o produto tem de ter o preço certo, senão ninguém o compra.

Além dos objetivos 7R's, existe outras formas em que a aplicação do *Lean Thinking* é integrada no agora designado *Lean Supply Chain management*, exemplo disso é o

processo de seleção de fornecedores, exemplificado na figura 6 [17], em que se aplicam os seguintes princípios:

1. A gestão de fornecedores é uma função que faz a gestão de toda a cadeia de valor, logo tem de ser incorporada na missão, valores e estratégias da organização.
2. As melhores práticas de gestão de fornecedores tem de ter uma abordagem multicamadas, envolvendo todos os níveis, além do primeiro um, também os níveis dois e três; para existir um fornecimento eficiente e dinâmico, a gestão aplicada só pode ser introduzida e executada, apenas se os objetivos corporativos são comunicados e disseminados por toda a organização; deve ter uma configuração central como único ponto único de contato com os fornecedores.
3. A gestão de fornecedores avançada e inovadora tem ferramentas padronizadas e processos.
4. As empresas com as melhores práticas para a gestão de fornecedores têm plataformas/ portais de fornecedores sofisticados em termos de qualidade, custo, entrega e outros *KPI's* adequados.
5. Na gestão de fornecedores tem de existir ações de mitigação que devem ser preventivas, proativas e sustentáveis e devem ser orientadas a longo prazo
6. A gestão de fornecedores requer uma abordagem colaborativa, incluindo alianças estratégicas com fornecedores. Essas atividades devem ser organizadas centralmente.
7. A gestão proativa de fornecedores dever ser feita por um gestor de fornecedores e tem de ser o único ponto de contato para o fornecedor (cliente).
8. Os indicadores de desempenho devem ser acordados mutuamente e o processo de avaliação deve consistir na qualidade, custo, entrega e critérios tecnológicos.
9. A organização deve ter capacidade e competência de ensinar os fornecedores.
10. Todos os princípios acima mencionados devem ser combinados com uma filosofia de melhoria contínua (*kaizen*) e reflexão (*hansei*) para alcançar um modelo de melhores práticas em gestão de fornecedores.

Já na outra extremidade, a jusante, temos um processo semelhante na incorporação do *Lean thinking* junto ao cliente ou *Downstream* mas neste caso temos outros nomes nas ferramentas usadas, como descrito na Figura 7 (22).

ECR ou *Efficient customer response* é uma estratégia de aumentar o nível de serviços e produtos no cliente através de um processo cooperativo entre fabricantes, retalhistas e distribuidores em que o objetivo de melhorar a eficiência da cadeia de abastecimento caminha lado a lado com a vantagem de obter melhores margens do que conseguiriam se tivessem objetivos individualizados. Assim todas as empresas que fazem parte da cadeia de valor podem reduzir a perda de oportunidade, níveis de inventário bem como todos os custos associados ao mesmo tempo que aumentam o lucro com o objetivo de satisfazer o cliente.

O processo da ECR é uma forma de averiguar todos os processos da cadeia de fornecimento de forma a verificar se é adicionado maior valor ao produto/serviço ao cliente. O resultado disto é ter mais e melhores produtos, de conveniência, com mais qualidade, o que faz existir uma seleção mais cuidada dos mesmos, assim como cria uma relação de ganho para todas as empresas envolvidas.

O inventário gerido pelo fornecedor, ou *Vendor Managed Inventory (VMI)*, é um conceito e modelo de negócio em que o cliente de uma determinada gama de produtos fornece aos fornecedores informação sobre previsões de compra de forma a que estes tenham total responsabilidade sobre a manutenção de um nível mínimo de inventário dos produtos acordados pelas partes e que localizam normalmente num armazém do comprador. Em muitas indústrias o VMI é gerido pelo fornecedor o que permite a otimização de materiais e produção do mesmo, de acordo com o cliente e de forma a entregar de forma sequenciada à linha de montagem do cliente.

O ERP, *Enterprise Resource Planning*, tem a capacidade de fornecer gestão integrada da empresa através de aplicações. As ferramentas ERP têm um processo e base de dados comum que corre todos os processos operacionais, financeiros, de recursos humanos, logísticos e demais áreas da empresa.

Quick Response Manufacturing (QRM) é uma abordagem com o objetivo de reduzir tempos de resposta tanto internamente como externamente. A ideia subjacente é de estar sempre a reestruturar os processos de fabrico e um permanente ajustamento a pedidos de alterações internas e externas. Assim estamos sempre a comprimir o tempo em todas as ações desencadeadas e cadeias de entrega da empresa, o que aumenta o tempo efetivo disponível, como melhora a relação entre fornecedores e compradores, assim como assegura que a empresa tem capacidade de reação aos menores sinais de alteração do mercado.

Incoterms 2020, definem o papel entre vendedor e comprador em uma transação internacional. Nestes contratos são tratados os trâmites de entrega de mercadorias internacionais e seu trajeto entre o vendedor e o comprador. Estas regras estão presentes em contratos de venda de mercadorias por todo o mundo e são usados por importadores, exportadores, advogados, transportadoras e seguradoras.

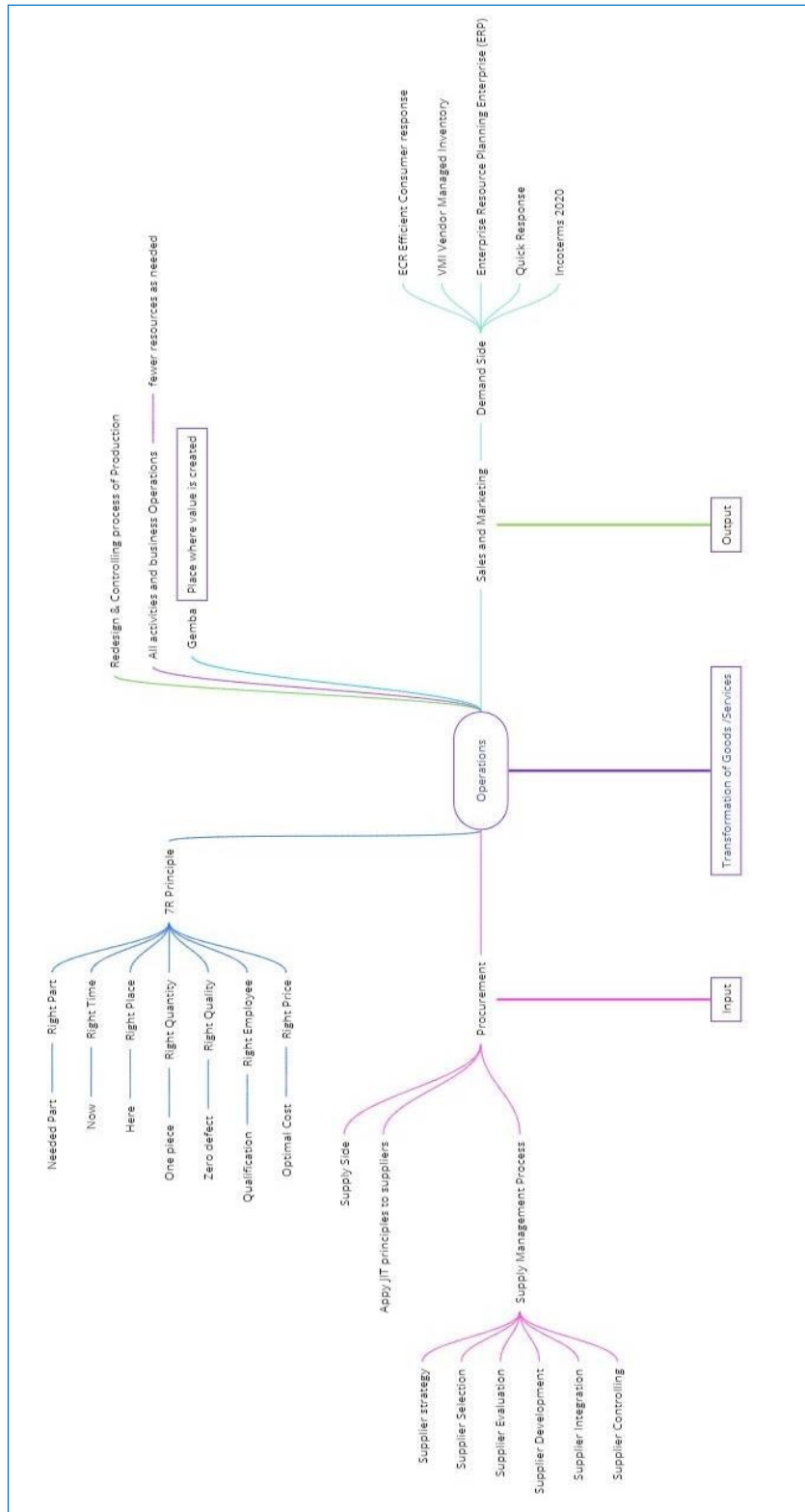


Figura 7 Mindmap das Operações Lean

2.9. LEAN NO DESENVOLVIMENTO DO PRODUTO

O Design for *Lean Manufacturing* é o processo em que os princípios *Lean* são aplicados nas fases de conceito ou de desenvolvimento de um processo ou serviço.

O *design Lean* utiliza métodos como simulações para atingir o design ótimo ou o processo mais eficiente. A preservação de valor com menos trabalho pode ser atingido através dos métodos *Lean* na resolução de problemas.



Figura 8 Lean Product Development

2.10. SISTEMAS LEAN DE PRODUÇÃO

O sistema Lean de Produção ou JIT está baseado em quatro princípios:

1. Zero defeitos – identificar defeitos o mais cedo possível dentro do processo produtivo
2. *Pull* – redução de desperdício no processo produtivo

3. *Tact* - ritmo pelo qual os produtos são produzidos para atingir as encomendas do cliente
4. *Flow* - O valor deve ser acrescentado num fluxo ininterrupto desde o início ao fim do processo produtivo

O *Andon* é uma ferramenta Lean de produção para notificar a gestão, manutenção e outros colaboradores de um problema de qualidade ou processo. O sistema incorpora sinais luminosos para identificar o posto de trabalho com problemas.

A ferramenta *Poka-Yoke* é uma palavra que traduzida significa “à prova de erro” e é um mecanismo que está incorporado num processo *Lean* que evita (*yokeru*) erros (*poka*). A ideia é eliminar defeitos no processo, através da prevenção, correção, dar atenção a erros humanos ou outro tipo de erros que possam ocorrer.

Ir ao *Gemba* e ao *shopfloor* é o local real ou o sítio correto onde acontecem as coisas.... O *shopfloor* é considerado extremamente importante no ambiente fabril e as pessoas da produção e nas funções de suporte são consideradas muito importantes para a adicionar valor.

Os *Shadow boards* são quadros específicos para componentes, ferramentas e equipamento nas operações, fábrica e serviços para reduzir tempo e tempos de espera.

Importância acrescida em *Lean*, é a atividade de Saúde, segurança e ambiente do trabalho, uma área que assegura todos os aspetos ambientais e de segurança no trabalho e envolve a criação de esforços e procedimentos organizados para identificar perigos no ambiente de trabalho e exposição a ambientes nocivos que podem afetar a saúde dos colaboradores.

Já a Eficácia geral do equipamento (*Overall Equipment Efficiency-OEE*) é o resultado da multiplicação da disponibilidade, pela Performance e qualidade e indica o estado atual do processo de produção e é uma ferramenta indispensável num sistema de produção baseado no Lean Management, assim como, o *Kanban*, um sistema visual que gere o trabalho conforme ele se move pelo processo produtivo.

Já os *Supermarkets* são normalmente localizados perto do processo de abastecimento, em cada item tem uma localização precisa e são retiradas apenas as quantidades precisas para o processo a seguir. Assim que um item é usado, um cartão *Kanban* é emitido para dar indicações que é preciso mais.

2.11. OUTRAS FERRAMENTAS E METODOLOGIAS

Além das ferramentas e metodologias já descritas, existem outras que são igualmente essenciais ao *Lean Management* e ao sucesso da sua implementação. Alguma, mas não todas estão presentes na Figura 9 a seguir apresentada:

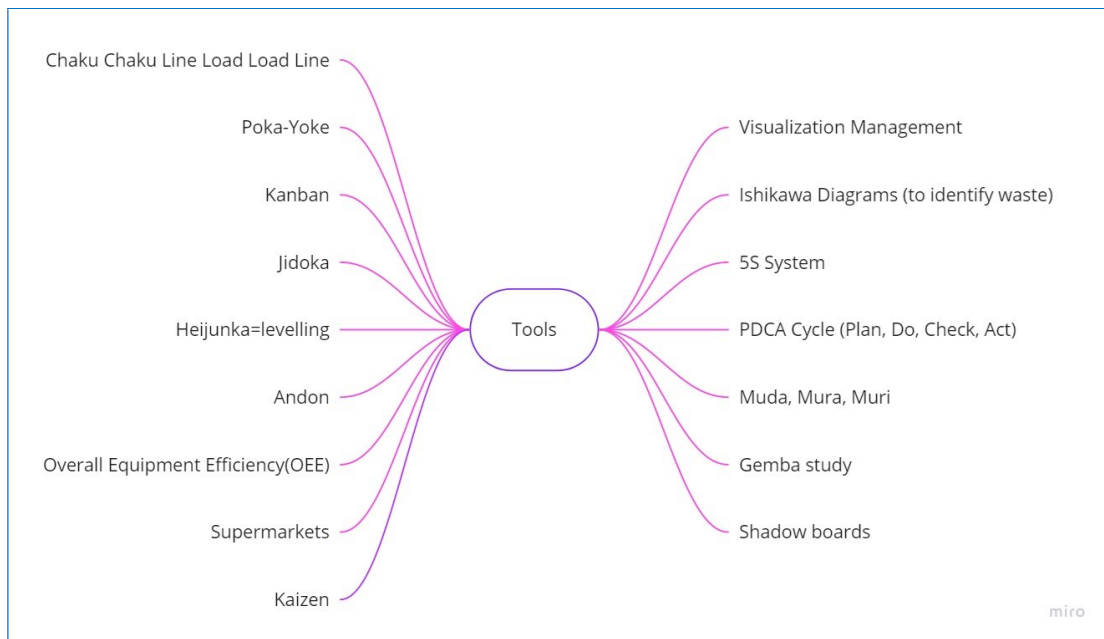


Figura 9 ferramentas e metodologias Lean

Kaizen é a combinação das palavras japonesas *Kai* e *Zen* que significa mudança e melhor, ou seja é a melhoria contínua, o *continuous improvement* e mais que uma ferramenta, é um conceito do próprio *Lean thinking*. O *kaizen* normalmente é realizado através de workshops de três a 5 dias de duração e o principal objetivo é implementar as melhorias identificadas durante o workshop ou logo a seguir. Uma das ferramentas usadas durante o *Kaizen* é habitualmente o PDCA (*Plan, Do, Check, Act*) e o *Visual Management*.

Os diagramas de *Ishikawa*, também chamados de diagramas de espinha de peixe, são usados fundamentalmente para identificar desperdício que são apresentados de forma a relacionar a causa versus efeito de um processo.

Outra metodologia para identificar desperdício são os 5S's, que significam:



Figura 10 Metodologia 5S's

Heijunka ou *Levelling* é uma forma de produção em quantidades pequenas que a ajuda a satisfazer os pedidos do cliente ao mesmo tempo que mistura variante do produto no mesmo processo, assim reduz prazos de entrega e ao mesmo tempo inventário.

Chaku Chaku Line, é uma forma de operar máquinas semiautomáticas em linha em um ou mais operadores andam pela linha alimentando o processo.

Muda, *Muri* e *Mura* são termos usados em conjunto no *TPS* e são os termos japoneses com o seguinte significado: *Muda* significa desperdício, *Muri* é sobrecarga ou excesso e finalmente *Mura* significa inconsistência, flutuação e ou variação.

Jidoka ou *autonomation* é um método *lean* (que está nas fundações do *TPS*) que é usado tanto na produção, como em desenvolvimento de produto e que é uma maneira da empresa não incorrer na entrega de produtos de baixa qualidade ou com defeito aos clientes, ao mesmo tempo que tenta manter o tempo *tact*.

2.12. ADDED VALUE VERSUS DESPERDÍCIO

A criação de valor resulta em novas atividades, produtos e ou serviços que geram valor para a empresa, ou seja dentro do significado que valor é algo pelo qual o cliente está disposto a pagar.

Já o desperdício, *Waste* em inglês ou *Muda* em japonês são todas as atividades que adicionam custo e ou tempo, sem adicionar valor. Existem várias ferramentas que podem ser usadas para identificar desperdício tais como o diagrama de *Ishikawa* ou a metodologia 5S's (como explicadas em cima).

Os desperdícios identificados para o *Lean Management* são os seguintes:



Figura 11 8 desperdícios do Lean

O transporte em excesso é um desperdício de tempo, energia, pessoas, pois o esforço necessário para o realizar é algo que o cliente não quer pagar. Alguns exemplos são os transportes do produto de uma área para outra para continuar a sua produção, as razões para isto acontecer, pode ser layouts inadequados ou longas distâncias entre operações. As consequências são a diminuição da produtividade o que resulta em custos operacionais mais elevados.

O Inventário pode consistir em excesso de produto acabado, semiacabados ou matérias primas e normalmente o de produto acabado é o mais caro porque não é possível eliminar todos os custos já associados. Para reduzir o inventário é necessário implementar melhorias no processo e maior capacidade de ajustamento ao cliente. As consequências passam por problemas de fluxo de caixa, etc.

O movimento é um desperdício, pois o movimento excessivo do operador, material ou máquina pela área de trabalho leva a um custo mais elevado, já que a produtividade diminui. A análise do fluxo de trabalho ajuda na sua redução.

Os tempos de espera é um dos outros desperdícios que se pretende evitar, pois é tempo que o operador não está a produzir. Uma paralisação implica maiores tempos de entrega, assim como diminui o grau de motivação do colaborador.

A produção em excesso resulta da produção cedo no tempo e em avanço, o que significa que existem componentes em excesso na empresa e que não são necessários. Esta situação leva a que o inventário aumente e respetivos custos de produção.

De outra maneira processamento excessivo resulta em um produto com características superiores, ou seja, maiores do que aquela que o cliente precisa. Existem muitos motivos para isto acontecer, como por exemplo mau desenvolvimento do produto, tecnologia insuficiente ou desconhecimento dos requisitos do cliente.

Defeitos são todos os produtos que não estão de acordo com os seus padrões de qualidade ou que se desviam dos requisitos do cliente. Como consequências temos perda de tempo, recursos e potencial perda do cliente. Uma das maneiras de evitar além da identificações de melhorias no processo e design, é o uso de *checklists*.

O último e mais recente é não usar o talento disponível dentro da empresa para novas atividades, em vez de adquirir competências externamente. Uma das consequências é desmotivação dos colaboradores, assim como aumento de custos.

2.13. LEAN NA INDÚSTRIA 4.0 E A INTELIGÊNCIA ARTIFICIAL

O Lean está em pleno desenvolvimento na indústria 4.0, pois os sistemas de produção estão a evoluir constantemente e um dos seus principais desafios é a incorporação de tecnologia, da digitalização e comunicações nos processos produtivos. A indústria 4.0 é o nome dado a esta megatendência existente da automação e de transferência de dados dentro das indústrias e empresas de serviços.

Na área da Inteligência Artificial (IA), ou *Artificial intelligence* (AI) na versão inglesa, as máquinas demonstram inteligência de uma forma contrastante comparativamente com os humanos e os animais.

Na figura 12 (31) um *Mind Map* com as principais tecnologias que estão a tomar conta do mundo e que serão futuramente consideradas como as próximas ferramentas Lean e que mostram a própria evolução do Lean Management.

Os robots autónomos (*Autonomous robots*) é um robot que executa comportamentos ou tarefas com alto grau de execução de forma autónoma e sem influência externa.

Já a Produção virtual (*Virtual Production*) são ferramentas ou elementos técnicos que são normalmente digitais usada para visualizar situações complexas ou que não podem ser concretizadas na realidade.

Outro elemento, as simulações *Lean* (*Lean Simulations*) são um conjunto de simulações práticas que permitem visualizar e ensinar aos colaboradores melhoria contínua em toda a cadeia de valor. As principais simulações focam na área do desenvolvimento do produto, planeamento de capacidade, de processos de fabrico e no desenho de cadeias de fornecimento. Os objetivos estão centrados em observar os efeitos ao alterar as variáveis de entrada e alternando os elementos da cadeia de valor.

Já os sistemas de integração (*Systems integration*) é uma metodologia de melhoria contínua quando integramos dados e sistemas de software com o objetivo de maximizar a cadeia de valor ao cliente.

Uma das áreas mais em destaque é a segurança cibernética (*Cybersecurity*) que são todos os sistemas de proteção que estão ligados à internet, incluindo todo o hardware, software e dados que a empresa tem. Nos últimos anos, esta é uma área que tem tido mais preocupação por parte das empresas visto ter aumentado a criminalidade e os ataques cibernéticos, colocando a empresa na possibilidade de ter graves prejuízos económicos, sociais e de imagem.

Em conjunto com a segurança cibernética, temos a computação em nuvem (*Cloud Computing*) que são serviços prestados por empresas que partilham os seus servidores e demais sistemas, não tendo mais a empresa necessidade de manter servidores locais.

Outro elemento já muito implementado em muitas empresas é a Manufatura aditiva (*Additive Manufacturing*) que é o nome designado para a produção industrial da impressão 3D, processo este controlado por um computador que cria objetos tridimensionais depositando materiais geralmente em camadas.

A realidade aumentada (*Augmented Reality*) é uma experiência interativa de um ambiente o mundo real, onde os objetos que residem no mundo real são aumentados por informações sensoriais geradas um computador, que podem ser visuais, de tato, auditivas....

Já a designação *Big Data* refere-se a um conjunto massivo de dados estruturados ou não que não são possíveis de ser processados por os bancos de dados tradicionais.

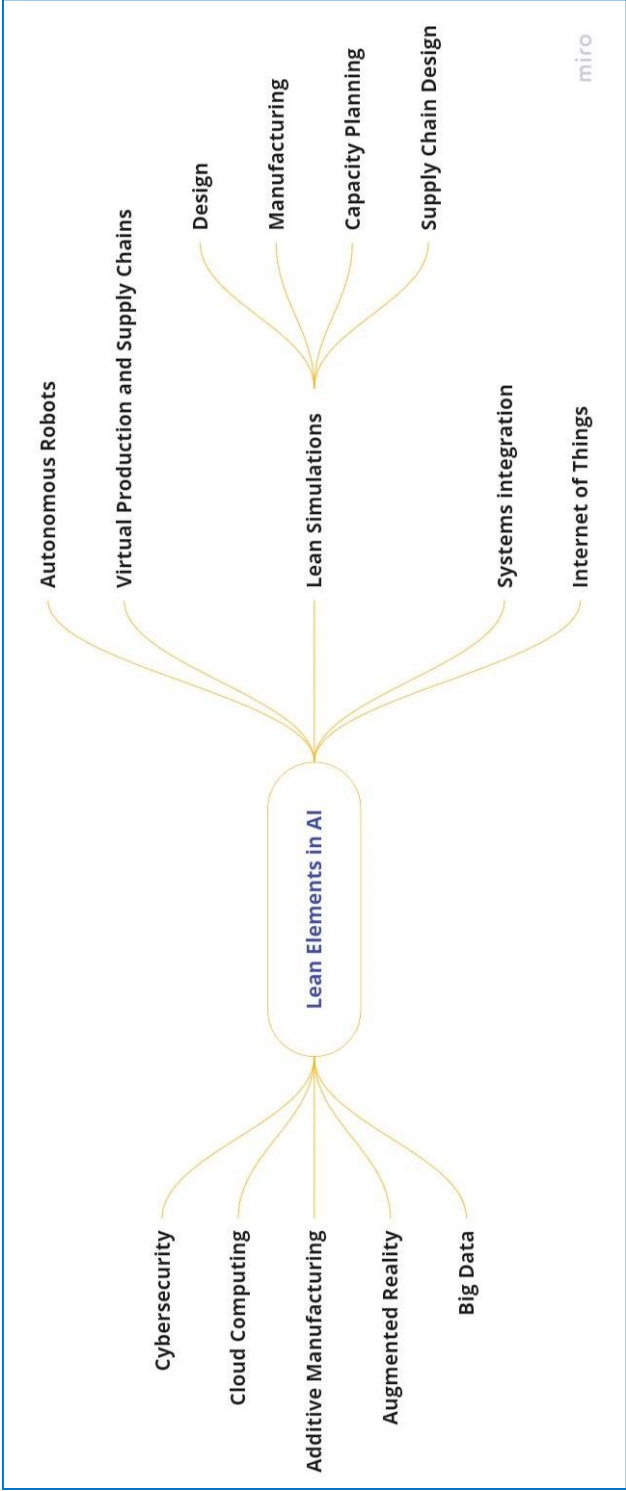


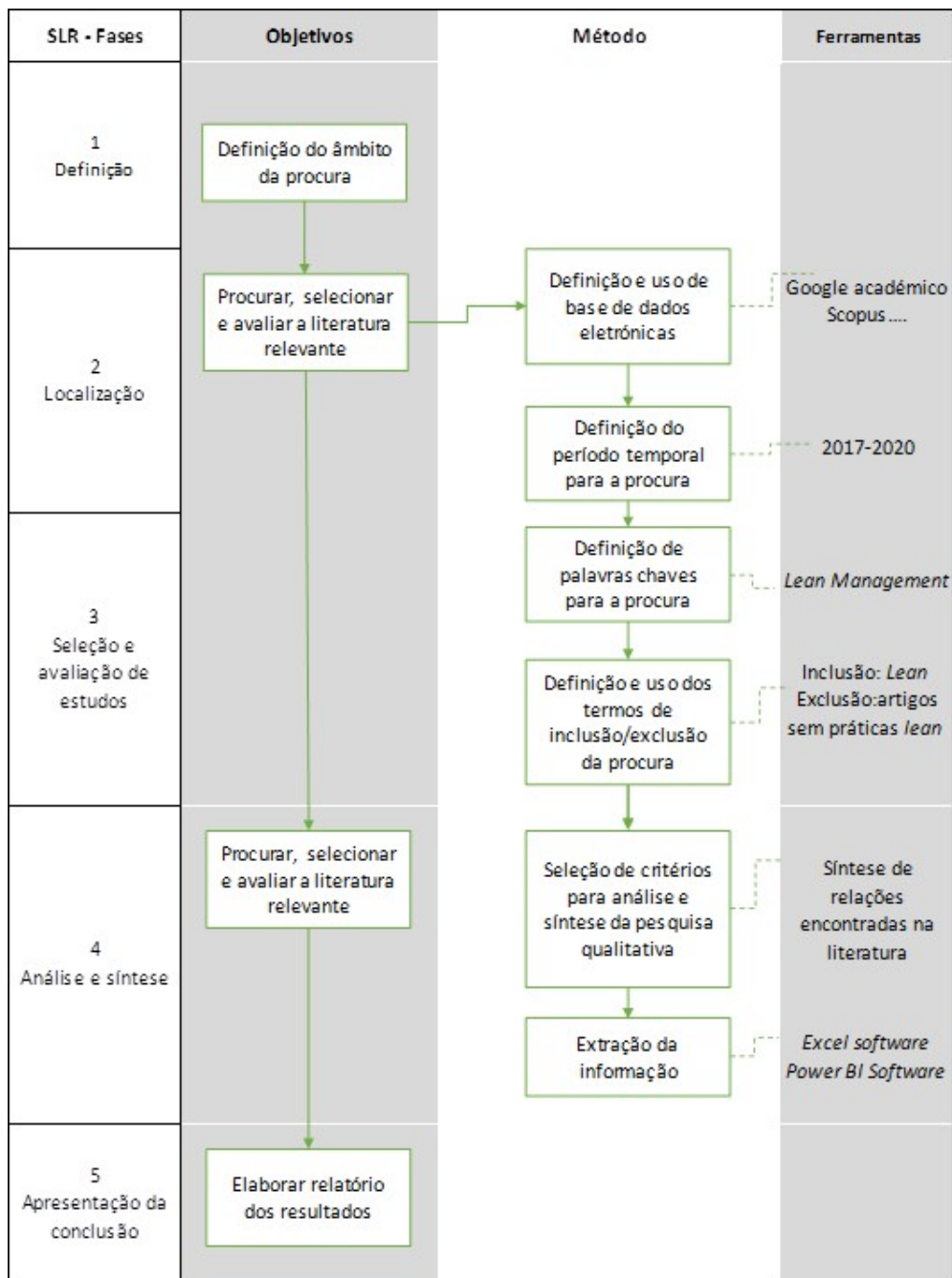
Figura 12 Lean Management in AI

3. DESENVOLVIMENTO DA TESE

O desenvolvimento da tese segue a metodologia SLR (SLR), *Systematic Literature Review*, uma metodologia que alicerce para todos os tipos de pesquisa e por isso conduz ao desenvolvimento de conhecimento, para a criação de diretrizes para políticas e práticas, para fornecer evidências de um efeito e se bem realizado tem a capacidade de engendrar novas ideias e ou instruções para um determinado campo. Assim servem como base para pesquisa e teorias futuras.

O método SLR segue os passos descritos na tabela 3 (34), adequada a uma pesquisa que se pretende qualitativa e em que se incidiu numa pesquisa bibliográfica relacionada com artigos científicos, livros e teses referentes ao âmbito a ser desenvolvido, Lean Management.

Tabela 3 SLR metodologia



3.1. FRAMEWORK DA INVESTIGAÇÃO

A revisão bibliográfica foi realizada para identificar a literatura mais relevante entre os anos 2017 a 2020 no âmbito do Lean Management. Desta forma é possível ajudar

empresas, estudantes, professores e demais interessadas em obter informação relevante sobre este tema, mas igualmente acessível através das ferramentas *Excel e PowerBI*.

As plataformas de base de dados eletrônicas identificadas para obter a informação são:

- Google académico
- ScienceDirect
- Taylor and Francis
- Scielo
- IEEEExplore
- B-On
- Emerald

As palavras usadas nestas plataformas foram Lean Management, onde depois foi filtrado os resultados apresentados pelos anos de 2017 a 2020, por relevância e classificadas segundo os seguintes critérios:

- Título
- Ano
- Setor Económico
- Área de aplicação
- Contexto
- Autores
- Metodologia
- Conclusões
- Links
- Citação
- Quantidade de Citações
- País
- Visualizações
- Palavras chave

Depois usando a ferramenta do Office, o Excel, é possível realizar uma análise qualitativa sobre o Lean Management durante o período de tempo objeto de estudo.

3.2. APRESENTAÇÃO DA LITERATURA

A literatura investigada tem um resultado total de 151 artigos que se apresenta diversificada pelos vários sectores económicos e por áreas específicas dentro do ambiente empresarial privado e público ou social, segundo a cadeia de valor de *Porter* (Porter,1980), como as operações, finanças, recursos humanos, etc. As tabelas a seguir apresentadas seguem o modelo de campos análise para cada artigo, por exemplo setor económico, ano, contexto, área de aplicação etc.

Tabela 4 Tabela exemplo

Id	Título	Sector económico	Atividade Sector económico	Área de aplicação	Área Aplic de trabalho	Ano	Contexto	País	Visualizações	Citações	Palavras chave
1	APPLICATION OF LEAN MANUFACTURING TOOLS: A CASE STUDY IN A MATRIBISS FACTORY	Industry	Matrices industry	Operations	Manufacturing	2018	Business	Ops of	2337	8	lean manufacturing, flow of value, factory of matrices, 5S, process standardization

3.2.1. LEAN MANAGEMENT POR SETOR ECONÓMICO

A pesquisa bibliográfica por sector económico está segmentada por indústria, serviços educação, saúde, Logística. Os artigos que não são específicos a um setor económico em particular estão classificados como geral.

3.2.1.1. SETOR ECONÓMICO INDÚSTRIA

No setor económico Indústria temos cerca de 56 artigos, em que temos na tabela 5, um resumo por numeração da revisão bibliográfica, título, atividade específica dentro do setor económico onde pertence, ano, contexto, quantidade de citações e visualizações.

Tabela 5 Setor económico indústria

Nº	Título	Setor económico	Atividade Sector económico	Ano	Contexto	País	Visualizações	Citações
23	Lean manufacturing implementation in reducing waste for electronic assembly line	Industry	Electronic industry	2017	Business	Malaysia	2119	21
24	Analysis of reconfigurable assembly system framing systems in automotive industry	Industry	Automotive industry	2017	Business	Malaysia	542	7

1	Application of Lean Manufacturing tools: a case study in a mattress factory	Industry	Mattress Industry	2018	Business	Brazil	2337	4
28	An exploratory study of waste in software development organizations using agile or lean approaches: A multiple case study at 14 organizations	Industry	Software industry	2018	Business	Sweden	146	13
35	Digital startups and the adoption and implementation of Lean Startup Approaches: Effectuation, Bricolage and Opportunity Creation in practice	Industry	Digital companies	2018	Academic	Italy	429	35
42	More Sustainable Performances Through Lean Practices: A Case Study	Industry	Metal packaging industry	2018	Business	Italy	189	2
47	A simulation-based methodology for the analysis of the effect of lean tools on energy efficiency: An application in power distribution industry	Industry	Electrical industry	2018	Business	Turkey	93	19
50	Examining the interaction between lean and sustainability principles in the management process of AEC industry	Industry	construction industry	2018	Academic	Egypt	290	32
57	Data-driven lean Management for Distribution Network	Industry	Electrical Industry	2018	Business	China	131	0
58	Design of Lean Management System for Equipment Assets Based on BOM Tree and RFID	Industry	Electrical Industry	2018	Business	China	88	0
113	Work intensification and employee involvement in lean production: New light on a classic dilemma	industry	Automotive industry	2018	Academic	Italy	978	13
11	he use of Lean practices: a case study in a clutch factory	Industry	Clutch Industry	2019	Business	Brazil	NA	1
14	The application of the Lean Manufacturing tools as support in quality management system and production efficiency in an automotive industry	Industry	Automotive industry	2019	Business	Poland	NA	0
16	Utilização do lean manufacturing para redução de desperdícios em um restaurante industrial	Industry	Operations	2019	Business	Brazil	145	0
19	Effect of the motivational factor on lean manufacturing performance: the case of a multinational consumer goods company	Industry	Consumer goods	2019	Business	Brazil	549	2
20	The implementation of lean manufacturing and ergonomics in Small Medium Enterprise – Case study	Industry	Food industry	2019	Business	Malaysia	221	2
21	Value stream mapping as a lean manufacturing tool: A new account approach for cost saving in a textile company	Industry	Textile industry	2019	Business	Brazil	5909	7
22	Lean and energy efficient production based on internet of things (IOT) in aviation industry	Industry	Aviation Industry	2019	Business	Russia, China	501	4
31	Decoupling Architecture from Lean Software Development in Requirements	Industry	Software industry	2019	Academic	USA	NA	0

33	Development of a Conceptual Framework of Lean Construction Principles: An Input–Output Model	Industry	construction industry	2019	Academic	Morocco	1049	6
36	The LDP in Digital Business Startups: The Case of raiserve	Industry	Digital companies	2019	Academic	USA	16	1
41	The economical modelling of a distribution system for electricity supply chain	Industry	Energy industry	2019	Academic	Taiwan	232	5
43	The optimization research of investment management in power grid enterprise	Industry	Energy industry	2019	Business	China	46	0
44	Research on Lean Management of Power Marketing Strategy in Power Grid Enterprises	Industry	Energy industry	2019	Business	China	33	NA
46	The Formation Of Organizational Culture In The Aspect Of Lean Management Principles In The Energy Industry	Industry	Energy industry	2019	Academic	Poland	327	4
48	Promoting sustainability of manufacturing industry through the lean energy-saving and emission-reduction strategy	Industry	Tire Industry	2019	Business	China	167	89
56	The Lean Closed Loop Management of Transformer Operation in Low Voltage Distribution Network	Industry	Electrical Industry	2019	Business	China	184	0
59	Obstacles to the Introduction of Lean Production in Russian Electrotechnical Enterprises	Industry	Electrical Industry	2019	Academic	Russia	35	0
61	Lean for the process industries: Dealing with complexity	Industry	Chemical, Food, Beverage industry, consumer products industries	2019	Business	USA	NA	144
63	The utility of Lean Six Sigma(LSS) in the Supply Chain agro- industry	Industry	Food industry	2019	Academic	Morocco	62	0
66	Lean Manager in the Factory of the Future : Case study in automotive industry	Industry	Automotive industry	2019	Business	France	244	2
67	Batteries for Satellites Constellation, using Lean Manufacturing for Space Industry	Industry	Space Industry	2019	Business	France	75	0
68	Corporate memory in the lean context	Industry	Automotive industry	2019	Business	Portugal	42	0
73	Super Lean Software Startup Engineering Management	Industry	IT industry	2019	Business	USA	88	0
79	Application of the Quality Management Methods and Tools in the Operation of Electrical Equipment	Industry	Electrical industry	2019	Academic	Russia	71	0
85	Lean management in the context of construction supply chains	Industry	construction industry	2019	Academic	Ireland	1395	19
101	Quality and flexibility performance trade-offs between lean and agile manufacturing firms in the automotive industry	Industry	Automotive industry	2019	Academic	UK	511	6
110	Internet of things and simulation approach for decision support system in lean manufacturing	Industry	Automotive industry	2019	Business	Japan, Malaysia	0	1

118	Lean manufacturing, human resource management and worker health: Are there smart bundles of practices along the adoption process?	Industry	Human resources	2019	Business	France	NA	3
146	Australian food retail supply chain analysis	Industry	Food industry	2019	Academic	Australia	NA	6
2	Applying SLP in a Lean Manufacturing Model to Improve Productivity of Furniture SME	Industry	Furniture industry	2020	Business	Peru, Spain	1300	NA
34	Lean Concept Development in Fast Food Industry Using Integration of Six Sigma and TRIZ Method	Industry	Food industry	2020	Academic	Indonesia	344	1
37	Application of Lean Methods into the Customised Product Development Process of Large Power Transformers	Industry	Energy industry	2020	Business	Slovenia	167	1
45	Research on Investment Distribution Technology of Power Grid Enterprise Overhaul Based on Gini Coefficient Theory	Industry	Energy industry	2020	Business	China	69	0
62	The effect of Lean Six Sigma practices on food industry performance: Implications of the Sector's experience and typical characteristic	Industry	Food industry	2020	Academic	Brazil, USA	66	2
76	Optimization of activities of road construction company based on lean manufacturing tools	Industry	construction industry	2020	Academic	Russia	291	0
86	A dynamic perspective on the key drivers of innovation-led lean approaches to achieve sustainability in manufacturing supply chain	Industry	Electronic industry	2020	Academic	China	98	15
96	Achieving a sustainable shipbuilding supply chain under I4.0 perspective	Industry	Shipbuilding Industry	2020	Academic	Spain	140	15
97	Improving manufacturing cycle efficiency through new multiple criteria data envelopment analysis models: an application in green and lean manufacturing processes	Industry	Organizational	2020	Business	Brazil	199	0
98	Barriers Affecting Successful Lean Implementation in Singapore's Shipbuilding Industry: A Case Study	Industry	Shipbuilding Industry	2020	Business	UK, Singapore	NA	1
99	Implementation of lean manufacturing in electronics industry	Industry	Electronic industry	2020	Academic	India	5	0
105	Technology Engineering for Medical Devices-A Lean Manufacturing Plant Viewpoint	Industry	Medical Devices Industry	2020	Business	USA	NA	1
108	Lean Production and Job Satisfaction: Perception of Workers in Plastics Manufacturing	Industry	Plastics Industry	2020	Academic	Philippines	0	1
111	A case study in consolidating the loss structure of different manufacturing sectors under lean context	Industry	Packaging Industry	2020	Business	Sweden	0	0
112	Investigating the enablers associated with implementation of Green Lean Six Sigma in manufacturing sector using Best Worst Method	industry	Automotive industry	2020	Academic	India	279	5

147	The effect of corporate social responsibility performance on financial performance: the case of food industry	Industry	Food industry	2020	Academic	Greece	NA	0
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3.2.1.2. SETOR ECONÓMICO SERVIÇOS

No setor económico dos serviços temos cerca de 5 artigos, em que temos na tabela 6, um resumo por numeração na revisão bibliográfica, título, atividade específica dentro do setor económico onde pertence, ano, contexto, quantidade de citações e visualizações.

Tabela 6 Setor económico serviços

Nº	Título	Setor económico	Atividade Sector económico	Ano	Contexto	País	Visualizações	Citações
74	Lean Service in a Banking Entity	Services	Bank services	2019	Business	Peru	35	0
122	Lean Six Sigma in financial services industry: a systematic review and agenda for future research	Services	Finance services	2019	Academic	India, UK	964	21
129	Realizing Total Customer Experience through Six Sigma Marketing: An empirical approach	Services	Travel Service	2019	Business	India	NA	1
132	Market-driven management of start-ups: The case of wearable technology	Services	Informatics and Cloud computing	2018	Business	Canada,Turkey, Iran	NA	8
144	Effective after-sales services through the lean servitization canvas	Services	After-sales	2020	Business	Netherlands,Norway, Germany	NA	1

3.2.1.3. SETOR ECONÓMICO SAÚDE

No setor económico da saúde temos cerca de 16 artigos, em que temos na tabela 7, um resumo por numeração na revisão bibliográfica, título, atividade específica dentro do setor económico onde pertence, ano, contexto, quantidade de citações e visualizações.

Tabela 7 Setor económico saúde

Nº	Título	Sector económico	Atividade Sector económico	Ano	Contexto	País	Visualizações	Citações
18	A lean approach on hospital flow management	Healthcare	Healthcare	2018	Academic	Brazil	2346	0

27	What Is Lean Management in Health Care? Development of an Operational Definition for a Cochrane Systematic Review	Healthcare	Healthcare	2018	Academic	Canada, Australia	1578	33
81	A systematic literature review of empirical research in Lean and Six Sigma in healthcare	Healthcare	Healthcare	2018	Academic	Brazil	1681	25
40	Desenvolvimento da metodologia lean num serviço de urgência: scoping review	Healthcare	Healthcare	2019	Academic	Portugal	NA	0
64	Review and classification of Lean project aims in hospitals	Healthcare	Healthcare	2019	Academic	South Africa	87	2
71	Lean Healthcare Processes: Effective Technology Integration and Comprehensive Decision Support Using Requirements Engineering Methods	Healthcare	Healthcare	2019	Business	Canada, Saudi Arabia	81	0
117	Assessing the relationship of the human resource, finance, and information technology functions on reported performance in hospitals using the Lean management system	Healthcare	Healthcare	2019	Academic	USA	NA	3
135	Exploring lean generic and lean healthcare cultural clusters	Healthcare	Healthcare	2019	Academic	Canada	NA	1
82	Increasing Competitiveness through the Implementation of Lean Management in Healthcare	Healthcare	Healthcare	2020	Business	Spain	625	1
123	Increasing Competitiveness through the Implementation of Lean Management in Healthcare	Healthcare	Healthcare	2020	Business	Spain	NA	NA
125	Contribuições do Lean Healthcare para o Combate à Covid-19	Healthcare	Healthcare	2020	Academic	Brazil	0	0
126	Reorganization of a large academic hospital to face COVID-19 outbreak: The model of Parma, Emilia-Romagna region, Italy	Healthcare	Healthcare	2020	Business	Italy	NA	9
127	Rapid Implementation of Telepsychiatry in a Safety-Net Health System During Covid-19 Using Lean	Healthcare	Healthcare	2020	Business	USA	NA	0
138	Introducing a strategic perspective in lean thinking applications through system dynamics modelling: the dynamic Value Stream Map	Healthcare	Healthcare	2020	Academic	Italy	NA	0
139	Operating room effectiveness: a lean health-care performance indicator	Healthcare	Healthcare	2020	Academic	Portugal	NA	0
145	Lean maturity and quality in primary care	Healthcare	Healthcare	2020	Business	Sweden, China	NA	5

3.2.1.4. EDUCAÇÃO, LOGÍSTICO E PÚBLICO

No setor económico da educação, logístico e público temos cerca de 9 artigos, em que temos na tabela 8, um resumo por numeração na revisão bibliográfica, título, atividade

específica dentro do setor económico onde pertence, ano, contexto, quantidade de citações e visualizações.

Tabela 8 Setor económico educação, logística e público

Nº	Título	Sector económico	Atividade Sector económico	Ano	Contexto	País	Visualizações	Citações
39	Center of Excellence for Lean Enterprise 4.0	Education	learning institutes	2019	Business	Germany	319	4
70	Visualizing Design Process by Using Lean UX to Improve Interdisciplinary Team's Effectiveness – A Case Study	Education	Education	2019	Business	Taiwan	226	0
7	Lean manufacturing aplicada à gestão da melhoria de um setor: um estudo de caso	Logistic	Logistics	2020	Business	Brazil	NA	0
17	Lean tools applied in urban public transportation	Logistic	Logistics	2018	Business	Brazil	2334	0
60	Digitization of Work Instructions and Checklists for Improved Data Management and Work Productivity	Logistic	Logistics	2019	Business	Singapore	100	0
69	Increased Productivity in the Area of External Logistics and Delivery Services of the Urban Employment Express Through the Methodology Lean Manufacturing	Logistic	Logistics	2019	Business	Peru	43	0
72	Lean maintenance logistics management: The key to green and sustainable performance	Logistic	Logistics	2018	Business	Morocco	191	1
136	Lean, streamlined machine: Digitalizing supply chains to boost organizational performance	Logistic	Supply Chain	2020	Academic	USA, Canada	NA	0
109	A geographic picture of Lean adoption in the public sector: Cases, approaches, and a refreshed agenda	Public Sector	Public sector	2020	Academic	Brazil	12	3

3.2.2. LEAN MANAGEMENT POR ÁREA DE APLICAÇÃO

A pesquisa bibliográfica por área de atividade está segmentada por operações, business management, recursos humanos, logística, inovação, qualidade e *supply chain*.

Nas operações, temos uma área de classificação mais detalhada para os artigos que são especificamente área de processos e chão de fábrica e designados por *manufacturing*. Em recursos humanos temos o fator humano como principal destaque, enquanto que na logística temos artigos que falam da gestão de fluxos de trabalho.

O business management, já tem áreas com maior enfoque na gestão, vendas, performance, financeiras, organizacional e cultural. A área do *Supply chain* está dedicada á gestão das mesmas e respetiva performance.

A área de aplicação da qualidade tem artigos de sustentabilidade e ambiente, já a área designada por inovação tem desenvolvimento de produto, processos, infraestruturas e todos os artigos relacionado com a inteligência artificial.

3.2.2.1. ÁREA DE APLICAÇÃO OPERAÇÕES

Tabela 9 Área de aplicação operações

Nº	Título	Área de aplicação	Area Apl detalhe	Ano	Contexto	País	Visualizações	Citações
1	APPLICATION OF LEAN MANUFACTURING TOOLS: A CASE STUDY IN A MATTRESS FACTORY	Operations	Manufacturing	2018	Business	Brazil	2337	4
2	Applying SLP in a Lean Manufacturing Model to Improve Productivity of Furniture SME	Operations	Manufacturing	2020	Business	Peru, Spain	1300	NA
4	Lean Manufacturing: Implementation, Opportunities and Challenges	Operations	Manufacturing	2019	Academic	Portugal	90	1
11	THE USE OF LEAN PRACTICES: A CASE STUDY IN A CLUTCH FACTORY	Operations	Manufacturing	2019	Business	Brazil	NA	1
15	Lean manufacturing implementation: bibliometric analysis 2007–2018	Operations	Manufacturing	2019	Academic	Brazil	487	13
16	Utilização do lean manufacturing para redução de desperdícios em um restaurante industrial	Operations	Manufacturing	2019	Business	Brazil	145	0
21	Value stream mapping as a lean manufacturing tool: A new account approach for cost saving in a textile company	Operations	Manufacturing	2019	Business	Brazil	5909	7
23	Lean manufacturing implementation in reducing waste for electronic assembly line	Operations	Manufacturing	2017	Business	Malaysia	2119	21
24	Analysis of reconfigurable assembly system framing systems in automotive industry	Operations	Manufacturing	2017	Business	Malaysia	542	7
26	Understanding the Need of Implementation of Lean Techniques in Manufacturing Industries: A Review	Operations	Manufacturing	2019	Academic	India	NA	2

27	What Is Lean Management in Health Care? Development of an Operational Definition for a Cochrane Systematic Review	Operations	Operations	2018	Academic	Canada, Australia	1578	33
28	An exploratory study of waste in software development organizations using agile or lean approaches: A multiple case study at 14 organizations	Operations	Operations	2018	Business	Sweden	146	13
31	Decoupling Architecture from Lean Software Development in Requirements	Operations	Operations	2019	Academic	USA	NA	0
33	Development of a Conceptual Framework of Lean Construction Principles: An Input–Output Model	Operations	Manufacturing	2019	Academic	Morocco	1049	6
34	Lean Concept Development in Fast Food Industry Using Integration of Six Sigma and TRIZ Method	Operations	Manufacturing	2020	Academic	Indonesia	344	1
40	Desenvolvimento da metodologia lean num serviço de urgência: scoping review	Operations	Operations	2019	Academic	Portugal	NA	0
41	The economical modelling of a distribution system for electricity supply chain	Operations	Operations	2019	Academic	Taiwan	232	5
42	More Sustainable Performances Through Lean Practices: A Case Study	Operations	Manufacturing	2018	Business	Italy	189	2
47	A simulation-based methodology for the analysis of the effect of lean tools on energy efficiency: An application in power distribution industry	Operations	Operations	2018	Business	Turkey	93	19
59	Obstacles to the Introduction of Lean Production in Russian Electrotechnical Enterprises	Operations	Operations	2019	Academic	Russia	35	0
62	The effect of Lean Six Sigma practices on food industry performance: Implications of the Sector's experience and typical characteristic	Operations	Manufacturing	2020	Academic	Brazil, USA	66	2
64	Review and classification of Lean project aims in hospitals	Operations	Operations	2019	Academic	South Africa	87	2
70	Visualizing Design Process by Using Lean UX to Improve Interdisciplinary Team's Effectiveness – A Case Study	Operations	Operations	2019	Business	Taiwan	226	0
71	Lean Healthcare Processes: Effective Technology Integration and Comprehensive Decision Support Using Requirements Engineering Methods	Operations	Operations	2019	Business	Canada, Saudi Arabia	81	0
73	Super Lean Software Startup Engineering Management	Operations	Operations	2019	Business	USA	88	0
74	Lean Service in a Banking Entity	Operations	Operations	2019	Business	Peru	35	0
75	Improving Enterprise production Management system on the basis of lean production	Operations	Operations	2019	Academic	Russia	0	0

76	Optimization of activities of road construction company based on lean manufacturing tools	Operations	Operations	2020	Academic	Russia	291	0
80	The disintegration of lean manufacturing and lean management	Operations	Operations	2019	Academic	USA	159	13
81	A systematic literature review of empirical research in Lean and Six Sigma in healthcare	Operations	Operations	2018	Academic	Brazil	1681	25
82	Increasing Competitiveness through the Implementation of Lean Management in Healthcare	Operations	Operations	2020	Business	Spain	625	1
97	Improving manufacturing cycle efficiency through new multiple criteria data envelopment analysis models: an application in green and lean manufacturing processes	Operations	Automotive Industry	2020	Business	Brazil	199	0
99	Implementation of lean manufacturing in electronics industry	Operations	Manufacturing	2020	Academic	India	5	0
105	Technology Engineering for Medical Devices-A Lean Manufacturing Plant Viewpoint	Operations	Manufacturing	2020	Business	USA	NA	1
111	A case study in consolidating the loss structure of different manufacturing sectors under lean context	Operations	Operations	2020	Business	Sweden	0	0
125	Contribuições do Lean Healthcare para o Combate à Covid-19	Operations	Operations	2020	Academic	Brazil	0	0
126	Reorganization of a large academic hospital to face COVID-19 outbreak: The model of Parma, Emilia-Romagna region, Italy	Operations	Operations	2020	Business	Italy	NA	9
127	Rapid Implementation of Telepsychiatry in a Safety-Net Health System During Covid-19 Using Lean	Operations	Operations	2020	Business	USA	NA	0
133	Lean and agile manufacturing: complementary or competing capabilities?	Operations	Operations	2020	Academic	Pakistan, USA	NA	1
135	Exploring lean generic and lean healthcare cultural clusters	Operations	Operations	2019	Academic	Canada	NA	1
138	Introducing a strategic perspective in lean thinking applications through system dynamics modelling: the dynamic Value Stream Map	Operations	Operations	2020	Academic	Italy	NA	0
141	A lean manufacturing road map using fuzzy-DEMATEL with case-based analysis	Operations	Operations	2020	Academic	Egypt	NA	0

3.2.2.2. ÁREA DE APLICAÇÃO BUSINESS MANAGEMENT

Tabela 10 Área de aplicação business management

Nº	Título	Área de aplicação	Area Apl detalhe	Ano	Contexto	País	Visualizações	Citações
6	APPLYING LEAN-TRIZ HYBRID APPROACH INTO TOYOTA KATA FOR ORGANIZATIONAL LEVEL IMPROVEMENT	Business Management	Organizational	2018	Academic	Brazil	2339	0
9	O AVANÇO DA METODOLOGIA LEAN MANUFACTURING NO MUNDO GLOBALIZADO	Business Management	Organizational	2019	Academic	Brazil	114	NA
10	Accounting Systems and the Financial Operations Performance in Lean Manufacturing Companies: A Correlation Study	Business Management	Finance	2019	Academic	USA	NA	0
13	Impact of Lean Manufacturing Practices on Firms' Sustainable Performance: Lean Culture as a Moderator	Business Management	Culture	2019	Academic	Malaysia, Korea	8612	11
19	Effect of the motivational factor on lean manufacturing performance: the case of a multinational consumer goods company	Business Management	Culture	2019	Business	Brazil	549	2
35	Digital startups and the adoption and implementation of Lean Startup Approaches: Effectuation, Bricolage and Opportunity Creation in practice	Business Management	Organizational	2018	Academic	Italy	429	35
36	The LDP in Digital Business Startups: The Case of raiserve	Business Management	Organizational	2019	Academic	USA	16	1
38	Investing in lean manufacturing practices: an environmental and operational perspective	Business Management	Organizational	2019	Academic	China, USA, Canada	2845	38
39	Center of Excellence for Lean Enterprise 4.0	Business Management	Organizational	2019	Business	Germany	319	4
43	The optimization research of investment management in power grid enterprise	Business Management	Finance	2019	Business	China	46	0
44	Research on Lean Management of Power Marketing Strategy in Power Grid Enterprises	Business Management	Marketing	2019	Business	China	33	NA
45	Research on Investment Distribution Technology of Power Grid Enterprise Overhaul Based on Gini Coefficient Theory	Business Management	Finance	2020	Business	China	69	0

46	The Formation Of Organizational Culture In The Aspect Of Lean Management Principles In The Energy Industry	Business Management	Culture	2019	Academic	Poland	327	4
50	Examining the interaction between lean and sustainability principles in the management process of AEC industry	Business Management	Organizational	2018	Academic	Egypt	290	32
52	An integrative view on Lean innovation management	Business Management	Organizational	2019	Academic	Netherlands	133	16
54	The application of dynamic game theory to participant's interaction mechanisms in lean management	Business Management	Organizational	2020	Academic	China	16	3
56	The Lean Closed Loop Management of Transformer Operation in Low Voltage Distribution Network	Business Management	Strategy	2019	Business	China	184	0
57	Data-driven lean Management for Distribution Network	Business Management	Performance	2018	Business	China	131	0
58	Design of Lean Management System for Equipment Assets Based on BOM Tree and RFID	Business Management	Finance	2018	Business	China	88	0
60	Digitization of Work Instructions and Checklists for Improved Data Management and Work Productivity	Business Management	Performance	2019	Business	Singapore	100	0
61	Lean for the process industries: Dealing with complexity	Business Management	Finance	2019	Business	USA	NA	144
68	Corporate memory in the lean context	Business Management	Culture	2019	Business	Portugal	42	0
89	Exploring lean manufacturing practices' influence on process innovation performance	Business Management	Performance	2020	Academic	UK	198	18
93	Lean manufacturing and business performance: testing the S-curve theory	Business Management	Performance	2020	Academic	Brazil, France	461	4
98	Barriers Affecting Successful Lean Implementation in Singapore's Shipbuilding Industry: A Case Study	Business Management	Organizational	2020	Business	UK, Singapore	NA	1
100	Impact of Lean and Sustainability Oriented Innovation on Sustainability Performance of Small and Medium Sized Enterprises: A Data Envelopment Analysis-based framework	Business Management	Performance	2018	Academic	UK, India	163	24
101	Quality and flexibility performance trade-offs between lean and agile manufacturing firms in the	Business Management	Performance	2019	Academic	UK	511	6

	automotive industry							
109	A geographic picture of Lean adoption in the public sector: Cases, approaches, and a refreshed agenda	Business Management	Organizational	2020	Academic	Brazil	12	3
116	The mediating influence of organisational cultural practices in successful lean management implementation.	Business Management	Culture	2020	Academic	UK	5	1
117	Assessing the relationship of the human resource, finance, and information technology functions on reported performance in hospitals using the Lean management system	Business Management	Organizational	2019	Academic	USA	NA	3
122	Lean Six Sigma in financial services industry: a systematic review and agenda for future research	Business Management	Management	2019	Academic	India, UK	964	21
123	Increasing Competitiveness through the Implementation of Lean Management in Healthcare	Business Management	Management	2020	Business	Spain	NA	NA
129	Realizing Total Customer Experience through Six Sigma Marketing: An empirical approach	Business Management	Marketing	2019	Business	India	NA	1
131	Extending the pursuit of flow (lean) management to encompass sales, general and administrative functions	Business Management	Finance	2019	Academic	USA	132	1
132	Market-driven management of start-ups: The case of wearable technology	Business Management	Organizational	2018	Business	Canada,Turkey, Iran	NA	8
134	Impact of lean operations on the roles of finance functions and their application of lean	Business Management	Finance	2020	Academic	Denmark	NA	0
137	Virtual workplaces and lean leadership: integrative conceptualization and organizational implications	Business Management	Organizational	2020	Academic	India	NA	0
139	Operating room effectiveness:a lean health-care performance indicator	Business Management	Performance	2020	Academic	Portugal	NA	0
140	Similarities and differences between business process management and lean management	Business Management	Management	2020	Academic	Brazil, Germany	NA	0

3.2.2.3. ÁREA DE APLICAÇÃO RECURSOS HUMANOS

Tabela 11 Área de aplicação recursos humanos

Nº	Título	Área de aplicação	Ano	Contexto	País	Visualizações	Citações
3	The moderating role of temporary work on the performance of lean manufacturing systems	HR	2019	Academic	Ireland	241	2
5	The South African perspective on the lean manufacturing Respect for People principles	HR	2019	Academic	South Africa	154	2
103	Lean Manufacturing and Environmental Sustainability: The Effects of Employee Involvement, Stakeholder Pressure and ISO 14001	HR	2020	Academic	China, Spain	272	0
106	Supporting Factors to Improve the Lack during Lean Manufacturing Implementation	HR	2020	Academic	Indonesia	137	1
108	Lean Production and Job Satisfaction: Perception of Workers in Plastics Manufacturing	HR	2020	Academic	Philippines	0	1
113	Work intensification and employee involvement in lean production: New light on a classic dilemma	HR	2018	Academic	Italy	978	13
114	Synergising Lean Six Sigma with human resource practices: evidence from literature arena	HR	2018	Academic	India, Dubai	405	12
115	Effects of HRM practices, lean production practices and lean duration on performance	HR	2017	Academic	Sri Lanka	871	7
118	Lean manufacturing, human resource management and worker health: Are there smart bundles of practices along the adoption process?	HR	2019	Business	France	NA	3
120	Corporate Social Responsibility and Human Resource Management: Towards Sustainable Business Organizations	HR	2020	Academic	Spain	6802	7
128	Lean information for lean communication: Analysis of concepts, tools, references, and terms	HR	2018	Academic	Brazil	132	14

3.2.2.4. ÁREA DE APLICAÇÃO LOGÍSTICA E QUALIDADE

Tabela 12 Área de aplicação logística e qualidade

Nº	Título	Área de aplicação	Area Apl detalhe	Ano	Contexto	País	Visualizações	Citações
7	LEAN MANUFACTURING APLICADA À GESTÃO DA MELHORIA DE UM SETOR: um estudo de caso	logistic	logistic	2020	Business	Brazil	NA	0

17	LEAN TOOLS APPLIED IN URBAN PUBLIC TRANSPORTATION	logistic	Logistic	2018	Business	Brazil	2334	0
18	A LEAN APPROACH ON HOSPITAL FLOW MANAGEMENT	logistic	logistic	2018	Academic	Brazil	2346	0
69	Increased Productivity in the Area of External Logistics and Delivery Services of the Urban Employment Express Through the Methodology Lean Manufacturing	logistic	Performance	2019	Business	Peru	43	0
72	Lean maintenance logistics management: The key to green and sustainable performance	logistic	Performance	2018	Business	Morocco	191	1
14	The application of the Lean Manufacturing tools as support in quality management system and production efficiency in an automotive industry	Quality	Quality	2019	Business	Poland	NA	0
20	The implementation of lean manufacturing and ergonomics in Small Medium Enterprise – Case study	Quality	Ergonomics	2019	Business	Malaysia	221	2
25	Sustainable manufacturing: Exploring antecedents and influence of Total Productive Maintenance and lean manufacturing	Quality	Environmental	2019	Academic	China, Spain	942	1
29	Lean Transformation of Industrial Work: Understanding What Supports Socially Sustainable Working Conditions During Lean Manufacturing	Quality	Ergonomics	2019	Academic	Sweden	682	0
48	Promoting sustainability of manufacturing industry through the lean energy-saving and emission-reduction strategy	Quality	Environmental	2019	Business	China	167	89
51	Are all lean principles equally eco-friendly? A panel data study	Quality	Environmental	2018	Academic	Portugal,Spain	187	25
53	The relationship between lean and environmental performance: Practices and measures	Quality	Environmental	2019	Academic	Italy, UK	196	32
55	Criteria and practices for lean and green performance assessment: Systematic review and conceptual framework	Quality	Environmental	2020	Academic	Brazil	244	28
79	Application of the Quality Management Methods and Tools in the Operation of Electrical Equipment	Quality	Management	2019	Academic	Russia	71	0
102	Evaluating the impact of lean practices on environmental performance: evidences from five manufacturing companies	Quality	Environmental	2019	Academic	Italy, UK	567	6
107	Impact of lean implementation from the ergonomics view: A research article	Quality	Ergonomics	2020	Academic	India	0	0
112	Investigating the enablers associated with implementation of Green Lean Six Sigma in manufacturing sector using Best Worst Method	Quality	Environmental	2020	Academic	India	279	5

142	Quality and lean practices synergies: A swift even flow perspective	Quality	Management	2020	Academic	Australia, Ireland	NA	2
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3.2.2.5. ÁREA DE APLICAÇÃO INOVAÇÃO

Tabela 13 Área de aplicação inovação

Nº	Título	Área de aplicação	Area Apl detalhe	Ano	Contexto	País	Visualizações	Citações
8	Industry 4.0 and lean manufacturing practices for sustainable organisational performance in Indian manufacturing companies	Innovation	Industry 4.0	2019	Academic	India, USA	2029	37
12	Industry 4.0 Enhanced Lean Manufacturing	Innovation	Industry 4.0	2019	Academic	China, Malaysia	715	5
22	Lean and energy efficient production based on internet of things (IOT) in aviation industry	Innovation	Industry 4.0	2019	Business	Russia, China	501	4
30	Mapping wastes in complex projects for Lean Product Development	Innovation	Development	2019	Academic	Italy, UK	120	8
32	REVIEW OF 35 YEARS OF LEAN PRODUCTION – OUTLOOK DEVELOPMENT TO LEAN, AGILE, AND IOT	Innovation	IOT	2019	Academic	Germany, Netherlands	NA	0
37	Application of Lean Methods into the Customised Product Development Process of Large Power Transformers	Innovation	Development	2020	Business	Slovenia	167	1
49	Industry 4.0, digitization, and opportunities for sustainability	Innovation	Industry 4.0	2019	Academic	Iran	232	33
65	Maintenance 4.0: Intelligent and Predictive Maintenance System Architecture	Innovation	Industry 4.0	2018	Academic	Portugal	2675	28
66	Lean Manager in the Factory of the Future : Case study in automotive industry	Innovation	Industry 4.0	2019	Business	France	244	2
67	Batteries for Satellites Constellation, using Lean Manufacturing for Space Industry	Innovation	Development	2019	Business	France	75	0
77	Lean Six Sigma and Industry 4.0 integration for Operational Excellence: evidence from Italian manufacturing companies	Innovation	Industry 4.0	2020	Academic	Italy, UK	163	0
78	A Strategic Roadmap for the Manufacturing Industry to Implement Industry 4.0	Innovation	Industry 4.0	2020	Academic	UK	0	1
83	Lean Management and Industry 4.0 Impact in COVID19 Pandemic Era	Innovation	Industry 4.0	2020	Academic	Morocco	0	0
84	Impacts of Industry 4.0 technologies on Lean principles	Innovation	Industry 4.0	2019	Academic	Canada, France	2077	18
88	Examining legitimatisation of additive manufacturing in the interplay between innovation, lean manufacturing and sustainability	Innovation	Industry 4.0	2020	Academic	UK	168	39

92	Process innovation through industry 4.0 technologies, lean practices and green supply chains	Innovation	Industry 4.0	2020	Academic	Italy	0	1
94	The complementary effect of lean manufacturing and digitalisation on operational performance	Innovation	Industry 4.0	2020	Academic	Norway	535	0
104	Machine learning in human resource system of intelligent manufacturing industry	Innovation	Industry 4.0	2020	Academic	China	157	1
110	Internet of things and simulation approach for decision support system in lean manufacturing	Innovation	IOT	2019	Business	Japan, Malaysia	0	1
119	Lean Smart Maintenance—Value Adding, Flexible, and Intelligent Asset Management	Innovation	Industry 4.0	2019	Academic	Austria	1494	3
130	Eco-Innovation Influencers: Unveiling the Role of Lean Management Principles Adoption	Innovation	Industry 4.0	2019	Academic	Portugal	NA	5
136	Lean, streamlined machine: Digitalizing supply chains to boost organizational performance	Innovation	Industry 4.0	2020	Academic	USA, Canada	NA	0
144	Effective after-sales services through the lean servitization canvas	Innovation	IOT	2020	Business	Netherlands, Norway, Germany	NA	1
150	On the application of Lean principles and practices to innovation management	Innovation	Development	2019	Academic	Netherlands, USA	NA	9

3.2.2.6. ÁREA DE APLICAÇÃO *SUPPLY CHAIN*

Tabela 14 Área de aplicação *supply chain*

Nº	Título	Área de aplicação	Area Apl detalhe	Ano	Contexto	País	Visualizações	Citações
63	The utility of Lean Six Sigma(LSS) in the Supply Chain agro- industry	Supply Chain	Management	2019	Academic	Morocco	62	0
85	Lean management in the context of construction supply chains	Supply Chain	Management	2019	Academic	Ireland	1395	19
86	A dynamic perspective on the key drivers of innovation-led lean approaches to achieve sustainability in manufacturing supply chain	Supply Chain	Management	2020	Academic	China	98	15
87	Operational excellence for improving sustainable supply chain performance	Supply Chain	Performance	2020	Academic	UK, India, China, United Arab Emirates	NA	13
90	Closed-loop supply chain games with innovation-led lean programs and sustainability	Supply Chain	Management	2020	Academic	France, Canada	105	20
91	Barriers to lean six sigma implementation in the supply chain: An ISM model	Supply Chain	Management	2020	Academic	Canada, Bangladesh, Australia	0	0

95	Leagile supply chain: design drivers and business performance implications	Supply Chain	Performance	2020	Academic	Australia	262	2
96	Achieving a sustainable shipbuilding supply chain under I4.0 perspective	Supply Chain	Management	2020	Academic	Spain	140	15
121	Development and validation of a lean supply chain management measurement instrument	Supply Chain	Management	2018	Academic	Spain	657	15
124	Viable supply chain model: integrating agility, resilience and sustainability perspectives— lessons from and thinking beyond the COVID-19 pandemic	Supply Chain	Management	2020	Academic	Germany	6509	13
146	Australian food retail supply chain analysis	Supply Chain	Management	2019	Academic	Australia	NA	6
151	Digitalizing supply chains potential benefits and impact on lean operations	Supply Chain	Management	2020	Academic	USA, Canada	NA	4

3.3. LEAN MANAGEMENT ANÁLISE DOS RESULTADOS EM EXCEL

Após o tratamento da informação e respetiva classificação sobre os critérios e segmentos em cima descritos, aplicamos as funcionalidades existentes no *Excel* para avaliar qualitativamente a informação pesquisada.

3.3.1. ANÁLISE POR ANO

Os artigos investigados nesta revisão literária perfazem um total de 151 artigos, em que 101 são académicos e 50 realizados em contexto de negócio empresarial

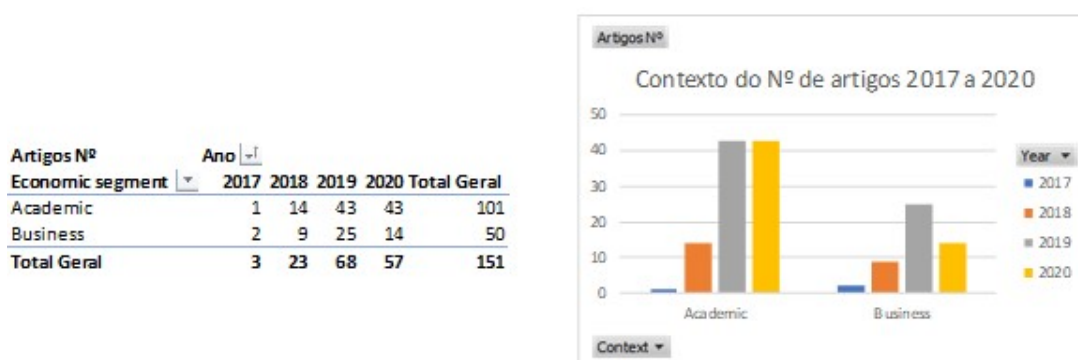


Figura 13

Artigos de 2017 a 2020 por contexto

Na Figura 13 é possível verificar que o ano de 2019 e 2020 tem números aproximados e é importante referir que o ano de 2020 só está contabilizado em termos de pesquisa até junho de 2020. O que é significativo se pensarmos que o ano 2020 devido à situação pandémica poderia ser mais pobre em termos de investigação.

3.3.2. ANÁLISE POR SETOR ECONÓMICO

Em relação ao número de artigos produzidos por setor económico, temos 56 artigos produzidos para a indústria, mas aqui destacamos os 16 artigos realizados para o setor da saúde, que revela a evolução do Lean Management do setor industrial para as áreas até agora sem preocupações em se organizarem em torno do Lean.

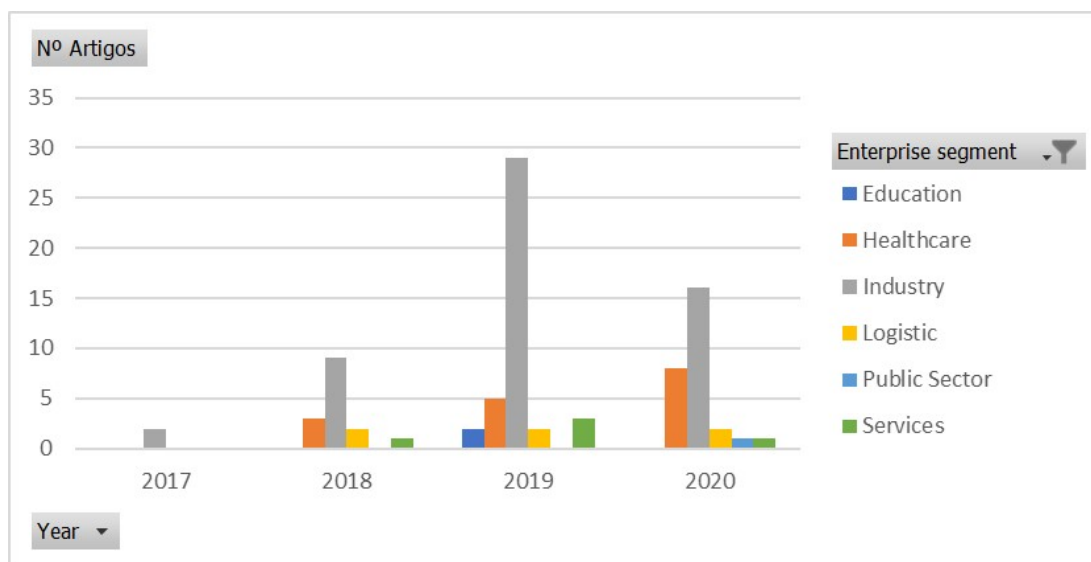


Figura 14 Evolução de artigos por setor económico por ano

Em termos de contexto, a indústria e a saúde ganham destaque, mas inversamente, pois existe maior publicação de artigos académicos na área da saúde enquanto a indústria produz mais artigos fora do contexto académico. Esta conclusão atesta o fato de só agora o Lean ser estudado para aplicação no setor da saúde, por isso é natural que as primeiras investigações sejam em termos académicos.

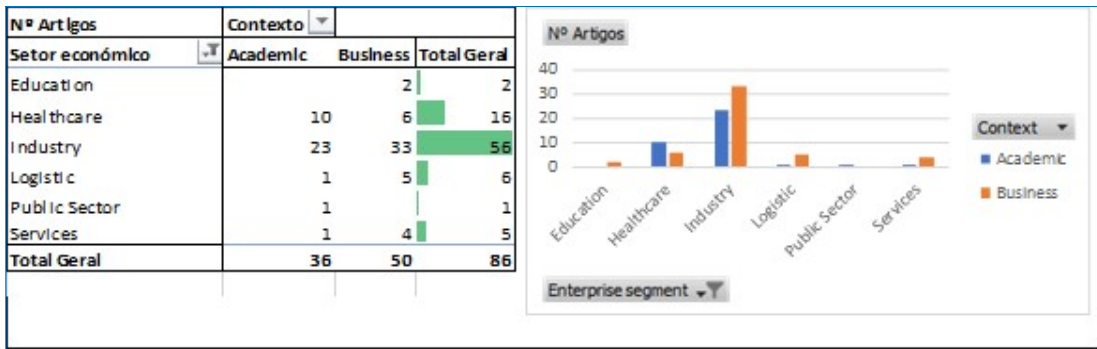


Figura 15 Contexto dos artigos por setor económico

Na análise dos setores económicos mais tradicionais, a indústria e os serviços, os artigos publicados são em maior número em contexto empresarial.

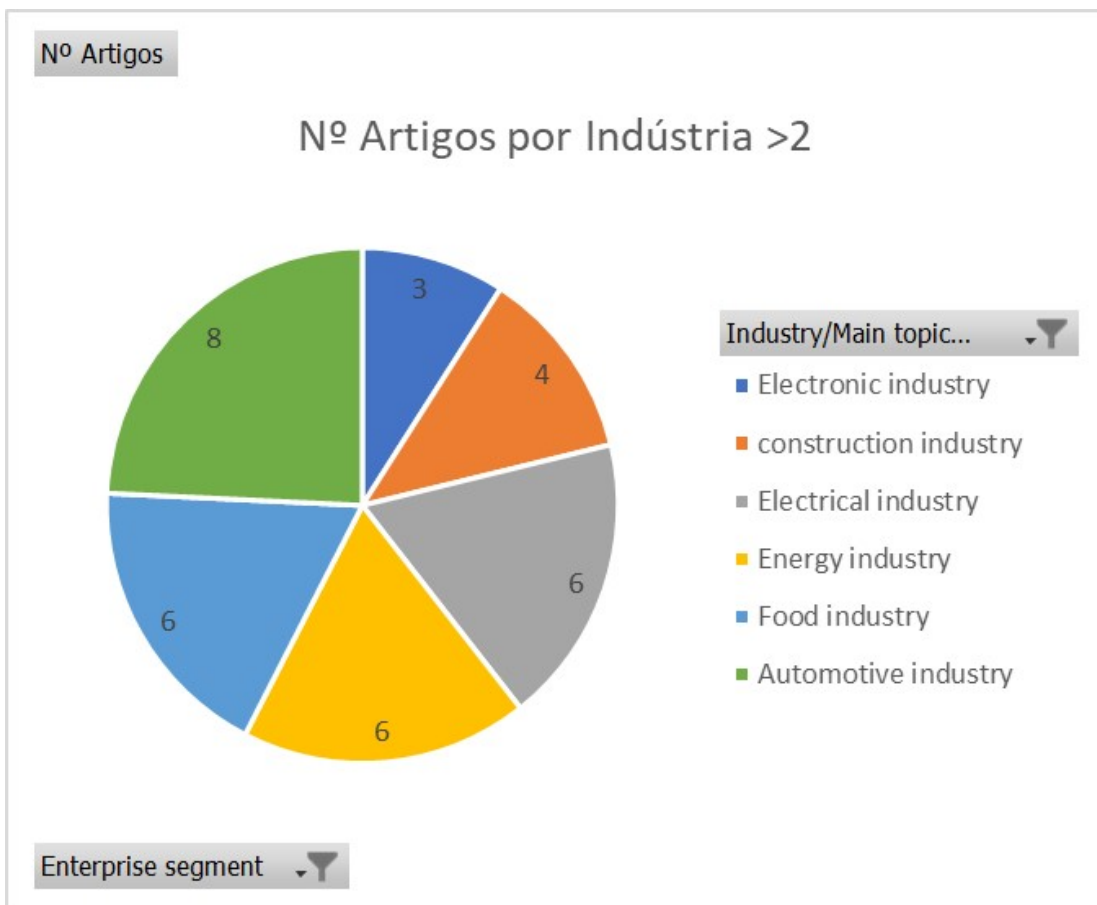


Figura 16 indústrias com maior número de artigos publicados

No caso da indústria a indústria automóvel continua a ter enorme relevância na publicação de artigos por si só. No entanto a indústria alimentar, elétrica e da energia, num mundo mais evoluído tecnologicamente e com maior densidade demográfica, tem

cada vez maior importância, de tal forma que os investigadores estudam de que forma estes negócios podem beneficiar com a implementação *Lean*. A figura 16 demonstra isso com artigos publicados que somados em conjunto são superiores aos artigos publicados aplicados à indústria automóvel.

Esta pesquisa por setor económico demonstra que de 2017 a 2020 assistimos a uma evolução do *Lean Management* para fora da indústria automóvel, onde começou estando neste momento numa fase em que a sua maturidade inspira confiança na sua implementação em indústrias cujo contexto de atividade pode ser até bastante divergente da indústria automóvel.

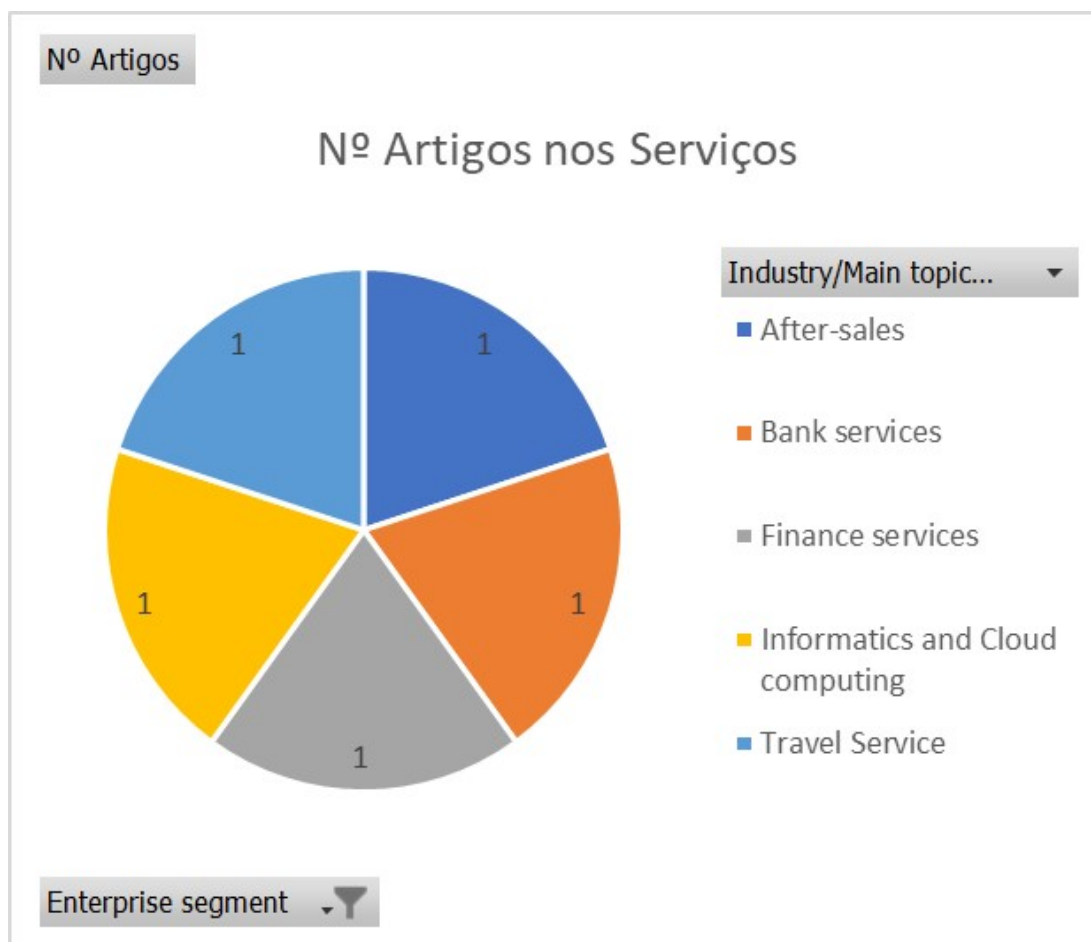


Figura 17 Setor serviços, detalhe de atividades

Nos serviços existe menor concentração com uma distribuição uniforme de artigos sobre cada uma das áreas.

Em relação aos países de origem das publicações, destaca-se a presença do Brasil, China e Estados Unidos da América com um número de artigos publicados de 12, 8 e 7 respetivamente. É de realçar que o Brasil tem maior número de artigos publicados na área da indústria, mas tem artigos na área da saúde superior a países como a França.

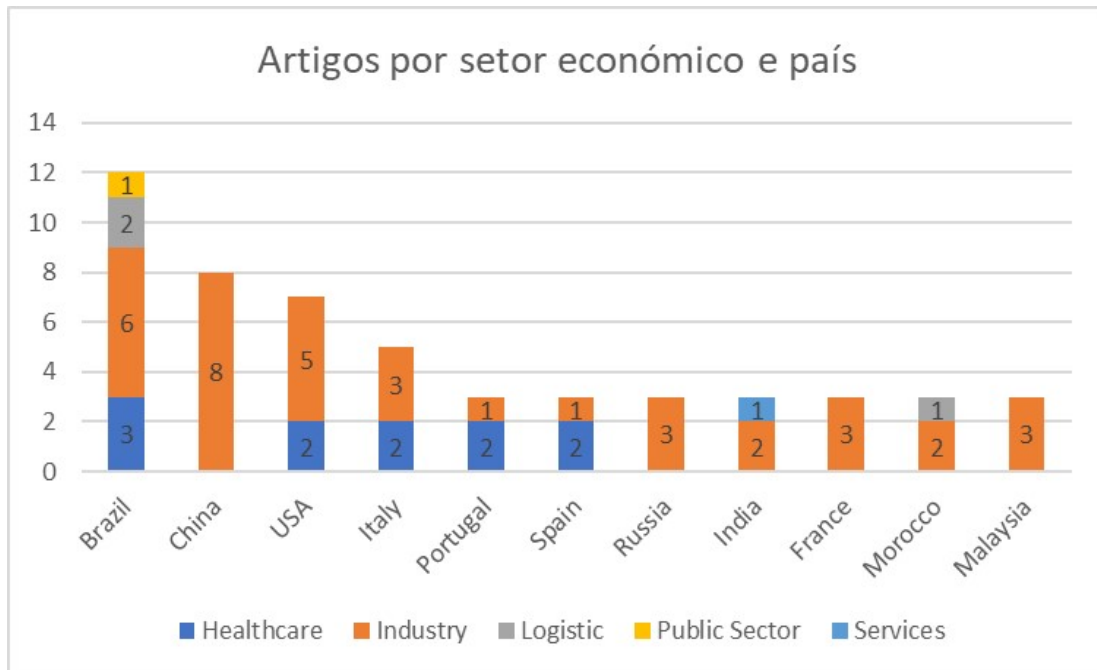


Figura 18 N.º artigos por setor económico e país

3.3.3. ANÁLISE POR ÁREA DE APLICAÇÃO

Na análise da publicação de artigos por ano destaco as áreas de Business Management e de Operações, áreas que são objeto de publicação de um maior número de artigos. No entanto é de realçar a evolução de artigos sobre a *Supply chain* e de recursos humanos que têm uma evolução positiva de 2019 para 2020 em termos de artigos publicados



Figura 19 Pesquisa por Título

Como se verifica pela figura 20, em números absolutos a pesquisa bibliográfica de 2017 a 2020 teve o maior número de artigos publicados dentro da área de aplicação Business Management e Operações com 44 e 42 artigos.

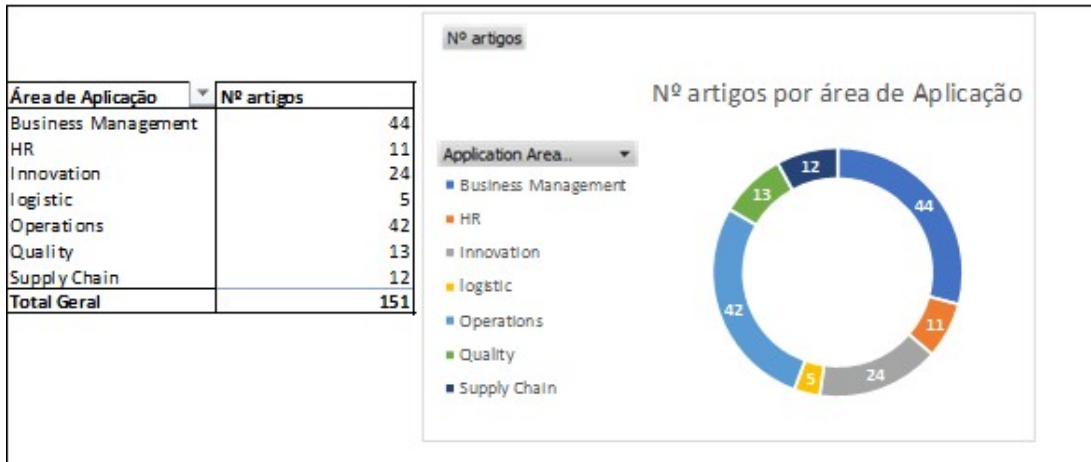


Figura 20 Nº total de artigos por área de aplicação

Podemos assumir então que o estudo da implementação do Lean Management está a fugir da área tradicional das operações e está agora mais presente na área do Business Management, onde existe agora maior necessidade da sua aplicação. Esta área contém as finanças, as vendas, o marketing e toda a gestão organizacional de uma empresa ou entidade.

Em termos de países, os artigos publicados nas diversas áreas de aplicação, temos a seguinte distribuição na figura 21.

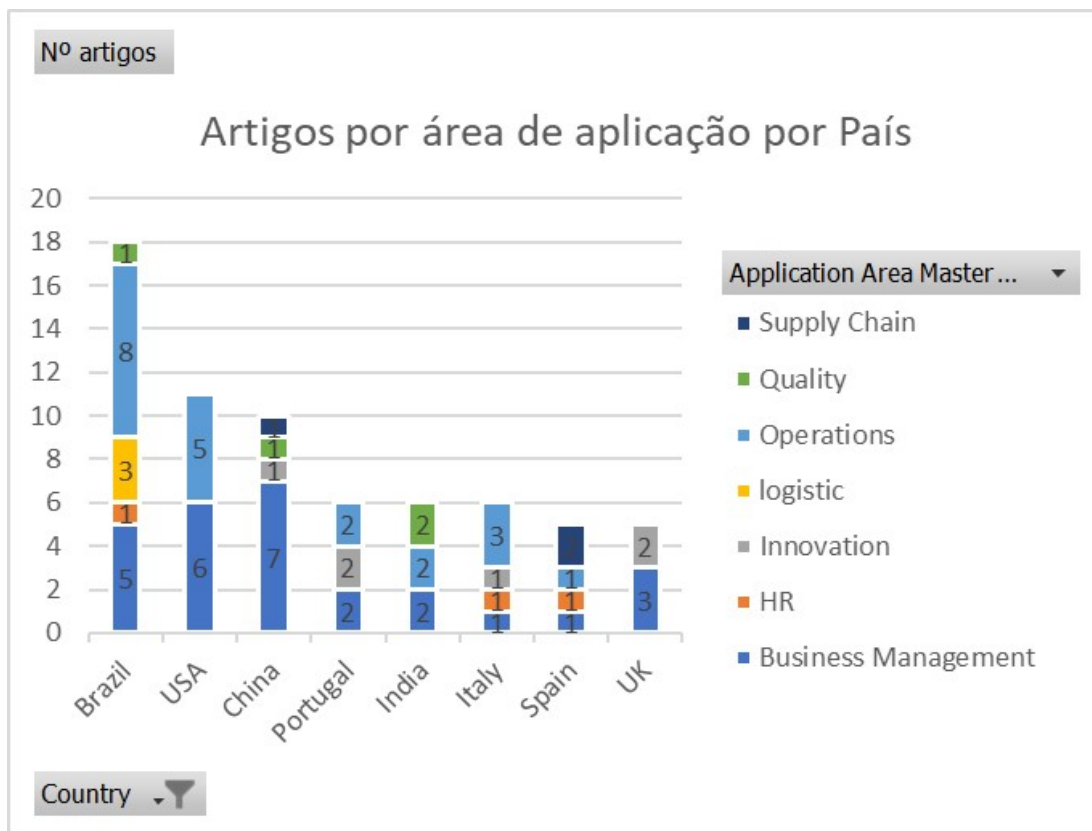


Figura 21 Nº de artigos por área de aplicação e país

Na análise verificamos que o Business Management tem maior foco de atenção nos Estados Unidos da América e China, o recurso humano tem destaque em países ibéricos e no Brasil, as Operações são fonte de interesse das investigações no Brasil e destaque o número de artigos produzidos em Portugal e no Reino Unido sob a área da inovação.

Tabela 15 evolução do Nº de artigos por país e área de aplicação

Nº artigos	Aplicação									
	País	Business Management	HR	Innovation	logistic	Operations	Quality	Supply Chain	Total Geral	
Brazil	⇒	5	↑1		↑3	↑8	↓1		18	
USA	↑	6				⇒5			11	
China	↑	7		↓1			↓1	↓1	10	
Portugal	↓	2		↑2		↓2			6	
India	↓	2				↓2	↑2		6	
Italy	↓	1	↑1	↓1		↓3			6	
Spain	↓	1	↑1			↓1		↑2	5	
UK	⇒	3		↑2					5	
Total Geral			27	3	6	3	21	4	3	67

A média de citações pelas várias áreas de aplicação é representado na figura 22, onde se constata que a média de citações é mais elevada na qualidade, business Management e *supply chain*.

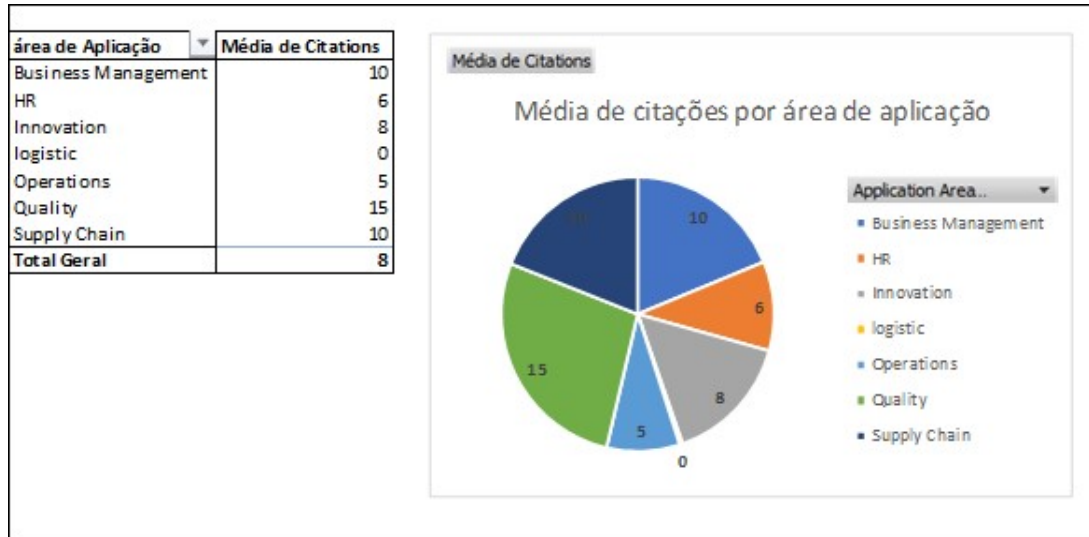


Figura 22 Média de citações por área de aplicação

Uma análise mais detalhada das áreas faz denotar que os artigos sobre *environmental* é um dos temas mais citados, seguido dos artigos sobre *Lean* nas finanças.

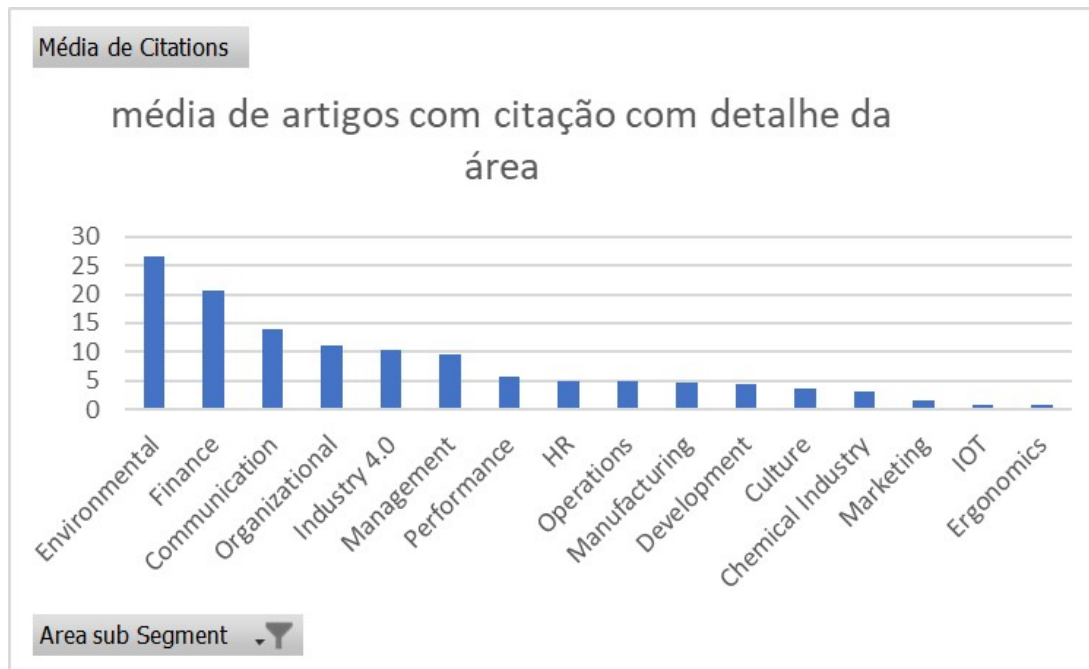


Figura 23 média de citações por especificidade da área de aplicação

3.3.4. ANÁLISE POR PAÍS

A pesquisa bibliográfica por país mostra que os países desenvolvidos e ou em vias de crescimento e com populações significativas é que produzem mais artigos sobre Lean Management.

Este resultado é perfeitamente natural, pois países mais desenvolvidos tem empresas com maior vertente tecnológicas e com posições dominantes que permitem maior interesse e financiamento para estudos sobre o Lean (como exemplo os Estados Unidos da América).

Os países que tenham maior densidade populacional e que estejam em crescimento económico tem entidades de ensino superior com grande população estudantil, junto com um tecido empresarial de pequenas e médias empresas com escala ou que necessitem de obter escala e por isso existe maior interesse em aplicar o Lean nos mais variados contextos e são exemplo disso países como o Brasil, China e India.

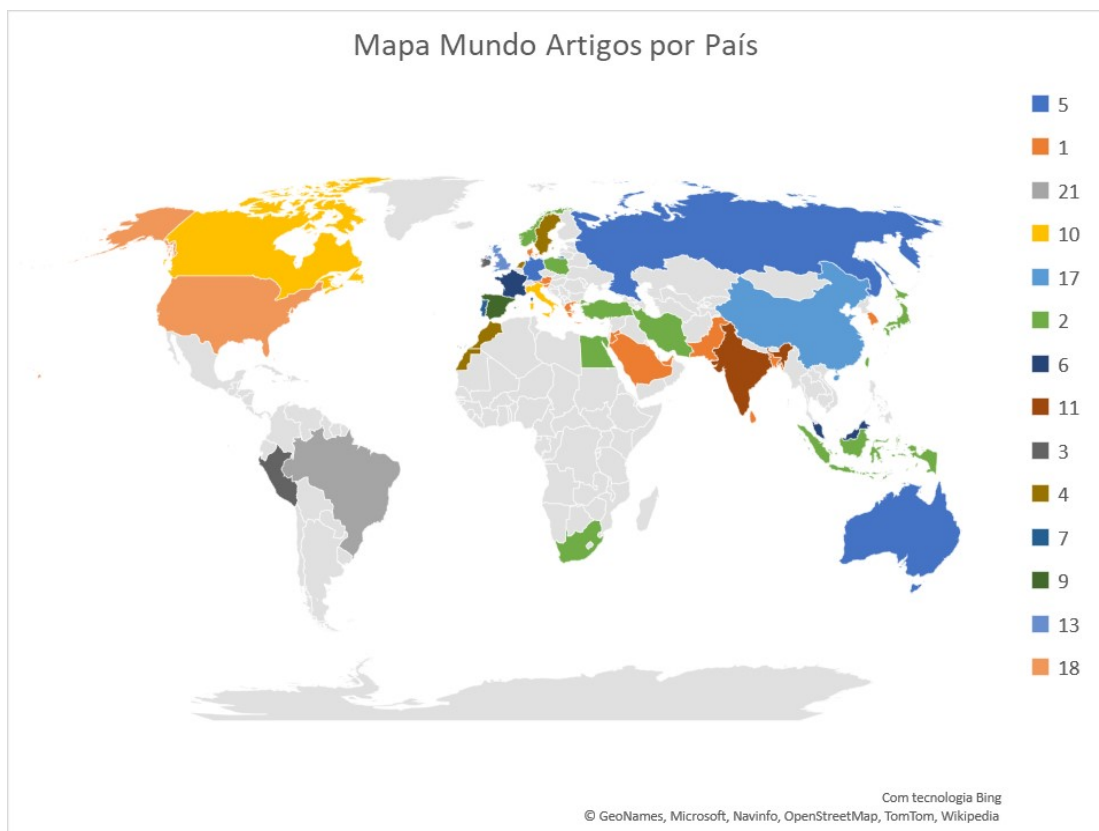


Figura 24 Nº de artigos por país

Os países do Brasil, China e da Índia são os países com mais artigos publicados, com Portugal a ocupar uma posição honrosa.

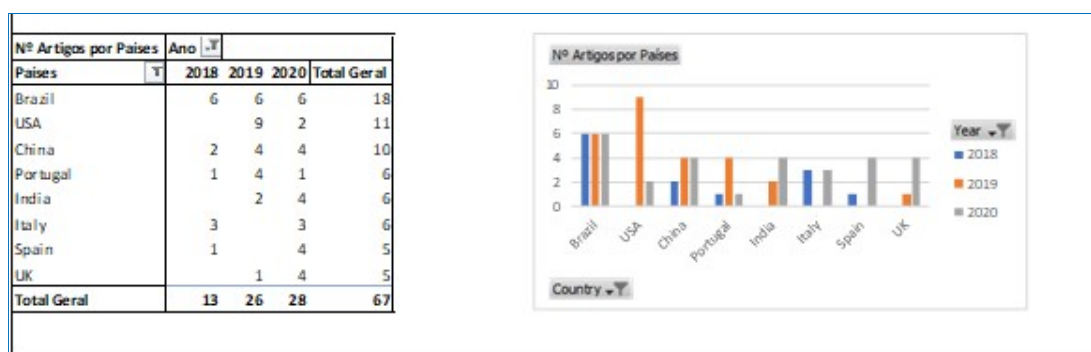


Figura 25 Nº artigos pelos países com mais de 5 artigos publicados de 2017 a 2020

Desta análise verificamos que a maioria destes países manteve a publicação de artigos durante o último ano, com exceção dos Estados Unidos da América e Portugal que teve uma redução em 2020.

Tabela 16 tabela de países com mais de 5 artigos por área específica

Nº Artigos por Países	Países								Total Geral
	Brasil	USA	China	Portugal	India	Italy	Spain	UK	
Manufacturing	6	1			1	2	1		11
Operations	2	4			1	2		1	10
Organizational	3	2	1			1	1		8
Finance		3	3						6
Industry 4.0			1	2		1		2	6
Management	1		1				3		5
Performance			1	1				2	4
Environmental	1		1			1			3
Culture	1				1			1	3
Marketing			1	1		1			3
logistic	3								3
HR							1	1	2
Ergonomics						1			1
Communication	1								1
Strategy				1					1
Total Geral	18	11	10	6	6	6	5	5	67

No Brasil verificamos que a área específica da produção é a área com maior publicação em *Lean*, junto com a logística e as questões organizacionais. No Estados Unidos e China a área financeira, gestão, marketing e a preocupação sobre a mudança organizacional tem vindo a ter cada vez mais atenção, o que reflete a maturidade económica destes países. É no entanto de realçar que as questões ambientais são fonte de interesse na China, mas

não são nos Estados Unidos da América o que poderá indicar que este último país, devido a posições políticas dos últimos anos, implicou menor sensibilidade à investigação sobre esta área do *Lean*.

Em termos de visualizações, os artigos mais visualizados foram artigos da Malásia e da Coreia realizados conjuntamente e em segundo lugar um artigo alemão.

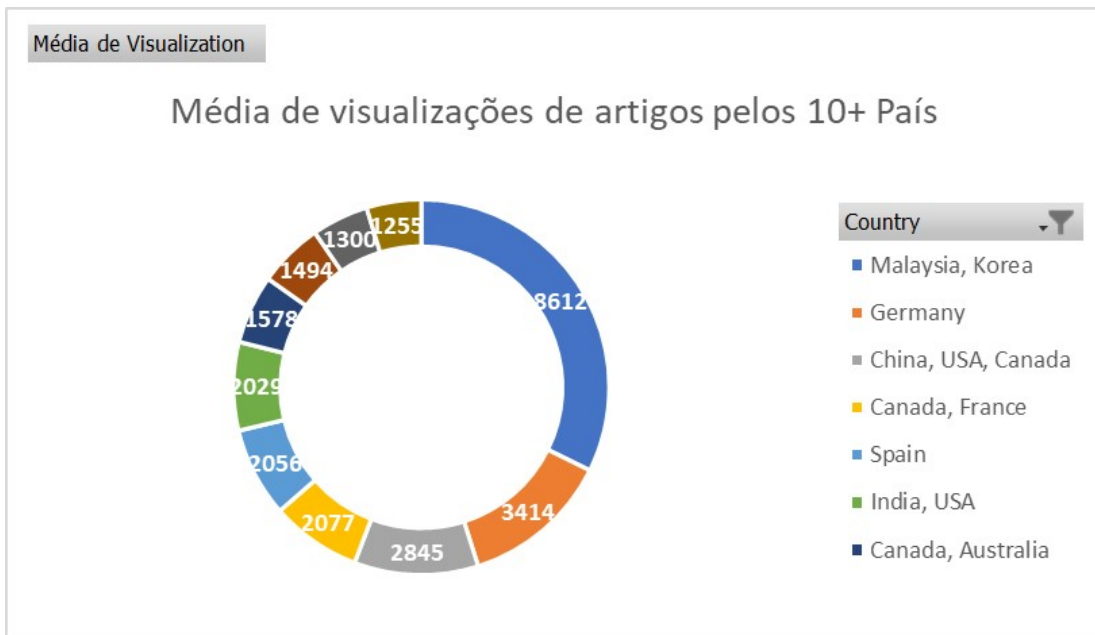


Figura 26 Média de artigos visualizados por países

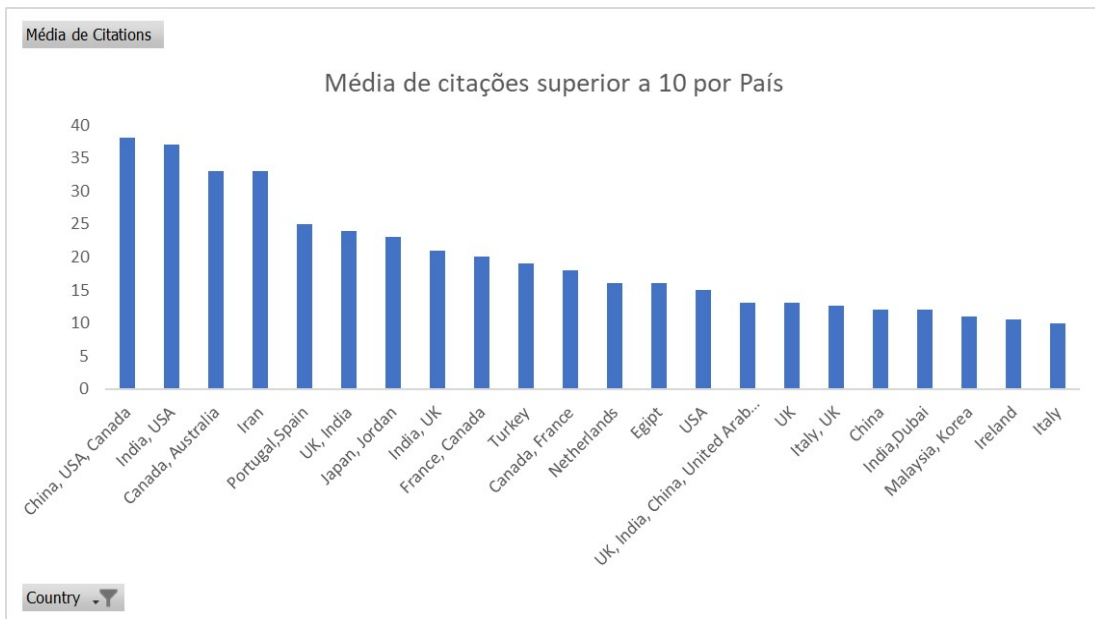


Figura 27 média de citações superior a 10 por país

Já em relação a citações temos uma média de artigos citados que pertencem a artigos realizados conjuntamente pela China, Estados Unidos da América e Canada; Índia e Estados Unidos da América e Canada e Austrália.

O primeiro é um artigo sobre o investimento em *Lean*, numa perspetiva de business management e ambiental, o segundo sobre a implementação da indústria 4.0 em empresas indianas e o último um estudo sobre o que é Lean dentro da área da saúde.

O número médio de citações indica a relevância dos temas, através da menção dos mesmos em outras publicações e confirma os resultados deste estudo em que as áreas do Business Management, a inovação, através da indústria 4.0 e o setor da saúde têm na investigação sobre Lean no tempo presente.

3.3.5. ANÁLISE POR PALAVRA CHAVE

A análise por palavra chave permite verificar quais as principais palavras dos artigos durante os anos de 2017 a 2020.

As palavras *lean manufacturing*, *Lean* e *Lean Management* são naturalmente as palavras mais encontradas. No entanto as palavras referentes à indústria 4.0, sustentabilidade, as performances operacionais estão igualmente presentes.

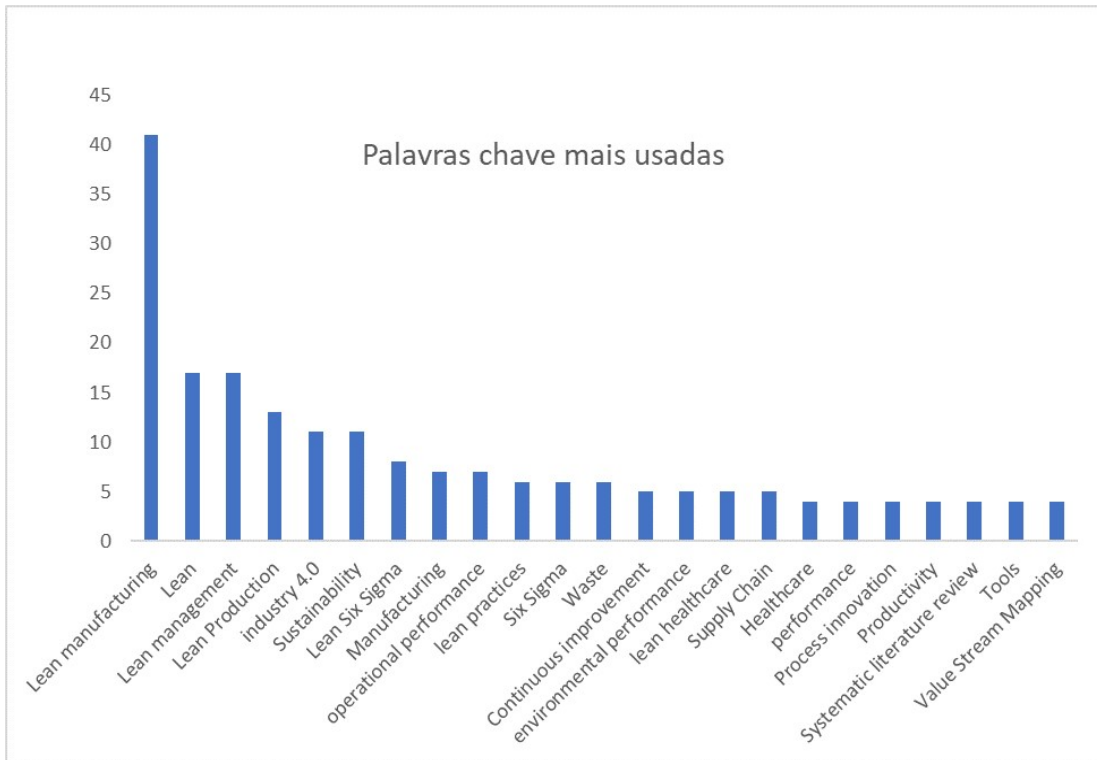


Figura 28 palavras chave mais usadas nos artigos de 2017 a 2020

Se agruparmos as palavras por segmento, teremos perspectiva mais ampliada sobre as palavras chave.

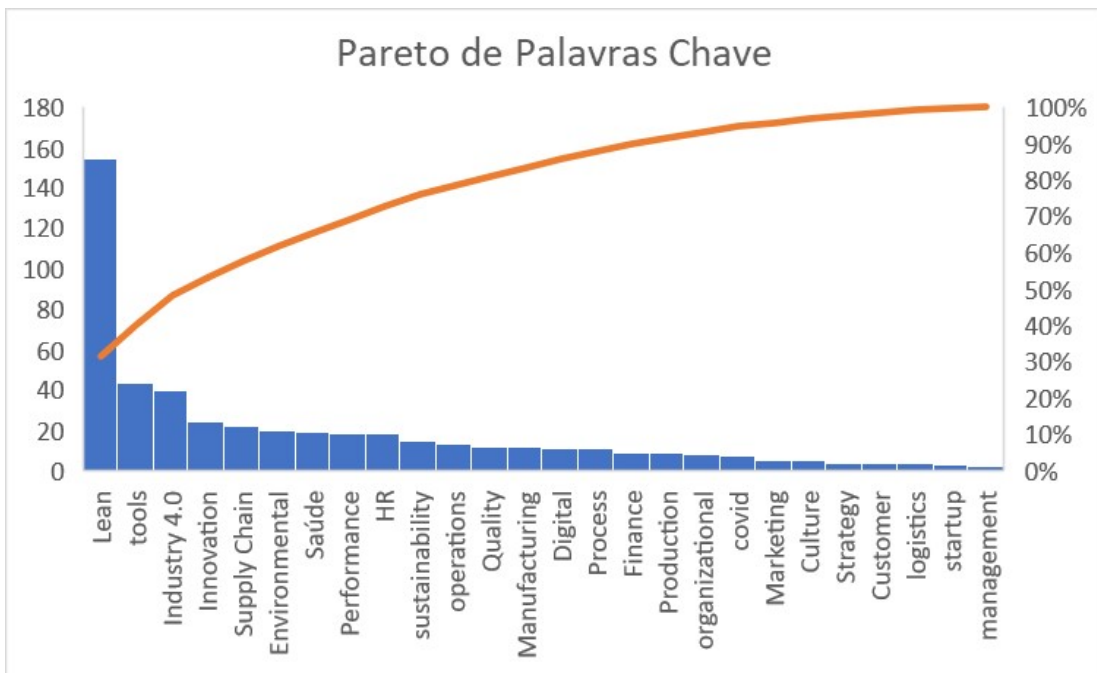


Figura 29 gráfico de pareto das principais palavras chave dos artigos

Todas as palavras chave referente a Lean continuam a dominar, assim como as suas ferramentas, mas logo a seguir temos os artigos que versam sobre a indústria 4.0 e em particular todos os processos de inovação. Os artigos sobre *supply chain*, ambiente e saúde têm maior preponderância, e é de notar que no último ano de 2020 já foram publicados artigos de Lean management aplicados aos sistemas de saúde referenciados ao COVID-19.

3.4. LEAN MANAGEMENT ANÁLISE DOS RESULTADOS EM *POWERBI*

A incorporação dos resultados obtidos da pesquisa bibliográfica e tratados com os mesmos critérios na ferramenta *PowerBI* permite obter um *dashboard* com visual apelativo e verificável online através de um link disponível ao público.

O resultado permite obter visualizações diversas as quais são descritas nos parágrafos a seguir. Como todos os visuais criados na ferramenta têm referência cruzada, uma alteração automaticamente altera todos.

Ao alterar o visual da Figura 30, é possível verificar através da alteração do ano, o número de artigos produzidos no(s) ano(s) selecionado(s). Este visual presente na figura é apresentado com valores totais e neste caso é referente ao número de artigos presente neste estudo.

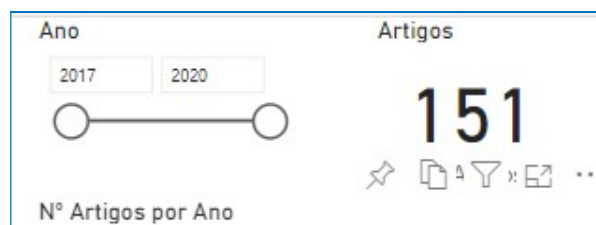


Figura 30 Visual que identifica ano e quantidade de artigos selecionados

Na figura 31 podemos verificar qual a evolução dos anos alvo da pesquisa, onde é facilmente percebido qual é o ano com mais artigos publicados que é o ano 2019.



Figura 31 Nº de artigos publicados por ano

O gráfico presente na figura 32 apresenta os artigos publicados em contexto acadêmico e em ambiente empresarial.



Figura 32 Gráfico com nº de artigos publicados por ano e contexto

O mapa de manchas apresentado na figura 33, é um visual que automaticamente mostra as localizações dos países de origem da investigação. É apresentado os países que publicaram artigos de 2017 a 2020, mas selecionado qualquer ano irá apresentar apenas os artigos alvo da seleção.



Figura 33 visual que permite identificar país do artigo e ano de publicação

A figura 34 apresenta um gráfico que mostra as áreas específicas alvo de investigação sobre o Lean Management, mas só as áreas que tiveram mais que cinco artigos publicados durante 2017 a 2020.

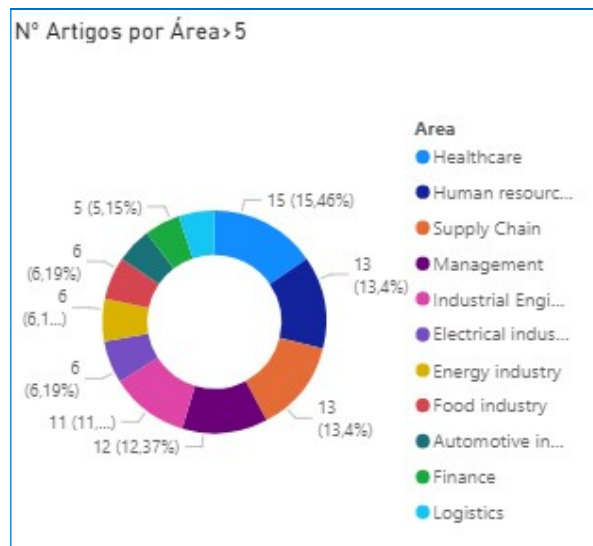


Figura 34 Nº de artigos produzidos por área de aplicação detalhada superior a 5

link. Este último automaticamente selecionado abre o artigo selecionado mediante uma conexão à internet existente.

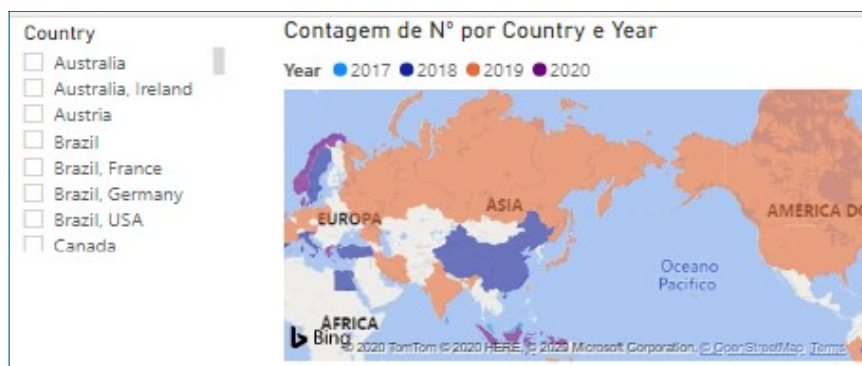


Figura 37 seleção de país para visualização de artigos

Aqui este visual apresentado na Figura 38, permite o utilizador realizar uma pesquisa por país e altera automaticamente o visual no mapa, dando indicações dos artigos realizados e em que ano.

Juntamente com o visual anterior que também fica alterado apresentando somente os artigos selecionados para o país designado.

A figura 39, mediante a seleção anterior apresenta as áreas alvo pelo dos investigadores de cada país .



Figura 38 Quantidade de artigos por área de aplicação e visualizações

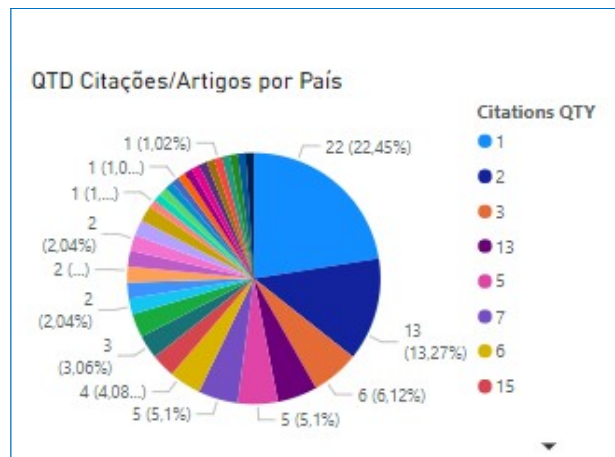


Figura 39 Quantidade de citações por País

Neste último apresenta estatisticamente o número de citações que cada artigo teve por país.

Os dados obtidos são similares aos dos resultados tratados na ferramenta Excel.

4. CONCLUSÕES

Ao longo deste texto foram sendo apresentadas conclusões que permitiram sustentar as opções de desenvolvimento efetuadas ao longo do projeto. Assim, nesta última secção é realizada uma síntese das principais conclusões, consequências e relevância do trabalho realizado e perspectiva dos futuros desenvolvimentos.

Os resultados obtidos nas ferramentas *excel* e em *powerbi* são semelhantes, pois os dados de entrada são iguais, apenas a manipulação dos dados é feita de forma diferente.

A partir da análise qualitativa dos dados obtidos nas duas ferramentas, conseguimos determinar que de 2017 a 2020, em que no ano 2020 com apenas 6 meses considerado em termos de publicações, foram publicados mais artigos sobre Lean Management em contexto académico do que em contexto empresarial.

No entanto se compararmos os 57 artigos publicados em 2020, com os 67 artigos publicados durante todo o ano de 2019, concluímos que o ano 2020 foi mais produtivo que o ano de 2019. Na atual situação de pandemia global e a respetiva contenção domiciliária que imperou durante boa parte dos meses de 2020, este fato é por si estranho, no entanto para um artigo ser publicado decorre vários meses de verificação e aprovação, o que indica que a maior parte destes artigos teve as suas investigações anteriores a 2020, durante 2019 e anos anteriores. Esta situação será potencialmente verificável em estudos posteriores a esta data e a uma análise quantitativa de artigos publicados em 2021 e 2022.

Se analisarmos os setores económicos que tiveram maior evolução em artigos publicados, verificamos que o setor da saúde evoluiu com mais artigos publicados entre 2019 e 2020, ao contrário do setor indústria que teve redução no mesmo período. Este aumento embora fosse uma tendência com artigos publicados em 2018, o seu gradual aumento em 2020 pode estar relacionado com a atual situação pandémica, pois existem palavras chave “COVID” e equivalentes, tudo em artigos publicados em 2020.

A análise macro por área de aplicação reforça a importância em 2020 da área *supply chain*, pois foi a única área que teve mais artigos publicados em 6 meses de 2020 do que em todo o ano de 2019, o que reflete não só a importância da área, mas a pressão que as cadeias de abastecimento sofreram com a atual situação provocado pelo COVID.

Em termos da importância global do período analisado de 2017 a 2020, a área do *Business Management*, seguida das operações são a área de foco da maioria dos investigadores, no entanto a inovação e o *supply chain* são áreas cada vez a conquistar o interesse, enquadrada pela perspectiva da cadeia de valor de *Porter* (Porter,1980).

Numa análise micro na área do *Business Management* as questões organizacionais e financeiras produzem mais artigos e na inovação é dominado pelo interesse dos investigadores na indústria 4.0, a área de expansão tecnológica do Lean Management.

Os países que se encontram no Top 10, neste período (2017~2020) a liderar processos de investigação com mais artigos produzidos são o Brasil, seguido pelos Estados Unidos da América e China, ocupando Portugal o sexto lugar com seis artigos produzidos sobre Lean Management.

Estes resultados enquadram-se na evolução Lean, tanto no contexto de expansão das áreas alvo de investigação, cada vez mais fora do ambiente fabril e mais centrado na evolução tecnológica. A título de exemplo, podemos referir a adoção do Lean nas tecnologias associadas à inteligência artificial, na forma de gerir o negócio e até em áreas que habitualmente não pensávamos o Lean como o marketing.

É de reforçar que se comprova que o Lean é uma filosofia em evolução e com um espetro de atuação cada vez mais amplo e em todas as geografias.

A área geográfica já não está só centrada no Japão e nos países europeus e norte americanos, mas em países como o Brasil e China.

Numa perspetiva futura era necessário ampliar o número de artigos publicados sobre o Lean management, pois uma amostra maior em número e mais ampla em espetro poderia refinar os dados.

Em relação a este trabalho era igualmente interessante observar os novos artigos pós – pandemia e onde será o foco em termos de áreas de aplicação e segmentos económicos. A área da saúde provavelmente irá ter maior atenção por parte dos investigadores, que irá privilegiar esta área depois da era COVID, pois nesta pesquisa já existem alguns artigos publicados. Outra área que irá provavelmente ter um aumento de interesse será as cadeias de abastecimento, devido ao anúncio de alguns países querem ficar menos dependentes de países como a China.

O mais relevante será verificar se devido à recessão económica que atualmente já se verifica muitas empresas tentaram adotar o Lean, como uma tentativa de melhorar a sua

gestão, processos, eliminar desperdícios, entrarem em tecnologias associadas à inteligência artificial, de forma a encontrar novas atividades ou adicionarem valor aos seus produtos e serviços para sobreviverem neste novo contexto.

A título de conclusão o presente estudo permite a quem o analise verificar de forma rápida as atuais e futuras tendências do *lean*, com o acesso a um *dashboard* em *PowerBI* que permite analisar todos os dados de acordo com o interesse do utilizador, ao mesmo que acede a qualquer um dos artigos desde que exista uma conexão à internet.

Referências Documentais

- (Bertagnolli, 2018). Bertagnolli, F. (2018). Lean Management. Wiesbaden: Springer.
- (Slack, 1995] Slack, N., et al. (1995). Operations management. London: Pitman Publishing.
- (Ohno, 1990) Ohno, T. (1990). Toyota production system. Beyond large scale production. New York: Productivity Press
- (Helmold e Terry, 2016] Helmold, M., & Terry, B. (2016). Global sourcing and supply management excellence in China. Procurement guide for supply experts. Singapore: Springer.
- (Helmold e Samara, 2019] Helmold, M., & Samara, W. (2019). Progress in performance management. Industry insights and case studies on principles, application tools, and practice. Heidelberg: Springer
- (TPS) <https://www.toyota.pt/world-of-toyota/toyota-no-mundo/toyota-production-system.json>
- (Liker et al, 2004) Liker, J. K. (2004). The Toyota way. Madison: McGraw-Hill.
- (Porter,1980) Porter, M. E. (1980). Competitive strategy: Techniques for analyzing industries and competitors. New York: Free Press.
- (Managing Strategic Change) Gerry Johnson (1992), Managing strategic change— strategy, culture and action, Long Range Planning, Volume 25, Issue 1,1992, Pages 28-36, ISSN 0024-6301.
- (SLR) Hannah Snyder(2019), Literature review as a research methodology: An overview and guidelines, Journal of Business Research, Volume 104, Pages 333-339

Anexo A. Tabela de Autores

Neste anexo estão descritos os autores, títulos, link de acesso ao documento.

Nº	Title	Author(s)	Abstract	Article Conclusion	Link	Citation
1	APPLICATION OF LEAN MANUFACTURING TOOLS: A CASE STUDY IN A MATTRESS FACTORY	Camilla de Cássia Mendonça Silva, Marcia Nóbrega Morais Arouche, Zelsa Maria Lima, Ana Célia Silva Vieira, Eduardo	Lean manufacturing is a production strategy that aims to reduce waste and increase value added through the application of tools of the Lean	Após a conclusão do trabalho foi observado que as metas estabelecidas foram alcançadas com êxito, havendo como resultado redução de desperdícios e aumento da produtividade diária totalizando um ganho de 20%. Além disso observou-se uma redução no índice de movimentação em torno de	http://leaosystem.ufsc.br/index.php/lean/article/view/7457/pdf	SILVA, Camilla de Cássia Mendonça, et al. Application of lean manufacturing tools: a case study in a mattress factory. <i>Journal of Lean Systems</i> , 2019, 4.1: 87-104.
2	Applying SLP in a Lean Manufacturing Model to Improve Productivity of Furniture SME	Z Farfan-Quintanilla, M Cañal-Jimena	Currently, a company's competitiveness in the market depends on its productivity in efficiently using its available resources. Low	the results showed a positive impact in which the new improved methods in the cutting and grinding process, as well as a new plant layout enabled operations and activities to be performed in less time, increasing productivity from 42.5% to 64.20%	https://link.springer.com/chapter/10.1007/978-3-300-39511-4_106	FARFAN-QUINTANILLA, Zsoltann, et al. Applying SLP in a Lean Manufacturing Model to Improve Productivity of Furniture SME. In: <i>International Conference on Intelligent Human Systems Integration</i> . Springer, Cham, 2020. p.
3	The moderating role of temporary work on the performance of lean manufacturing systems	Ciancha, F Wiengarten, A Longoni	Companies are extensively employing lean manufacturing practices and temporary work, which surface value are in stark contrast to each	Our results indicate that while lean manufacturing improves operational performance, the use of temporary work positively influences the relationship between lean manufacturing and mix and volume flexibility performance.	https://doi.org/10.1080/00207543.2019.1651458	SANCHA, Ciancha, et al. The moderating role of temporary work on the performance of lean manufacturing systems. <i>International Journal of Production Research</i> , 2020, 58.14: 4285-4305.
4	Lean Manufacturing: Implementation, Opportunities and Challenges	F Silva, L Pinto Ferreira	The paradigm of manufacturing is undergoing a major evolution throughout the world. The use of computers, the Internet	....	https://repositorio.ufsc.br/handle/10400/2214776	SILVA, Francisco; PINTO FERREIRA, Luis. Lean Manufacturing: Implementation, Opportunities and Challenges. Nova Science Publishers, 2019.
5	The South African perspective on the lean manufacturing Respect for People principles	Rojanette Coetzee, Cara Jonker, Karl van der Merwe, Liel van Dyk	ORIENTATION: Many industries have adopted the popular continuous improvement (CI) approach, lean manufacturing, to	This study has provided insight into lean implementation within the South African context. All the Japanese RFP themes are required for the South African context, but additional themes are also required. South Africans require job security prior to a lean implementation and they believe	http://www.scielo.org.br/scielo.php?script=sci_arttext&id=52071-07632019000100011	COETZEE, Rojanette, et al. The South African perspective on the lean manufacturing Respect for People principles. <i>SA Journal of Industrial Psychology</i> , 2019, 45.1: 1-11.
6	APPLYING LEAN-TRIZ HYBRID APPROACH INTO TOYOTA KATA FOR ORGANIZATIONAL LEVEL IMPROVEMENT	Thiago Bastos Fernandes, Rodrigo Bastos Fernandes, Fernando Antônio Forcellini	The pursuit for competitive advantages demand manufacturers to increase flexibility, productivity and profitability, while reducing operational cost	A proposta aliou conhecimento de inovação sistemática aplicada à resolução de problemas em nível organizacional de acordo com a abordagem Toyota Kata, organizando ferramentas para tornar possível sua aplicação. Os resultados experimentais indicaram que apesar do	http://leaosystem.ufsc.br/index.php/lean/article/view/7473	FERNANDES, Thiago Bastos; FERNANDES, Rodrigo Bastos; FORCELLINI, Fernando Antônio. Applying Lean-TRIZ hybrid approach into Toyota kata for organizational level improvement. <i>Journal of Lean Systems</i> , 2019, 4.2: 34-
7	LEAN MANUFACTURING APLICADA À GESTÃO DA MELHORIA DE UM SETOR: um estudo de caso	Cairo Henrique Ferreira Borges, Marcos Fernandes Sobrinho, Graciele Cristiana Silva, Luis Almeida da Silva	O Lean Manufacturing ou manufatura enxuta é uma filosofia de gestão que busca eliminar ou reduzir atividades que não agregam valor ao	A aplicação da metodologia Lean possibilitou reduzir desperdícios em etapas envolvidas na análise de afilativa do miolo executadas no Laboratório. Os dados apontam para redução de atividades que, em larga medida, não agregam valor ao processo, além de analisar melhorias de	http://revistas.icsp.br/index.php/FINOM_Humanidade_Tecnologica/article/view/934	BORGES, Cairo Henrique Ferreira, et al. LEAN MANUFACTURING APLICADA À GESTÃO DA MELHORIA DE UM SETOR: um estudo de caso. <i>HUMANIDADES E TECNOLOGIA (FINOM)</i> , 2020, 1.19: 68-77.
8	Industry 4.0 and lean manufacturing practices for sustainable organisational performance in Indian manufacturing companies	Sachin, Kamlesh, Anoop, Gunasekaran, Neelakanth C, Rajendran S, Gunasekaran	The current literature claims the direct effects of Industry 4.0 technologies (I4T) on lean manufacturing practices (LMP) and sustainable	The findings suggest significant direct and indirect effects of I4T on SOP and confirm the presence of LMP as a strong mediating variable. The results of the study extend the literature on I4T by identifying I4T as an enabler of LMP, leading to enhancement of the SOP. Implications and future	https://doi.org/10.1080/00207543.2019.1630772	KAMBLE, Sachin; GUNASEKARAN, Anoop; DHONE, Neelakanth C. Industry 4.0 and lean manufacturing practices for sustainable organisational performance in Indian manufacturing companies. <i>International Journal of Production</i>
9	O AVANÇO DA METODOLOGIA LEAN MANUFACTURING NO MUNDO GLOBALIZADO	JMR Spejo, AFGM Bueno	Com advento da globalização iniciou-se a era do desenvolvimento e inovações tecnológicas, no qual origens as organizações buscarem	Após análise dos resultados foi possível observar que o uso das principais ferramentas sugeridas neste estudo sejam as soluções iniciais para os obstáculos que as empresas podem encontrar durante a implantação: entendimento do sistema, reajustar o esquema de trabalho,	https://revista.fatectec.edu.br/index.php/InterfaceTecnologica/article/view/579	SPEJO, Jhone Mateus Rodrigues; BUENO, Ana Flávia Garcia Moraes. O AVANÇO DA METODOLOGIA LEAN MANUFACTURING NO MUNDO GLOBALIZADO. <i>Revista Interface Tecnológica</i> , 2019, 16.1: 300-313.
10	Accounting Systems and the Financial Operations Performance in Lean Manufacturing Companies: A Correlation Study	Edwards, Kathy	Many manufacturing organizations in the United States face challenges with reducing cost, improving efficiency, and increasing profit margins.	Many manufacturing organizations in the United States face challenges with reducing cost, improving efficiency, and increasing profit margins. Over the past several years, manufacturing companies have implemented the lean manufacturing philosophy in order to improve	https://search.proquest.com/openview/5acc497df61da4a28c1e8e23127056/1?pq-origsite=scholar&qcbt=18750&disav	EDWARDS, Kathy. Accounting Systems and the Financial Operations Performance in Lean Manufacturing Companies: A Correlation Study. 2019. PhD Thesis. Capella University.
11	THE USE OF LEAN PRACTICES: A CASE STUDY IN A CLUTCH FACTORY	Daniel França Lazarin, Edemilson Nogueira, Alceu Gomes Alves Filho	he Lean Production (LP) approach has been widely used by companies because it is a system that seeks to eliminate waste in production processes,	Quanto aos benefícios advindos da implementação enxuta, diversos exemplos foram mencionados pelo entrevistado. Alguns deles foram: motivação do operador (por meio do uso da autonomia), kaizen, equipes de trabalho e	http://leaosystem.ufsc.br/index.php/lean/article/view/7469	LAZARIN, Daniel França; NOGUEIRA, Edemilson; ALVES FILHO, Alceu Gomes. The use of lean practices: A case study in a clutch factory. <i>Journal of Lean Systems</i> , 2019, 4.3: 84-105.
12	Industry 4.0 Enhanced Lean Manufacturing	Nai Yeen Gavin Lai, Kai Hoong Wong, Dunant Halim ; Jiawu Lu ; Hooi Siang Kang	The current global manufacturing landscape is fast changing with growing worldwide demand for better, more innovative, value added	As globalization intensifies competition among manufacturers, there is an immense pressure for organizations to achieve higher level of manufacturing performance. Lean Manufacturing has been a beneficial approach in improving productivity and this study has shown that the	https://ieeexplore.ieee.org/abstract/document/8740569	LAI, Nai Yeen Gavin, et al. Industry 4.0 enhanced lean manufacturing. In: 2019 8th International Conference on Industrial Technology and Management (ICITM). IEEE, 2019. p. 206-211.
13	Impact of Lean Manufacturing Practices on Firms' Sustainable Performance: Lean Culture as a Moderator	Mohammad Iranmanesh, Suhaiza Zailani, Sunghyup Sean Hyun3, Mohd Helmi Ali Kwangyong Kim	Nowadays, manufacturing firms are pressured by governments, non-governmental organizations and customers to operate in a	The aim of this study was to identify the relationship between lean manufacturing practices and the sustainable performance of manufacturing firms in Malaysia by considering lean culture as a moderator. Our findings suggest that process and equipment, product design,	https://www.mdpi.com/2071-1050/11/4/1112	IRANMANESH, Mohammad, et al. Impact of Lean Manufacturing Practices on Firms' Sustainable Performance: Lean Culture as a Moderator. <i>Sustainability</i> , 2019, 11.4: 1112.
14	The application of the Lean Manufacturing tools as support in quality management system and production efficiency in an automotive industry	Michał Paweł Ratajczak	The aim of the study is to present the impact of the Lean Manufacturing implemented in an automotive industry on the quality of products and	The implementation of its tools in the company has contributed to the increase in the quality of products and production processes, and also affected on the reduction of losses. The Lean Manufacturing rules have positively influence on the company's production efficiency. The concept	http://repositorio.ufsc.br/handle/10400/2214776	Ratajczak, Michał Paweł. The application of the Lean Manufacturing tools as support in quality management system and production efficiency in an automotive industry. <i>Dis. Instytut Podstaw Budowy Maszyn</i> , 2019.
15	Lean manufacturing implementation: bibliometric analysis 2007-2018	Rosenira Izabel de Oliveira & Sammya Oliveira Sousa & Fernando Celso de Campos	In order to preserve competitiveness in their markets, organizations seek necessary tools to help them manage their activities. To identify	This research has provided an analytical overview of productions on the subject of lean manufacturing implementation. In the period studied, it was possible to observe in the publications that organizations are adhering to lean manufacturing, however, facing the barriers	https://doi.org/10.1007/s00170-018-2965-4	De Oliveira, Rosenira Izabel, Sammya Oliveira Sousa, and Fernando Celso De Campos. Lean manufacturing implementation: bibliometric analysis 2007-2018. <i>The International Journal of Advanced Manufacturing Technology</i>
16	Utilização do lean manufacturing para redução de desperdícios em um restaurante industrial	Costa, Eugênio Paccelli, Almeida, Luis Fernando Magranini de	The present work addresses the application of waste control, the use of Lean Manufacturing tools, for the purpose of improvement and use	O trabalho realizado foi um estudo de caso em uma cozinha industrial que apresentava problemas de desperdícios na operação produtiva, não sendo expandido para outras áreas da empresa. Dessa forma, foi realizado um mapeamento do processo para conhecimento e	https://repositorio.ufsc.br/bitstream/handle/10400/2214776/78261/2/Utilizac%3a7hc%3a2oLeanManufacturic%3a.pdf	MARQUES, Leonardo de Oliveira, et al. Utilização do lean manufacturing para redução de desperdícios em um restaurante industrial. 2019.
17	LEAN TOOLS APPLIED IN URBAN PUBLIC TRANSPORTATION	Jenaina Renata Garcia, Eliete Santos da Silva Zaganti, Mariane Alexandra Antonowicz	The present paper has the objective of proposing an application of the tools of the lean philosophy in urban public transport companies of the north of	...Através de análise do referencial teórico, foi possível observar que as empresas utilizam os princípios e ferramentas do Lean, preferencialmente em seus setores manufatureiros. Os setores administrativos ainda recebem pouca atenção, dificultando o	http://leaosystem.ufsc.br/index.php/lean/article/view/2501	GARCIA, Jenaina Renata; DA SILVA ZAGANTI, Eliete Santos; ANTONOWICZ, Mariane Alexandra. Lean tools applied in urban public transportation. <i>Journal of Lean Systems</i> , 2019, 4.1: 152-171.
18	A LEAN APPROACH ON HOSPITAL FLOW MANAGEMENT	Bruna Dones Gayer, Érico Marcon, Wagner Pietrobelli Bueno, Priscila Wachs, Tarcizio Abrau Saurin	The rising hospitals costs and their impact on management are a problem faced by several health institutions and part of this cost	Problemas hospitalares, assim como custos, também estão relacionados a problemas de planejamento e logística atualmente (Volland et al., 2017). Com o intuito propor soluções e melhorar nesse ambiente de características complexas, esse estudo buscou analisar um fluxo	http://leaosystem.ufsc.br/index.php/lean/article/view/2976	WACHS, Priscilla, et al. A lean approach on hospital flow management. <i>Journal of Lean Systems</i> , 2019, 4.4: 53-61.

Nº	Title	Author(s)	Abstract	Article Conclusion	Link	Citation
19	Effect of the motivational factor on lean manufacturing performance: the case of a multinational consumer goods company	Felipe Castro Paulo Soares Figueiredo Camila Pereira-Guizzo Francisco Uchoa Passos	The goal of this study was to evaluate the effect of the motivational factor on the results obtained after implementing a lean manufacturing system in a	In general, studies into the behavioral aspects of lean manufacturing focus on consequences to the physical and psychological states of employees after lean implementation, that is, how LM affects the employee in his or her role and regarding his or her well-being. However, there are few studies	http://www.scielo.br/pdf/ep/v26n3/0104-530x-ep-26-3-e4850.pdf	Castro, F., Figueiredo, P. S., Pereira-Guizzo, C., & Passos, F. U. (2019). Effect of the motivational factor on lean manufacturing performance: the case of a multinational consumer goods company. <i>Gestão & Produção</i> , 26(3),
20	The implementation of lean manufacturing and ergonomics in Small Medium Enterprise—Case study	A N M Rose, M F F Ab Rashid, N M Z Nik Mohamed and M A S Jubri	Productivity can be increased by eliminating of all wastes. The objective of lean manufacturing is to eliminate wastes. Commonly, there are	The integration of basic lean manufacturing and ergonomics could enhance company performance. Some companies especially SME are lack of expertise in lean manufacturing and ergonomics. Therefore, in this case study, the research has concentrated on how basic lean manufacturing	https://iopscience.iop.org/article/10.1088/1757-899X/702/1/012057/meta	ROSE, A. N. M., et al. The implementation of lean manufacturing and ergonomics in Small Medium Enterprise—Case study. In: IOP Conference Series: Materials Science and Engineering. IOP Publishing, 2019. p. 012057.
21	Value stream mapping as a lean manufacturing tool: A new account approach for cost saving in a textile company	C.P. Carvalho, D.S. Carvalho, M.B. Silva	Companies around the world are under pressure to reduce their prices to be competitive. In order to keep profitability, they are adopting lean	This article gave an understanding of how LM tools can be applied to identify wastes in a textile enterprise production flow. Value stream mapping showed the opportunities in waste reduction mainly in the final goods inventory. The work also reported the combined application of two LM	https://iopolpapers.upv.es/index.php/IME/article/view/8607	CARVALHO, C.P.; CARVALHO, D.S.; SILVA, M.B. Value stream mapping as a lean manufacturing tool: A new account approach for cost saving in a textile company. <i>International Journal of Production Management and</i>
22	Lean and energy efficient production based on internet of things (IIOT) in aviation industry	Aleksandr Korchagin, Antonina Denisikina and Irina Fateeva	Nowadays, the interest to lean manufacturing increases every year and a lot of aviation companies use it on their practice. At the same time, Internet	In this article there were analyzed the new technologies for aircraft manufacturer company: Lean Manufacturing and Internet of Things, which can significantly improve the production system. There were made the following conclusions through this paper: • Lean Manufacturing can lead	https://www.e3s-conferences.org/articles/e3sconf/pdf/2019/26/e3sconf_ssbwosce2019_02124.pdf	KORCHAGIN, Aleksandr; DENISIKINA, Antonina; FATEEVA, Irina. Lean and energy efficient production based on internet of things (IIOT) in aviation industry. In: E3S Web of Conferences. EDP Sciences, 2019. p. 02124.
23	Lean manufacturing implementation in reducing waste for electronic assembly line	Nurul Husna Zakaria1*, Nik Mohd Zuki Nik Mohamed1,2, Mohd Fazli Faizae Ab Rahid1 and Ahmad Nasser Mohd Rose1	Lean manufacturing is the most convenient way to eliminate unnecessary waste and can provide what customers demand. This paper presents	In this paper, it was aimed to reduce the waste exist in line production that related by the performance of workers in line. The virtual simulation was simulated based on data collections gained during observation process. The significant of each improvement was verified.	https://www.matec-conferences.org/articles/mateconf/pdf/2017/04/mateconf_aiev2017_01048.pdf	Lean manufacturing implementation in reducing waste for electronic assembly line Nurul Husna Zakaria, Nik Mohd Zuki Nik Mohamed, Mohd Fazli Faizae Ab Rahid, Ahmad Nasser Mohd Rose
24	Analysis of reconfigurable assembly system framing systems in automotive industry	Mohamad Zamri Md Zain, Ahmad Majidi Abdul Rani*, Mohd Amin Abd Majid	Current trend in automotive industry shows increasing demand for multiple models with lean production. Prior to that, automotive	Reconfigurable assembly systems (RAS) can be a solution for rapid change in automotive framing structure and for a responsively adjustable production capacity. It also contribute in improving manufacturing or production target indicators i.e. quality, cost and delivery.	https://www.matec-conferences.org/articles/mateconf/pdf/2017/04/mateconf_aiev2017_01047.pdf	Analysis of reconfigurable assembly system framing systems in automotive industry Mohamad Zamri Md Zain, Ahmad Majidi Abdul Rani, Mohd Amin Abd Majid MATEC Web Conf. 90.01047 (2017)
25	Sustainable manufacturing: Exploring antecedents and influence of Total Productive Maintenance and lean manufacturing	Ping-Kuo Chen, Jordi Fortuny-Santos, Itizar Lujan, Patxi Ruiz-de-Arjulo-Lopez3	This article explores the environment-related antecedents and the influence of Total Productive Maintenance and other lean	Although the implementation of a number of LM practices (including TPM) in some companies can be explained by the perception of environmental pressure, each one of the six LM practices studied (including TPM) is correlated with environmental certification	https://journals.sagepub.com/doi/pdf/10.1177/1687814019889736	Chen P-K, Fortuny-Santos J, Lujan I, Ruiz-de-Arjulo-López P. Sustainable manufacturing: Exploring antecedents and influence of Total Productive Maintenance and lean manufacturing. <i>Advances in Mechanical Engineering</i> .
26	Understanding the Need of Implementation of Lean Techniques in Manufacturing Industries: A Review	G. K. Kiran Kuma	In competitive environment lean manufacturing is necessary in every industry. Lean production is a standard	The Conclusion of this review paper reveals that the successful Lean Manufacturing System implementation needs the planning, commitment, learning, safety, integration, Proper Methodology and meanwhile simultaneous implementation of Lean elements along with proper sequence.	https://s3.amazonaws.com/academia.edu.documents/58909110/1tsrd23194.pdf?response-content-disposition=inline%3B%20filename%3DUnderstanding+the+Need+of+Implementation.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAWOWYQZV53UL3ANZ2F0200931	KUMAR, Gk Kiran. Understanding the Need of Implementation of Lean Techniques in Manufacturing Industries: A Review. 2019.
27	What Is Lean Management in Health Care? Development of an Operational Definition for a Cochrane Systematic Review	Thomas Rotter, Christopher Plishka ,Adeboye Lawal, Liz Harrison, Nazmi Sari, Donna Goodridge, Rachel	Industrial improvement approaches such as Lean management are increasingly being adopted in health care. Synthesis is necessary to ensure these	This article outlines the process utilized to develop, test, and apply an operational definition of Lean management in health care. To our knowledge, this is the first data-driven operational definition of Lean in health care developed to date. Although there are other theoretical	https://journals.sagepub.com/doi/pdf/10.1177/0163278718756992	ROTTER, Thomas, et al. What is lean management in health care? Development of an operational definition for a Cochrane systematic review. <i>Evaluation & the health professions</i> , 2019, 42.3: 366-390.
28	An exploratory study of waste in software development organizations using agile or lean approaches: A multiple case study at 14 organizations	HivaAlahyariTonyGorscheRichardBertsson Svensson	Various wastes, categorized in 10 different categories, were identified by the respondents. From the mentioned wastes, not all were necessarily waste	In order to identify, recognize and eliminate waste, a common understanding, and a joint and holistic view of the concept is needed. It is also important to optimize the whole organization and the whole product, as waste on one level can be important on another, thus sub-optimization	https://www.sciencedirect.com/science/article/pii/S095058491830171X	ALAHYARI, Hiva; GORSCHKE, Tony; SVENSSON, Richard Bertsson. An exploratory study of waste in software development organizations using agile or lean approaches: A multiple case study at 14 organizations. <i>Information</i>
29	Lean Transformation of Industrial Work: Understanding What Supports Socially Sustainable Working Conditions During Lean Manufacturing	HÅKANSSON, Malin	The overall aim of this thesis is to contribute to the understanding of what extent lean manufacturing transforms industrial work, including	This thesis shows that it is possible to make lean initiatives in manufacturing companies more socially sustainable. Overall, findings from this thesis indicate that important and interdependent components that can contribute to socially sustainable lean initiatives involve	http://www.diva-portal.org/smash/record.jsf?eid=diva2%3A131376%3B%3F08swid=9486	HÅKANSSON, Malin. Lean Transformation of Industrial Work: Understanding What Supports Socially Sustainable Working Conditions During Lean Manufacturing. 2019. PhD Thesis. KTH Royal Institute of Technology.
30	Mapping wastes in complex projects for Lean Product Development	Valeria Belvedere; Francesco Cuttita; Monica Rossi; Luca Stringhetti	Lean Product Development (LPD) is suggested as an approach that can reduce waste in projects aimed at developing technically	This paper reports the findings of a study carried out at INAF, the Italian Institute of Astrophysics, in an attempt to understand how the knowledge developed thus far in the literature on LPD in relation to waste detection and elimination can be leveraged also in complex projects.	https://www.sciencedirect.com/science/article/pii/S026378631731222X	BELVEDERE, Valeria, et al. Mapping wastes in complex projects for Lean Product Development. <i>International Journal of Project Management</i> , 2019, 37.3: 410-424.
31	Decoupling Architecture from Lean Software Development in Requirements	Manning, C., Wood, D., Thomas, E., & Owen, S.	Unified semantic symmetries have led to many theoretical advances, including 4 bit architectures and 32 bit architectures. After years	In this position paper we presented Gelder, an optimal tool for investigating e-business. We used knowledge-based technology to disprove that the little-known stable algorithm for development of information retrieval systems by Bose and Harris	https://www.svsystem.org/index.php/ssrm/article/view/356	MANNING, Craig, et al. Decoupling Architecture from Lean Software Development in Requirements. <i>International Journal of Software Systems Research and Methodology</i> , 2019, 6.1.
32	REVIEW OF 35 YEARS OF LEAN PRODUCTION – OUTLOOK DEVELOPMENT TO LEAN, AGILE, AND IOT	Stefan SCHMIDT, Benjamin S. G. SCHMIDT	Lean production (or lean management) gained popularity in several waves. The last three decades have been filled with numerous attempts	Before business processes are digitised, simplification and standardization are necessary. Japanese lean management and agile methods can help. Above all, it needs a passion for developing a company and the people working there. It depends on how quickly something can	http://annals.fih.upt.ro/pdf-full/2015/ANNALS-2019-1-02.pdf	SCHMIDT, Stefan; SCHMIDT, Benjamin SG. REVIEW OF 35 YEARS OF LEAN PRODUCTION – OUTLOOK DEVELOPMENT TO LEAN, AGILE, AND IOT. <i>Annals of the Faculty of Engineering Hunedoara-International Journal of Engineering</i> .
33	Development of a Conceptual Framework of Lean Construction Principles: An Input-Output Model	Mohamed S. Baijou, Anas Cha and Abdelali Ennadi	In the new global economy, Lean Construction has become an effective way to design construction systems, which aims at reducing all	This work was aimed to provide a conceptual model that shows the main principles of Lean Construction, as well as the key sub-principles that contribute to their Development of a Conceptual Framework of LCP 21 reinforcement. Initially, the most relevant	https://www.researchgate.net/profile/Mohamed-Saad-Baijou/publication/328837160_Development_of_a_Conceptual_Framework_of_Lean_Construction_Principles_An_Input-Output_Model/links/5c8b97bca6fdcc1d499ee3ec/Development-of-a-Conceptual-Framework-of-Lean-Construction-Principles-An-Input-Output-Model.pdf	BAIJOU, Mohamed S.; CHAFI, Anas; ENNADI, Abdelali. Development of a Conceptual Framework of Lean Construction Principles: An Input-Output Model. <i>Journal of Advanced Manufacturing Systems</i> , 2019, 18.01: 1-
34	Lean Concept Development in Fast Food Industry Using Integration of Six Sigma and TRIZ Method	S Indrawati, A'Azam, E Adrianto, S Miranda and A D Prasaswari	The service industry plays an important role to the development of Indonesian economy. Recently, the fast food industry has a good growth	Based on the results of research on the integration of six sigma and TRIZ methods on lean service, it can be concluded that: • The type of waste that occurs in the fast food industry is service delay. This waste is caused by the process of giving flavor with a time of 527	https://iopscience.iop.org/article/10.1088/1757-899X/722/1/012044/pdf	INDRAWATI, S., et al. Lean Concept Development in Fast Food Industry Using Integration of Six Sigma and TRIZ Method. In: IOP Conference Series: Materials Science and Engineering. IOP Publishing, 2020. p. 012044.
35	Digital startups and the adoption and implementation of Lean Startup Approaches: Effectuation, Bricolage and Opportunity Creation in practice	Antonio Ghezzi	Digital startups launching original value propositions can test out and validate their business model using an emergent set of practices known as Lean	This study presented a first large scale research into if and how digital startups adopt and implement Lean Startup Approaches. The findings emerge from a mixed-method combining quantitative and qualitative analyses, and the contributions are relevant for both the theory and	https://www.sciencedirect.com/science/article/pii/S004016251731778x	GHEZZI, Antonio. Digital startups and the adoption and implementation of Lean Startup Approaches: Effectuation, Bricolage and Opportunity Creation in practice. <i>Technological Forecasting and Social Change</i> , 2019, 146: 945-960.
36	The LDP in Digital Business Startups: The Case of raiseerve	Ryall Carroll, R. Mitch Casselman	Uncertainty in the early development of digital business startups can benefit from data-driven testing of hypotheses. Startups face uncertainty	The use of the LDP also has a number of practical implications. This type of rigorous hypothesis testing early in a digital startups life cycle allows for additional experiments within a small window of time in a very inexpensive manner. This may lead to more ideas being pursued, greater insight	https://scholarspace.manoa.hawaii.edu/bitstream/10125/59975/0635.pdf	CARROLL, Ryall; CASSELMAN, R. Mitch. The Lean Discovery Process: the case of raiseerve. <i>Journal of Small Business and Enterprise Development</i> , 2019.

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37	Application of Lean Methods into the Customised Product Development Process of Large Power Transformers	Mitja VARL, Jožef DUHOVNIK, Jože TAVČAR	The study conducts research on lean product development (PD) methodology and presents a case study of its practical application into a specific	This study presents an extensive transformation of one-of-a-kind PD process according to Toyota's methodology of lean. The focus of comprehensive renovation has been placed on reducing waste and increasing agility and smartness of the design process in a specific, highly individualized	https://hrcak.srce.hr/234237	VARL, Mitja, et al. Application of Lean Methods into the Customised Product Development Process of Large Power Transformers. Tehnički vjesnik, 2020, 27.1: 276-282.
38	Investing in lean manufacturing practices: an environmental and operational perspective	Chunguang Bai, Ahmet Satir & Joseph Sarkis	Lean manufacturing practices (LMs) and corporate environmental sustainability are becoming inextricably linked. Throughout the	The implementation of LMs could generate a competitive edge for an organisation. Yet, organisations want to become lean and green at a reasonable investment cost. Some organisations may lack experience in this respect, as well as the necessary tools and management skills. Thus,	https://www.tandfonline.com/doi/full/10.1080/00207543.2018.1498986	Bai, Chunguang; SATIR, Ahmet; SARKIS, Joseph. Investing in lean manufacturing practices: an environmental and operational perspective. International Journal of Production Research, 2019, 57.4: 1037-1051.
39	Center of Excellence for Lean Enterprise 4.0	U Dombrowski, J Wullbrandt, S Fochler	Lean Production Systems are state of the art in manufacturing industry. A Lean Enterprise integrates all business units, such as Lean Development, Lean	The evaluation matrix in Fig. 4 shows that IFU CoE LE 4.0 can already cover the majority of current and future competence requirements that have been identified in the IFU competence portfolio. On this basis, however, in a second evaluation phase, remaining weak points could be identified,	https://www.researchgate.net/profile/Jonas_Wullbrandt/publication/33262673_Center_of_Excellence_for_Lean_Enterprise_4.0/links/5c9a542585155e6d7c1b91a/Center-of-Excellence-for-Lean-Enterprise-4.0.pdf	DOMBROWSKI, Uwe; WULLBRANDT, Jonas; FOCHLER, Simon. Center of Excellence for Lean Enterprise 4.0. Procedia Manufacturing, 2019, 31: 66-71.
40	Desenvolvimento da metodologia lean num serviço de urgência: scoping review	Armando David de Sousa e Maria Teresa Ramalhal Teixeira Silva Baptista	Os serviços de urgência(SU) enfrentam desafios significativos no atendimento eficiente, de qualidade e seguro, a sobrelotação, o	Independente da estratégia adotada na implementação da metodologia lean, verificaram-se ganhos com a sua aplicação, refletidos na redução dos tempos de permanência dos utentes no SU, na diminuição dos abandonos e no tempo de atendimento, verificou-se ainda,	https://proceedings.ciaiq.org/index.php/CIAIQ2019/article/view/2009/1945	DE SOUSA, Armando David; BAPTISTA, Maria Teresa Ramalhal Teixeira Silva. Desenvolvimento da metodologia lean num serviço de urgência: scoping review. CIAIQ2019, 2019, 2: 113-122.
41	The economical modelling of a distribution system for electricity supply chain	Ivan Darma Wangsa & Hui Ming Wee	We propose an integrated distribution system model for electricity supply chain. The distribution system consists of a power plant, a transmission substation,	In this study, we have formulated an electricity power plant system for a single power plant and multi-customers using the inventory theory. The model considers system blackout, stochastic electricity demand and transmission cost. An iterative procedure has been developed to derive	https://link.springer.com/article/10.1007/s12667-018-0274-w#Abs1	WANGSA, Ivan Darma; WEE, Hui Ming. The economical modelling of a distribution system for electricity supply chain. Energy Systems, 2019, 10.2: 415-435.
42	More Sustainable Performances Through Lean Practices: A Case Study	Sara Antomaroni; Maurizio Bevilacqua; Filippo Emanuele Ciarrapica	Companies recognise lean practices to be a useful methodology for the reaching of more efficient performances in manufacturing processes.	The work carried out in the current application, starting from the knowledge of lean practices, was deepened from an environmental sustainability point of view inquiring whether the two aspects presented common points and interactions. The method proposed, indeed, regards the	https://ieeexplore.ieee.org/document/8436263?keywords=evywords	ANTOMARONI, Sara; BEVILACQUA, Maurizio; CIARRAPICA, Filippo Emanuele. More sustainable performances through lean practices: A case study. In: 2018 IEEE International Conference on Engineering, Technology and Innovation
43	The optimization research of investment management in power grid enterprise	Qian Zhang, Lixu Xia and Wan He	As an important platform for the power grid enterprise, investment management is an important gripper for implementing precise	This paper focuses on the new requirements of power system reform, state-owned enterprise reform and other relevant policies for the investment management of power grid enterprises, and proposes the optimization plan for the investment management in power grid	https://iopscience.iop.org/article/10.1088/1757-1315/332/4/042016/pdf	ZHANG, Qian; XIA, Lixu; HE, Wan. The optimization research of investment management in power grid enterprise. In: IOP Conference Series: Earth and Environmental Science. IOP Publishing, 2019. p. 042016.
44	Research on Lean Management of Power Marketing Strategy in Power Grid Enterprises	Chao Sun ; Yingjie Zang ; Jingwen Sun ; Yanbo Liu	The core of lean management is to eliminate all invalid labor and waste. It sets the target on perfection and ensures the advantage of	Overall, electricity sales to power companies can not only provide good economic returns, but also on the development of power enterprises to lay a solid foundation in order to promote the development of social economy. However, because in the development process, affected by	https://ieeexplore.ieee.org/document/8881154	C. Sun, Y. Zang, J. Sun and Y. Liu, "Research on Lean Management of Power Marketing Strategy in Power Grid Enterprises," 2019 IEEE Innovative Smart Grid Technologies - Asia (ISGT Asia), Chengdu, China, 2019, pp. 3091-3094.
45	Research on Investment Distribution Technology of Power Grid Enterprise Overhaul Based on Gini Coefficient Theory	Xiaoyang Yang, Ping Xu, Jianfeng Shi, Zhongxu Li and Chao Chen	Equipment overhaul is one of the core businesses of power grid enterprises. The scientific and rational allocation of overhaul funds plays an important	In this paper, the Gini coefficient theory is used to optimize the overhaul funds of 11 municipal units in 2 province of China, and the optimized investment allocation plan is obtained, which not only satisfies the demand for electricity (ie benefit) in economically developed regions, but	https://iopscience.iop.org/article/10.1088/1757-899x/729/1/012041/meta	YANG, Xiaoyong, et al. Research on Investment Distribution Technology of Power Grid Enterprise Overhaul Based on Gini Coefficient Theory. In: IOP Conference Series: Materials Science and Engineering. IOP Publishing, 2020. p.
46	The Formation Of Organizational Culture In The Aspect Of Lean Management Principles In The Energy Industry	Marta Sukiennik and Patrycja Bąk	Nowadays, the aspect of Lean Management is a very fashionable trend of reorganizing the work of production processes, but also in management	The business operations of energy companies have a uniquely specific nature, from the core process itself to relationships with the environment. However, like any other "traditionally" operating enterprise, they want to make a profit and be effective. Nowadays, when	https://doi.org/10.1051/e3sconf/201910801033	SUKIENNIK, Marta; BĄK, Patrycja. The formation of organizational culture in the aspect of lean management principles in the energy industry. In: E3S Web of Conferences. EDP Sciences, 2019. p. 01033.
47	A simulation-based methodology for the analysis of the effect of lean tools on energy efficiency: An application in power distribution industry	Serdar Baysan, Ozgur Kabadurmus, Emre Caviccan, Sule Tir Satoglu , Mehmet Bulent Durmusoglu	In recent years, there has been an increasing interest in energy consumption in manufacturing systems due to the rising	The effectiveness of the proposed methodology was validated by an application in a real-life cable ladder manufacturing system. According to the application results, the transition from job-shop layout to cable ladder manufacturing cell yielded 45.46% reduction in energy consumption. The	https://www.sciencedirect.com/science/article/pii/S0959652618336205?via=ihI	BAYSAN, Serdar, et al. A simulation-based methodology for the analysis of the effect of lean tools on energy efficiency: An application in power distribution industry. Journal of Cleaner Production, 2019, 211: 895-908.
48	Promoting sustainability of manufacturing industry through the lean energy-saving and emission-reduction strategy	Wei Cai, Kee-hung Lai, Conghu Liu, Fangfang Wei , Minda Ma , Shun Jia , Zhigang Jiang , Li Lv	The energy-saving and emission reduction (ESER) strategy is a crucial measure for promoting the sustainability of manufacturing industry in	With a wide distribution and large amount of energy consumption a low efficiency, manufacturing industry has been regarded as the main source damaging the environment. To cope with global warming, the government bodies worldwide are urging the green transition	https://doi.org/10.1016/j.scitotenv.2019.02.069	CAI, Wei, et al. Promoting sustainability of manufacturing industry through the lean energy-saving and emission-reduction strategy. Science of the Total Environment, 2019, 665: 23-32.
49	Industry 4.0, digitization, and opportunities for sustainability	Morteza Ghobakhloo	The fourth industrial revolution and the underlying digital transformation, known as Industry 4.0, is progressing exponentially. The digital	While some communities might still be in denial regarding the magnitude and importance of Industry 4.0, leading organizations have been implementing advanced digital technologies such as IIoT, AVR, industrial robotics, cloud computing, AI, and HPC-CADM in preparation for the rise of the	https://doi.org/10.1016/j.iclepro.2019.119869	GHOBAKHOLO, Morteza. Industry 4.0, digitization, and opportunities for sustainability. Journal of Cleaner Production, 2020, 252: 119869.
50	Examining the interaction between lean and sustainability principles in the management process of AEC industry	Laila M. Khodeir, Reem Othman	Architecture, Engineering and Construction (AEC) industry is classified as a huge consumer of natural resources. It consumes 50% of natural material	Applying sustainability in management of process and organizations gives equal attention to the quality of life to all stakeholders and the contribution of the process to the society and economy, in addition to environmental conservation. Lean's main goal is to maximize	https://doi.org/10.1016/j.aasei.2016.12.005	KHODEIR, Laila M.; OTHMAN, Reem. Examining the interaction between lean and sustainability principles in the management process of AEC industry. Ain Shams Engineering Journal, 2018, 9.4: 1627-1634.
51	Are all lean principles equally eco-friendly? A panel data study	Antonio Sartal; Ana I. Martinez-Senra; Virgilio Cruz-Machado	We address the individual environmental impact of three pillars of Lean Manufacturing, Just-in-Time, Jidoka and Respect for People (RfP), from a	Our research proposes a model focused on the manufacturing plant which allows us to examine how each individual Lean pillar meets current environmental requirements and also to establish the overall impact of LM on environmental performance. Although the Lean-Green literature	https://doi.org/10.1016/j.iclepro.2017.12.190	SARTAL, Antonio; MARTINEZ-SENRA, Ana I.; CRUZ-MACHADO, Virgilio. Are all lean principles equally eco-friendly? A panel data study. Journal of Cleaner Production, 2018, 177: 362-370.
52	An integrative view on Lean innovation management	Sam Solaimani, Ardalan Haghighi Talab, Bo van der Rhee	This study proposes the Lean philosophy, which integrates a firm's "hard" and "soft" processes, as a promising way to enhance firm innovativeness. Five	From a practical viewpoint and to the best of our knowledge, this research is the first integrative approach to understanding how Lean helps firms manage the innovation process and boost their innovativeness. Methodologically, SEM shows high efficacy in modelling the complex inter-	https://doi.org/10.1016/j.ibusres.2019.07.042	SOLAIMANI, Sam; TALAB, Ardalan Haghighi; VAN DER RHEE, Bo. An integrative view on Lean innovation management. Journal of Business Research, 2019, 105: 109-120.
53	The relationship between lean and environmental performance: Practices and measures	Marcos Dieste, Roberto Paniato, Jose Arturo Garza-Reyes, Anthony Anozikeb	Lean production has emerged in the past decades as one of the most popular themes in the business and manufacturing literature	The present literature review contributes to the clarification and delimitation of the lean and green relationships. In particular, the study has explained the lean and environmental performance concepts and presented the current issues belonging to their relationships. As a	https://doi.org/10.1016/j.iclepro.2019.03.243	DIESTE, Marcos, et al. The relationship between lean and environmental performance: Practices and measures. Journal of Cleaner Production, 2019, 224: 120-131.
54	The application of dynamic game theory to participant's interaction mechanisms in lean management	Shuwen JING, Rui Li, Zhanwen Niu, Junai Yan	This research focuses on the problems that enterprises are affected by multiple stakeholders in the process of lean management. Based on	According to provide lean management consults for the companies, we find that the above alternatives have been taken effect in many companies implementing lean management. These companies include engine production enterprise founded in 1964, the First Automobile	https://doi.org/10.1016/j.rie.2019.106196	JING, Shuwen, et al. The application of dynamic game theory to participant's interaction mechanisms in lean management. Computers & Industrial Engineering, 2020, 139: 106196.

Nº	Title	Author[s]	Abstract	Article Conclusion	Link	Citation
55	Criteria and practices for lean and green performance assessment: Systematic review and conceptual framework	Luana Marques Souza Farias Luciano Costa Santos Cláudia Fabiana Gohr Lucas Carvalho de Oliveira Matheus Henrique da	Although researchers recognize the synergy between lean and green manufacturing, the concepts around this topic remain unstructured.	This study systematized the available knowledge about lean and green, aiming to identify how these practices could be integrated for performance assessment purposes. Therefore, an SLR was conducted, from which it was possible to propose a conceptual framework to support the evaluation	Lean, Green, Performance, Framework, Systematic literature review	FARIAS, Luana Marques Souza, et al. Criteria and practices for lean and green performance assessment: Systematic review and conceptual framework. <i>Journal of Cleaner Production</i> , 2019, 218: 746-762.
56	The Lean Closed Loop Management of Transformer Operation in Low Voltage Distribution Network	Bin Li ; Jingde Wang ; Kang Yan ; Yidan Lu ; Fa Luo	The management of the distribution network transformers' operation (DNTO) has become a popular and efficient way for the power grid	In view of the current situation of DNTO in power grid companies, based on the Six Sigma management strategy and comprehensive evaluation theory, the management of DNTO is optimized. Through simulation analysis, the following conclusions are drawn:	https://ieeexplore.ieee.org/document/8850928	LI, Bin, et al. The Lean Closed Loop Management of Transformer Operation in Low Voltage Distribution Network. <i>IEEE Access</i> , 2019, 7: 160934-160946.
57	Data-driven lean Management for Distribution Network	Jiao Hao ; Chen Jiming ; Guo Yajuan	This paper proposes a concept of "data-driven, lean-oriented and closed-loop" management for distribution network and introduce its practice in Jiangsu province. The distribution network big data platform constructed in this paper has high scalability. With the development of big data	This paper proposed a "data-driven, lean-oriented and closed-loop" management concept for distribution network and introduce its practice in Jiangsu province. The distribution network big data platform constructed in this paper has high scalability. With the development of big data	https://ieeexplore.ieee.org/document/8592556	HAO, Jiao; JIMMING, Chen; YAUIAN, Guo. Data-driven lean Management for Distribution Network. In: 2018 China International Conference on Electricity Distribution (CICED), IEEE, 2018, p. 701-705.
58	Design of Lean Management System for Equipment Assets Based on BOM Tree and RFID	Dong Yukun ; Liu Hong ; Shen Shengnan ; Zhang Pengfei ; Wu Xiaoyu ; Liu Zhaoxiong	In the management of capital assets owned by major enterprise, there exist some information disconnection including no information about	The topic proposes a device management system model based on BOM structure tree and RFID. Through RFID, planning information, material procurement, engineering construction, operation and maintenance, decommissioning and other equipment information.	https://ieeexplore.ieee.org/document/8582553/keywords#keywords	YUKUN, Dong, et al. Design of Lean Management System for Equipment Assets Based on BOM Tree and RFID. In: 2018 2nd IEEE Conference on Energy Internet and Energy System Integration (EI2), IEEE, 2018, p. 1-9.
59	Obstacles to the Introduction of Lean Production in Russian Electrotechnical Enterprises	Vladimir V. Iashchenko ; Ekaterina D. Orlova	The paper provides an overview of sources containing data on possible obstacles to the implementation of the concept of lean production	This paper examined the main endogenous and exogenous factors that prevent the introduction of lean production in Russia. An analysis of domestic and foreign literature on this issue was carried out and it was concluded that barriers to the implementation of LP are present in any country,	https://ieeexplore.ieee.org/document/8657146	V. V. Iashchenko and E. D. Orlova, "Obstacles to the Introduction of Lean Production in Russian Electrotechnical Enterprises," 2019 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (ECONRUS),
60	Digitization of Work Instructions and Checklists for Improved Data Management and Work Productivity	Benjamin Jia Ming Heng ; Andrew Keong Ng ; Raymond Kong Hee Tay	Overhaul of trains is essential to maintain the reliability and availability of trains for operations. Work instructions (WI) and checklists are used during	To maintain the reliability and availability of trains for operations, overhaul of trains is of vital importance. Implementation of digitizing WI and checklists for overhaul through the rail mobile maintenance system can yield many benefits, such as time-saving, cost-effective, convenient,	https://ieeexplore.ieee.org/document/8880219	B. J. Ming Heng, A. Keong Ng and R. K. Hee Tay, "Digitization of Work Instructions and Checklists for Improved Data Management and Work Productivity," 2019 4th International Conference on Intelligent Transportation Engineering
61	Lean for the process industries: Dealing with complexity	Peter L. King	Compared to its widespread implementation across almost all areas of production, Lean improvement efforts lag	Lean is far more likely to be successful if guided by appropriate business leadership and clear performance targets. Business leaders must create and communicate a strong, clear vision of what lean will look like in their operations. Lean has a much better chance of becoming part of the	https://doi.org/10.4324/9780429400155	King, Peter L. Lean for the process industries: Dealing with complexity, CRC Press, 2019.
62	The effect of Lean Six Sigma practices on food industry performance: Implications of the sector's experience and typical characteristic	Luana Bonome Message Costa, Moacir Godinho Filho, Lawrence D. Fredendall, Gilberto	Lean, Six Sigma and Lean Six Sigma initiatives (L&SS) have been adopted by different industry and service sectors to improve companies' performance	This study of L&SS adoption in the food industry used a survey methodology to evaluate the relevance of the initiative in the sector. This sector views "quality" as a safety and hygiene factor, which differentiates it from other sectors. In addition, this sector also lacks familiarity with the	https://doi.org/10.1016/j.foodcont.2020.107110	COSTA, Luana Bonome Message, et al. The effect of Lean Six Sigma practices on food industry performance: Implications of the Sector's experience and typical characteristics. <i>Food Control</i> , 2020, 112: 107110.
63	The utility of Lean Six Sigma(LSS) in the Supply Chain agro- industry	Mohib Asmae;Ennadi Abdelil;Sabbani Youssef;Herrou Brahim	The competition has become aggressive and the customer has become more demanding and more complex, which have forced organizations to	Lean Six Sigma has been used as a structured methodology to improve organizational processes almost in all industrial fields (aeronautics, automotive, ...). In Morocco LSS implementation stills in the beginning stage, although Operational Excellence remains the most popular approach for	https://ieeexplore.ieee.org/stamp/stamp.jsp?tpoc=8	ASMAME, Mohib, et al. The utility of Lean Six Sigma (LSS) in the Supply Chain agro-industry. In: 2019 International Colloquium on Logistics and Supply Chain Management (LOGISTIQA), IEEE, 2019, p. 1-7.
64	Review and classification of Lean project aims in hospitals	Bronwyn Joubert;Wouter Bam	The Lean philosophy is increasingly being applied to the healthcare industry in order to improve the quality of care and reduce costs. This study presents	This study executed a review of the focus of Lean initiatives in hospitals in order to contribute to a better understanding of how the implementation and adaptation of the Lean philosophy is occurring in healthcare. This was done by gathering parameters on year of publication, country,	https://doi.org/10.1109/ICE.2019.8792633	JOUBERT, Bronwyn; BAM, Wouter. Review and classification of Lean project aims in hospitals. In: 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMI), IEEE, 2019, p. 1-11.
65	Maintenance 4.0: Intelligent and Predictive Maintenance System Architecture	Ana Cachada, José Barbosa, Paulo Leitão, Carla A. S. Geraldes, Leonel Deusdado, Jacinta Costa Carlos Teixeira,	In the current manufacturing world, the role of maintenance has been receiving increasingly more attention while companies	Nowadays maintenance is considered as an integral part of the manufacturing process that contributes to the product quality, plant availability and ability to meet delivery schedules. This is particularly important in manufacturing companies that adopt modern management	https://ieeexplore.ieee.org/document/8502489	A. Cachada et al., "Maintenance 4.0: Intelligent and Predictive Maintenance System Architecture," 2018 IEEE 23rd International Conference on Emerging Technologies and Factory Automation (ETFA), Turin, 2018, pp. 139-146, doi:
66	Lean Manager in the Factory of the Future : Case study in automotive industry	Eva Rother ; Armand Baboli	The fourth industrial revolution is heralded, and industrial manufacturing is preparing for transformations linked to Industry 4.0. The	Despite the growing number of publications dealing with Industry 4.0 and its possible interactions with Lean manufacturing, the aspects linked to Lean management are not dealt with. This article proposes three axes of reflection around the Lean manager: the implication as a	https://ieeexplore.ieee.org/document/8714779	E. Rother and A. Baboli, "Lean Manager in the Factory of the Future : Case study in automotive industry," 2019 IEEE 6th International Conference on Industrial Engineering and Applications (ICIEA), Tokyo, Japan, 2019, pp. 218-224, doi:
67	Batteries for Satellites Constellation, using Lean Manufacturing for Space Industry	Laurence Perino-Gallice ; Olivier Masson ; Michel Bel ; Florence Fusalba	"The space revolution is being led by more than Musk and Bezos", Backstage, aerospace leaders and their suppliers already work on design to	The standard sized cell (18650) used insures an evolutionary design of the module independent of the cell retained for the module. Therefore, an extensive COTS 18650 Li-ion cells benchmark is continuously running to enable switching the cell reference with only delta qualification thanks to a	https://ieeexplore.ieee.org/document/8932064	PERINO-GALLICE, Laurence, et al. Batteries for Satellites Constellation, using Lean Manufacturing for Space Industry. In: 2019 European Space Power Conference (ESPC), IEEE, p. 1-6.
68	Corporate memory in the lean context	Nuno Sobral, Beatriz Rodrigues, Cláudia Serra, Nuno Bastos, Adriana Gomez, Catarina Mequita, Maria	A large part of the information necessary for an organization to function is stored exclusively in people's memories. This applies to two different	To sum up, information should not be stored in people's minds, at least not exclusively. There are relatively simple, even purely mechanical, solutions for lessening the reliance on human memory on a short-term basis. In the long term, we propose the creation of a digital knowledge	https://ieeexplore.ieee.org/document/8760752	N. Sobral et al., "Corporate memory in the lean context," 2019 14th Iberian Conference on Information Systems and Technologies (CISTI), Coimbra, Portugal, 2019, pp. 1-5, doi: 10.23919/CISTI.2019.8760752.
69	Increased Productivity in the Area of External Logistics and Delivery Services of the Urban Employment Express Through the Methodology Lean Manufacturing	Ana Gabriela Salgado Heredia, Nelson Esteban Salgado Reyes	This paper has as objective to use the methodology "Lean Manufacturing", to increase the productivity in the area of External Logistics and Delivery	Com a metodologia de Manufatura Enxuta é possível apurar as despesas e atividades que não geram valor em cada atividade realizada pela equipe, as informações foram revisadas através de análises de Pareto e de Causas Raiz, dando as possíveis variáveis que estão gerando este	https://ieeexplore.ieee.org/document/8760915	A. G. Salgado Heredia and N. E. Salgado Reyes, "Increased Productivity in the Area of External Logistics and Delivery Services of the Urban Employment Express Through the Methodology Lean Manufacturing," 2019 14th Iberian
70	Visualizing Design Process by Using Lean UX to Improve Interdisciplinary Team's Effectiveness – A Case Study	Teng-Wen Chang ; Yingying Lee ; Hsin-Yi Huang	This is an ongoing project investigating on how to improve interdisciplinary teams to co-work efficiently and effectively. Based on our prior	Effective collaboration between people from different disciplines is necessary to maximize the potential benefits of interdisciplinary for current business activity and academic research [4] as our working style is gradually transformed into interdisciplinary coordination. In this paper we	https://ieeexplore.ieee.org/document/8564199	T. Chang, Y. Lee and H. Huang, "Visualizing Design Process by Using Lean UX to Improve Interdisciplinary Team's Effectiveness – A Case Study," 2018 22nd International Conference Information Visualisation (IV), Fisciano,
71	Lean Healthcare Processes: Effective Technology Integration and Comprehensive Decision Support Using Requirements Engineering Methods	Malak Basyman ; Daniel Amyot ; Yasser Alshahali	Healthcare faces many challenges in delivering better service quality and fulfilling, rapidly, changing needs. Lean management approaches, widely	Given the challenges mentioned in healthcare, we believe that Lean management cannot be used alone when introducing changes and improving processes. We identified gaps in providing methods to capture and analyze concepts in a process improvement context, and in relating	https://ieeexplore.ieee.org/document/8823905	M. Basyman, D. Amyot and Y. Alshahali, "Lean Healthcare Processes: Effective Technology Integration and Comprehensive Decision Support Using Requirements Engineering Methods," 2019 IEEE/ACM 1st International
72	Lean maintenance logistics management: The key to green and sustainable performance	Salima Hammadi, Sidi Mohamed Ben,	In a competitive industrial environment the most significant goal of almost all production systems is to reach optimal performance at the lowest	Maintenance logistics is a wide-angle management visioic of all maintenance resources regarding their interactions and trying to set a reliable way to solve their problems. To manage it sustainably, it stays promising to explore lean culture breakthroughs and participatory	https://ieeexplore.ieee.org/document/8378090	S. Hammadi and B. Herrou, "Lean maintenance logistics management: The key to green and sustainable performance," 2018 4th International Conference on Logistics Operations Management (GOL), Le Havre, 2018, pp.

Nº	Title	Author(s)	Abstract	Article Conclusion	Link	Citation
73	Super Lean Software Startup Engineering Management	Rahul Razdan ; Satish Kambalimath	Lean software startups manage risk by developing products in short product cycles and through iterative product development. The "lean"	We have presented a super lean startup business structure for the management of software R&D team. This model builds a self-consistent structure for reimagining a software team that maximizes the utilization of the precious capital raised by the company. We have shown success of the model in	https://ieeexplore.ieee.org/document/8813609/keywords#keywords	R. Razdan and S. Kambalimath, "Super Lean Software Startup Engineering Management," 2019 IEEE Technology & Engineering Management Conference (TEMSCON), Atlanta, GA, USA, 2019, pp. 1-6, doi:
74	Lean Service in a Banking Entity	Macarena Gamio Estremadoyro ; Francesca Maestri Fernandez Concha ; Percy Castro Rangel	We study the case of a financial entity that presented problems due to high wait times and high operation times in the credit process. A diagnosis	Foram detalhadamente os benefícios, as ferramentas de uso comum e a aplicação de melhorias da metodologia Lean Service voltada para um banco de microcrédito no Peru. A partir do diagnóstico, observou-se falta de padronização de processos, deficiências no ordenamento das agências e dor	https://ieeexplore.ieee.org/document/8943587	M. G. Estremadoyro, F. M. F. Concha and P. C. Rangel, "Lean Service in a Banking Entity," 2019 7th International Engineering, Sciences and Technology Conference (IESTEC), Panama, Panama, 2019, pp. 370-375, doi:
75	Improving Enterprise production Management system on the basis of lean production	Sedelnikova Irina, Fedprov Oleg, Yakusheva Alla	The modern Russian machine industry is characterized by low efficiency and a low level of competitiveness in comparison with the	Establishing Lean production is a complex process, for which it is necessary to use a systematic approach, involving full range of lean tools use. At the same time, one of the main problems, especially typical to Russian companies, is insufficient staff involvement, and in many cases	http://scholar.google.pt/scholar?url=http%3A%2F%2Farticle.sciencepublshingroup.org%2Fpdf%2F10.11648.lj.ijfm.20190706.15.pdf&hl=pt-PT&sa=T&ci=meta&ctag=8.cdc=1&id=13598102338150842355&ei=skp0X6DpK50dmmGaoPAAQ&scisq=AAGBfm3PR2awM52vYanTsDXTbNfIUwMA&nos	IRINA, Sedelnikova; OLEG, Fedorov; ALLA, Yakusheva. Improving Enterprise Production Management System on the Basis of Lean Production. International Journal of Economics, Finance and Management Studies, 2019, 7.6: 210.
76	Optimization of activities of road construction company based on lean manufacturing tools	Anna Minnullina, Natalya Solopova	The article proposes an algorithm for implementation of lean manufacturing in relation to a company in the road construction industry. The	Practical use of the 5S lean manufacturing tool and the accompanying visualization tool allowed us to achieve following results in the construction and installation works of the company: - increasing labor productivity and overall performance; - reduction of losses of working time; - lower costs; -	https://doi.org/10.1051/e3sconf/202015706003	MINNULLINA, Anna; SOLOPOVA, Natalya. Optimization of activities of road construction company based on lean manufacturing tools. In: E3S Web of Conferences. EDP Sciences, 2020. p. 06003.
77	Lean Six Sigma and Industry 4.0 Integration for Operational Excellence: evidence from Italian manufacturing companies	Andrea Chiarini, Maneesh Kumar	This research investigates a possible integration between Lean Six Sigma (LSS) tools and principles and Industry 4.0 technologies. The aim is	The results of this research have many implications for practitioners. First, the pattern for achieving integration could be used by consultants and managers as a guideline for the implementation. In this paper, we explicitly give examples of why streamlining the processes and	https://doi.org/10.1080/09537287.2020.1748485	CHIARINI, Andrea; KUMAR, Maneesh. Lean Six Sigma and Industry 4.0 Integration for Operational Excellence: evidence from Italian manufacturing companies. Production Planning & Control, 2020, 1-18.
78	A Strategic Roadmap for the Manufacturing Industry to Implement Industry 4.0	Javaid Butt	Industry 4.0 (also referred to as digitization of manufacturing) is characterized by cyber physical systems, automation, and data	Industry 4.0 has revolutionized the manufacturing industry. However, there are still major challenges associated with not only its adoption but its implementation as well. The practical contributions of this paper are twofold. Firstly, it provides a state-of-the-art literature review of	https://doi.org/10.3390/design4020011	BUTT, Javaid. A Strategic Roadmap for the Manufacturing Industry to Implement Industry 4.0. Designs, 2020, 4.2: 11.
79	Application of the Quality Management Methods and Tools in the Operation of Electrical Equipment	Semenov V.P., Riaskov I.S.	The basic quality management methods and tools widely accepted in various types of international	As already noted, the considered quality management and engineering methods can be successfully used in different combinations at each stage of the full product life cycle. It should be emphasized that many of the above quality engineering methods and tools can be used in the	https://doi.org/10.17816/PTES26338	SEMEV, Victor P.; RIASKOV, Ian S. Application of the quality management methods and tools in the operation of electrical equipment. Planning and Teaching Engineering Staff for the Industrial and Economic Complex of the
80	The disintegration of lean manufacturing and lean management	Richard J. Schonberger	Lean management—in manufacturing, supply chains, healthcare, services—has lost its way. Telling evidence of lean's dissolution shows up for	.....Another story might have been written with the theme of "never excited by lean," referring to attitudes of senior executives and boards of directors. To probe the matter, in 2010 I did an internet survey of annual reports for 20 manufacturers—hand-picked companies whose	https://doi.org/10.1016/j.bushor.2019.01.004	SCHONBERGER, Richard J. The disintegration of lean manufacturing and lean management. Business Horizons, 2019, 62.3: 359-371.
81	A systematic literature review of empirical research in Lean and Six Sigma in healthcare	Daniel Barberato Henrique, Moacir Godinho Filho	The purpose of this paper is to review the existing literature on empirical research in Lean, Six Sigma and Lean Six Sigma in healthcare. The approach	It is hoped that this study will set an impulse to promote further research and exploration in empirical research in this field. The result of the present study will help researchers to direct their efforts toward a systematic approach for carrying out empirical research in Clin healthcare	https://doi.org/10.1080/14783363.2018.1429259	Daniel Barberato Henrique & Moacir Godinho Filho (2020) A systematic literature review of empirical research in Lean and Six Sigma in healthcare, Total Quality Management & Business Excellence, 31:3-4, 429-449, DOI:
82	Increasing Competitiveness through the Implementation of Lean Management in Healthcare	J.Carlos Prado-Prado, Jesús García-Arca, Arturo J. Hernández-González, Mar Mosteiro-Anón	The main aim of this paper was two-fold: first, to design a participative methodology that facilitates lean management	Internal management of healthcare is incredibly complex and a vast quantity of data are collected. In general, it is still not possible to easily identify how a hospital is performing in terms of quality, cost and delivery of services, because a great deal of the information gathered is not linked to	https://doi.org/10.3390/ijerph17144981	PRADO-PRADO, J. Carlos, et al. Increasing Competitiveness through the Implementation of Lean Management in Healthcare. International Journal of Environmental Research and Public Health, 2020, 17.14: 4981.
83	Lean Management and Industry 4.0 Impact in COVID19 Pandemic Era	Siham Tissir, Said El Fezazi , Anass Cherraffi	Covid19 is spreading across the globe. This pandemic affects almost all sectors of activities. It has created disruptions in production chains around	This paper examined the impact of industry 4.0 by its emerging technologies to limited the spread of covid19 pandemic. In addition, it highlights the impact of lean management principle (LTP) on the continuity of companies' activity. With the covid19 outbreak, the implementation of I4.0 will be	http://scholar.google.pt/scholar?url=http%3A%2F%2Fwww.leam.socsci.oly.org%2Fdetours%2020%2Fpapers%2F531.pdf&hl=pt-PT&sa=T&ci=meta&ctag=8.cdc=58&id=12859194412047821218&ei=hZox65vNvOTy9YP9hW0yAc&scisq=AAGBfm1IGPcyQ083RvT6djo9XW3_c4d4&nos	TISSIR, Siham; EL FEZAZI, Said; CHERRAFI, Anass. Lean Management and Industry 4.0 Impact in COVID19 Pandemic Era.
84	Impacts of Industry 4.0 technologies on Lean principles	Frédéric Rosin, Pascal Forget, Samir Lamouri, Robert Pellerin	Industry 4.0 is increasingly being promoted as the key to improving productivity, promoting economic growth and ensuring the sustainability of	According to these results, technologies from Industry 4.0 do not seem to cover the integratedness of Lean principles, but can reinforce the efficiency of these principles. Although, specific Lean principles, such as levelled production and standardised and stable	https://doi.org/10.1080/00207543.2019.1672902	ROSIN, Frédéric, et al. Impacts of Industry 4.0 technologies on Lean principles. International Journal of Production Research, 2020, 58.6: 1644-1661.
85	Lean management in the context of construction supply chains	Xianhai Meng	Construction started its lean journey with learning from manufacturing. Unlike lean manufacturing, few studies to date have investigated lean	This research discovers an extension of lean manufacturing and a diversion from lean manufacturing as two main patterns of lean construction development. The two patterns coexist in the construction industry today. On one hand, the increasing adoption of industrialised	https://doi.org/10.1080/00207543.2019.1566659	MENG, Xianhai. Lean management in the context of construction supply chains. International Journal of Production Research, 2019, 57.11: 3784-3798.
86	A dynamic perspective on the key drivers of innovation-led lean approaches to achieve sustainability in manufacturing supply chain	Heyinwa Juliet Orji, Shaouxuan Liu	In response to the ever-increasing consumer awareness on carbon emissions and government policies, firms consider adopting innovation-led	In this study, ten drivers of innovation-led lean approaches and ten sustainability criteria relevant to the manufacturing supply chain were identified from literature and further validated by expert evaluations. It is possible that additional drivers of innovation-led lean approaches and	https://doi.org/10.1016/j.ijpe.2018.05.026	ORJI, Heyinwa Juliet; LIU, Shaouxuan. A dynamic perspective on the key drivers of innovation-led lean approaches to achieve sustainability in manufacturing supply chain. International Journal of Production Economics, 2020, 219: 480-
87	Operational excellence for improving sustainable supply chain performance	Sachin Kumar Mangla, Simonov Kusi-Sarpong, Sunil Luthra, Chunguang Bai, Suresh Kumar Jakhari, Sharfuddin	Planning and synchronizing operations are fundamentally essential to ensure sustainability in Supply Chains (SCs) (Bag et al., 2020). Traditionally	The SI attracted research articles from varied operational perspective, such as sourcing decisions, reversed logistics, sales and logistics, big data application, blockchain application, IT implementation, Lean-agile-green management, and life-cycle assessment. Three key topics came	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7110000/	MANGLA, Sachin Kumar, et al. Operational excellence for improving sustainable supply chain performance. Resources, Conservation, and Recycling, 2020, 162: 105025.
88	Examining legitimatisation of additive manufacturing in the interplay between innovation, lean manufacturing and sustainability	Abby Ghobadian , Irene Talavera , Arijit Bhattacharya , Vikas Kumar , Jose Arturo Garza-Reyes , Nicholas O'Ragan	In response to hypercompetition, globalisation and increasing consumer expectations, many manufacturing firms have	Additive manufacturing, as articulated, is a disruptive innovation in its formative phase with a potential of extending the reach of lean manufacturing and sustainability. Many promising technologies fail at this stage by not reaching high scales of adoption. Additive manufacturing,	https://doi.org/10.1016/j.ijpe.2018.06.001	GHOBIAN, Abby, et al. Examining legitimatisation of additive manufacturing in the interplay between innovation, lean manufacturing and sustainability. International Journal of Production Economics, 2020, 219: 457-
89	Exploring lean manufacturing practices' influence on process innovation performance	Alexander Kurt Moldner, Jose Arturo Garza-Reyes, Vikas Kumar	Little is known about the effects of lean manufacturing practices on the process innovation performance of manufacturing	As first of its kind, the present work contributes new and detailed insights into the nature of the investigated interdependencies. Holistic LTPs seem to have a greater potential to enhance process innovation than rather specific ones, whereas HLPs have close interrelations and thus	https://doi.org/10.1016/j.bushor.2018.09.002	MÖLDNER, Alexander Kurt; GARZA-REYES, Jose Arturo; KUMAR, Vikas. Exploring lean manufacturing practices' influence on process innovation performance. Journal of Business Research, 2020, 106: 233-249.
90	Closed-loop supply chain games with innovation-led lean programs and sustainability	Talat S. Genc, Pietro De Giovanni	This paper studies the impact of some innovation-led lean programs in a Closed-loop Supply Chain (CLSC) setting. We use a game-theoretic approach	This paper studies several models of CLSC by examining vertical relations between consumers, manufacturer (downstream), and supplier (upstream) in the context of innovation-led lean programs. The latter involves sustainability, responsiveness and process innovations. In these	https://doi.org/10.1016/j.ijpe.2018.05.026	GENC, Talat S.; DE GIOVANNI, Pietro. Closed-loop supply chain games with innovation-led lean programs and sustainability. International Journal of Production Economics, 2020, 219: 440-456.

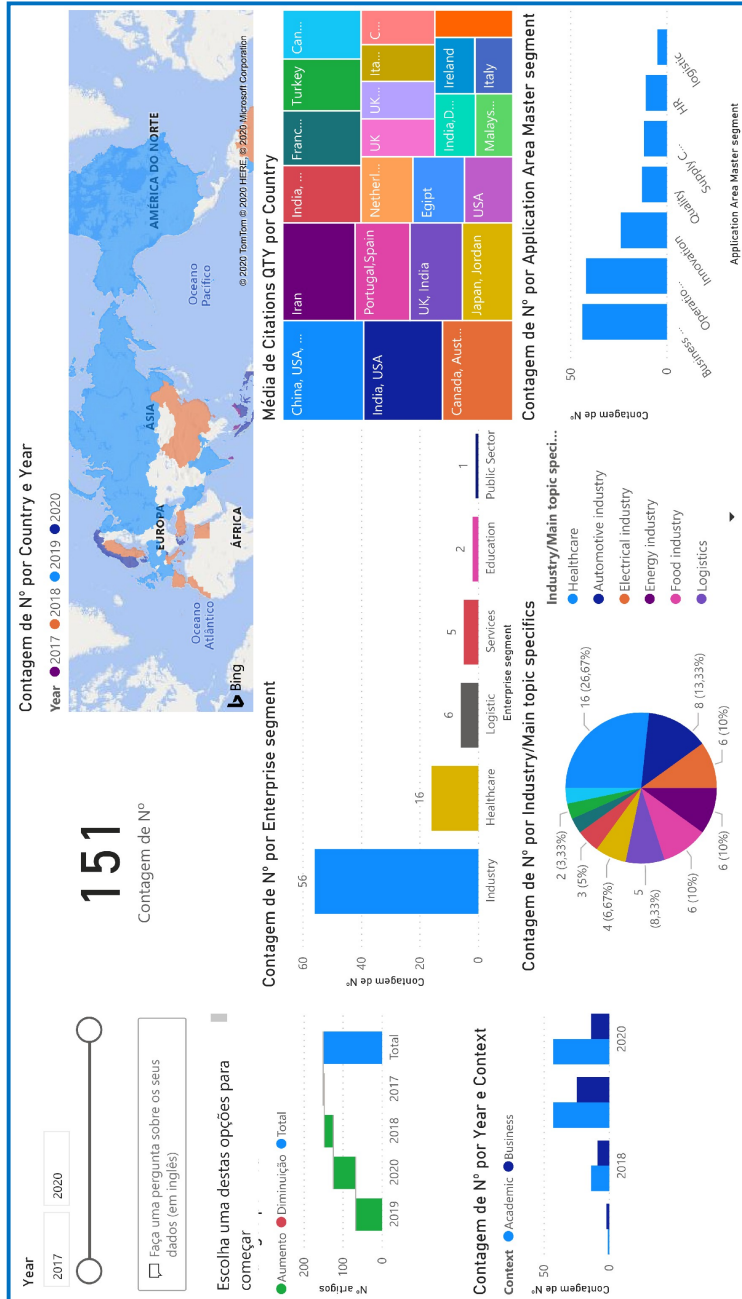
Nº	Title	Author[s]	Abstract	Article Conclusion	Link	Citation
91	Barriers to lean six sigma implementation in the supply chain: An ISM model	Syed Mithun Ali, Md. Anwar Hossen, Zuhayer Mahtab, Golam Kabir, Sanjoy Kumar Paulic, Zia ul Haq Adnan	Lean six sigma (LSS), a process improvement tool to achieve operational excellence in any industry, has become popular among practitioners over	.....The findings of this study can guide managers in the manufacturing industry to focus on issues essential to supporting the implementation of LSS concepts across the supply chain. Managers usually have limited resources to work with. Removing barriers requires a financial investment.	https://doi.org/10.1016/j.cie.2020.106843	Ali, Syed Mithun, et al. Barriers to Lean Six Sigma Implementation in the Supply Chain: An ISM Model. Computers & Industrial Engineering, 2020, 106843.
92	Process Innovation through Industry 4.0 technologies, lean practices and green supply chains	Pietro De Giovanni, Alfio Cariola	This paper investigates the impact of a process innovation strategy that firms implement through Industry 4.0 (I4.0) technologies on lean	In this paper, we bridge the literature of Leanness, GSCM, Performance and Process Innovation based on I4.0 technologies by investigating the impact of process innovation strategies on the relationship between Leanness, GSCM, and Performance. The latter is classified into Operational, Environmental	https://doi.org/10.1016/j.retrec.2020.100869	DE GIOVANNI, Pietro; CARIOLA, Alfio. Process innovation through industry 4.0 technologies, lean practices and green supply chains. Research in Transportation Economics, 2020, 100869.
93	Lean manufacturing and business performance: testing the S-curve theory	Leóny Luis Lopes Negrão, Ana Beatriz Lopes de Souza Jabbour, Hengky Latan, Moacir Godinho Filho,	This article makes a case for the importance of exploring patterns in the relationship between the adoption of lean manufacturing practices	This article contributes to lean manufacturing theory by testing whether the relationship between the adoption of lean manufacturing practices and business performance follows a non-linear and S-shaped pattern. Netland and Ferdows (2016) previously showed such a relationship in	https://doi.org/10.1080/09537287.2019.1693775	NEGRÃO, Leóny Luis Lopes, et al. Lean manufacturing and business performance: testing the S-curve theory. Production Planning & Control, 2020, 31:10: 771-785.
94	The complementary effect of lean manufacturing and digitalisation on operational performance	Sven-Vegard Buer, Jan Ola Strandhagen, and Fabio Sgarbossa	The most recent trend manufacturers have embraced to seek operational performance improvements is the use of a wide range of digital	The fourth industrial revolution promises to change the manufacturing landscape, and those who are not able to reap the new technology-induced opportunities are destined to fall behind their competitors. An important area to investigate is the role lean manufacturing will play	https://doi.org/10.1080/00207543.2020.1790684	BUER, Sven-Vegard, et al. The complementary effect of lean manufacturing and digitalisation on operational performance. International Journal of Production Research, 2020, 1-17.
95	Leagile supply chain: design drivers and business performance implications	Masih Fadaki, Shams Rahman & Caroline Chan	In the context of a dynamic and hypercompetitive business environment, effective supply chain design helps organisations to align resources for	Although several theoretical frameworks regarding the leanness and agility aspects of supply chain design were introduced over two decades ago, a clear answer as to why quantitative testing of those models did not support the theories is yet to be provided.	https://doi.org/10.1080/00207543.2019.1693650	FADAKI, Masih; RAHMAN, Shams; CHAN, Caroline. Leagile supply chain: Design drivers and business performance implications. International Journal of Production Research, 2020, 58:18: 5601-5623.
96	Achieving a sustainable shipbuilding supply chain under I4.0 perspective	Magdalena Ramirez-Peña, Alejandro J. Sánchez-Sotano, Víctor Pérez-Fernández, Francisco J. Abad, Moises	Industry 4.0 (I4.0) considers a number of changes in enterprises, including business models, to achieve the Smart Factory concept. This	This article defines the shipbuilding supply chain according to the performance model established in Industry 4.0. The Lean, Agile, Resilient and Green paradigms are established as the most relevant through the study of the supply chain. Twelve enabling technologies have been	https://doi.org/10.1016/j.iclrepr.2019.118789	RAMIREZ-PÉÑA, Magdalena, et al. Achieving a sustainable shipbuilding supply chain under I4.0 perspective. Journal of Cleaner Production, 2020, 244: 118789.
97	Improving manufacturing cycle efficiency through new multiple criteria data envelopment analysis models: an application in green and lean manufacturing processes	Aneilson Francisco da Silva, Fernando Augusto Silva Marins, Erica Ximenes Dias & Carlos Alberto Ushizima	The Green & Lean Manufacturing organisational strategy emphasises waste and environmental impact reduction, efficiency	This paper describes an innovative approach, since a Web of Science research finds no publications applying MCOEA models to problems to measure the efficiency of production processes based on Green & Lean Manufacturing concepts. The consulted analysts and managers' joint	https://doi.org/10.1080/09537287.2020.1713413	Aneilson Francisco da Silva, Fernando Augusto Silva Marins, Erica Ximenes Dias & Carlos Alberto Ushizima (2020): Improving manufacturing cycle efficiency through new multiple criteria data envelopment
98	Barriers Affecting Successful Lean Implementation in Singapore's Shipbuilding Industry: A Case Study	Edwin Tan Hock Lai, Florence Ng Jia Yun, Ivan C. Araklam, John Heng Aik Joo	Lean manufacturing is essential for any company to remain competitive in the global business market. Companies in Singapore's shipbuilding	In conclusion, the shipbuilding industry has played an important role in Singapore's maritime cluster, contributing significantly to the country's economic growth during the last four decades. However, this dynamic and highly labor-intensive industry has been facing increasing competition	http://doi.org/10.31387/isscm0410260	LAU, EdwinTanHock, et al. Barriers Affecting Successful Lean Implementation in Singapore's Shipbuilding Industry: A Case Study. Operations and Supply Chain Management: An International Journal,
99	Implementation of lean manufacturing in electronics industry	B. Venkat Jayanth, P. Prathap, P. Sivaraman, S. Yogesh, S. Madhu	The electronics industry is one of the fastest growing industries and investments are flowing in, to increase its quality and manufacturing capacity.	SMEs face stiff competition from large and well-established corporations due to globalization. However, they can use lean manufacturing to compete with these companies and achieve large market share. Considering the lean manufacturing principles such as elimination of waste,	https://doi.org/10.1016/j.matpr.2020.02.718	JAYANTH, B. Venkat, et al. Implementation of lean manufacturing in electronics industry. Materials Today: Proceedings, 2020.
100	Impact of Lean and Sustainability Oriented Innovation on Sustainability Performance of Small and Medium Sized Enterprises: A Data Envelopment Analysis-based framework	Debashree De, Soumyadeb Chowdhury, Prasanta Kumar Dey, Sadhan Kumar Ghosh	Lean and Sustainability Oriented Innovation both enhance competitiveness of small and medium enterprises (SMEs) in a sustainable way. Lean is	This study reports on a case study approach as how SMEs can be segregated considering the lean and SOI as input for the Supply chain sustainability. From the study and recommendations, it was shown how lean and SOI strategies can help in achieving sustainability. The	https://doi.org/10.1016/j.jiipe.2018.07.003	DE, Debashree, et al. Impact of lean and sustainability oriented innovation on sustainability performance of small and medium sized enterprises: a data envelopment analysis-based framework. International Journal of Production
101	Quality and flexibility performance trade-offs between lean and agile manufacturing firms in the automotive industry	Amir Qamar, Mark A. Hall, Daniel Chicksand & Simon Collinson	Firms operating in the automotive industry have traditionally been ascribed with efficiency and high levels of quality, as lean production has	..... The idea that lean production can also result in high levels of flexibility and the notion that agile production can lead to just as high levels of quality as lean production is refuted. Decision makers in the automotive industry need to prioritise the success factors most important to their respective	https://doi.org/10.1080/09537287.2019.1681534	QAMAR, Amir, et al. Quality and flexibility performance trade-offs between lean and agile manufacturing firms in the automotive industry. Production Planning & Control, 2020, 31:9: 723-738.
102	Evaluating the impact of lean practices on environmental performance: evidences from five manufacturing companies	Marcos Dieste, Roberto Panizzolo & Jose Arturo Garza-Reyes	Previous evidence suggests that lean practices help organizations to enhance environmental performance. However,	Another point of reflection regards the mix of lean practices that better impacts on environmental performance. In this perspective, it is crucial for managers to assess and supervise carefully the impact of the lean practices implemented since the positive effects of a group of practices can hide	https://doi.org/10.1080/09537287.2019.1681535	DIESTE, Marcos; PANIZZOLO, Roberto; GARZA-REYES, Jose Arturo. Evaluating the impact of lean practices on environmental performance: evidences from five manufacturing companies. Production Planning & Control, 2020,
103	Lean Manufacturing and Environmental Sustainability: The Effects of Employee Involvement, Stakeholder Pressure and ISO 14001	Ping-Kuo Chen, Jtzair Lujan-Blanco, Jordi Fortuny-Santos, and Patxi Ruiz-de-Arbulu-López	This paper explores the relationships between lean manufacturing (LM), the promotion of green practices, employee involvement, pressure to	..... We developed our research questions from the perspective of LM, taking into account the human side of LM, and its relationship with ISO 14001 and found that attitude is paramount to improve environmental sustainability. This opens new questions for research: at a macro level, a more	https://doi.org/10.3390/su121827258	Chen, P.-K.; Lujan-Blanco, I.; Fortuny-Santos, J.; Ruiz-de-Arbulu-López, P. Lean Manufacturing and Environmental Sustainability: The Effects of Employee Involvement, Stakeholder Pressure and ISO 14001. Sustainability 2020, 12, 7258.
104	Machine learning in human resource system of intelligent manufacturing industry	Xie, Qing	A hybrid model based on latent factor model (LFM) and deep forest algorithm, namely multi-Grained Cascade forest (gForest) was established to	Machine learning technology is applied to solve the recruitment problem of human resources system in the intelligent manufacturing industry. LFM (latent factor model) and deep forest algorithm are combined to optimise and improve human resources system in the intelligent	https://doi.org/10.1080/17515755.2019.1710862	XIE, Qing. Machine learning in human resource system of intelligent manufacturing industry. Enterprise Information Systems, 2020, 1-21.
105	Technology Engineering for Medical Devices-A Lean Manufacturing Plant Viewpoint	Sai Sruthi Gadde, Venkata Dinesh Reddy Kalli	The development of software for medical device manufacturing is a delicate process from many points of view, including protection and	Having looked at SDLC in the M.D. production plant, we have established several major factors of impact, namely regulation and concentration of industry, and we have focused on two in this paper. Whilst many M.D. companies are worried about regulatory enforcement, in this case, we	http://scholar.google.pt/scholar_url?url=https://doi.org/10.1080/09537287.2020.1710862	GADDE, Sai Sruthi; KALLI, Venkata Dinesh Reddy. Technology Engineering for Medical Devices-A Lean Manufacturing Plant Viewpoint. Technology, 2020, 9.4.
106	Supporting Factors to Improve the Lack during Lean Manufacturing Implementation	Dewi Putri Mardiana and Salman Alfariis	Product quality and customer satisfaction were challenges faced by many manufacturing or services companies which considered the global	The lack of lean manufacturing implementation can be overcome by continuous improvement, the improvement used to spur and increase creativity of employees to solved the problem and new ideas were generated to faced challenges. In addition, lean manufacturing implementation require good	doi:10.1088/1742-6596/1430/1/012043	MARDIANA, Dewi Putri; ALFARIIS, Salman. Supporting Factors to Improve the Lack during Lean Manufacturing Implementation. In: Journal of Physics: Conference Series. IOP Publishing, 2020, p. 012043.
107	Impact of lean implementation from the ergonomics view: A research article	H. Vinoth Kumar, Sivakumar Annamalai, N. Bagathirai	In the developed industries, it has been demonstrated that the efficient incorporation of Ergonomics in procedures and facilities reduces	The ever growing Lean implementation in the workplace has enabled researchers to explore how this strategy intersects with other jobs. Ergonomics is one of the key professions to be studied in conjunction with lean efforts; Constructing workstations with respect to	https://doi.org/10.1016/j.matpr.2020.07.113	KUMAR, H. Vinoth; ANNAMALAI, Sivakumar; BAGATHIRAI, N. Impact of lean implementation from the ergonomics view: A research article. Materials Today: Proceedings, 2020.
108	Lean Production and Job Satisfaction: Perception of Workers in Plastics Manufacturing	Edralin C. Lim	In today's era of globalization, various sectors have been facing increasing competition. In order to compete and survive, companies have	This study assessed the effect of lean production on perceived job satisfaction of workers in plastic manufacturing. As per the results, perceived total productive maintenance and perceived employee involvement positively affected the perceived job satisfaction of the workers. The results were also	http://scholar.google.pt/scholar_url?url=https://doi.org/10.1080/09537287.2020.1710862	LIM, Edralin C. Lean Production and Job Satisfaction: Perception of Workers in Plastics Manufacturing. Review of Integrative Business and Economics Research, 2020, 9: 429-437.

Nº	Title	Author(s)	Abstract	Article Conclusion	Link	Citation
109	A geographic picture of Lean adoption in the public sector: Cases, approaches, and a refreshed agenda	Tatiana Oleques Lukrafka, Diego Souza Silva, Marcia Echevste	Public organizations are immersed in challenging contexts, having to meet and balance internal and external demands for transparency,	.....Existing evidence-based research on the topic h	https://doi.org/10.1016/j.emj.2020.02.004	LUKRAFKA, Tatiana Oleques; SILVA, Diego Souza; ECHEVSTE, Marcia. A geographic picture of Lean adoption in the public sector: Cases, approaches, and a refreshed agenda. <i>European Management Journal</i> , 2020.
110	Internet of things and simulation approach for decision support system in lean manufacturing	Teruaki ITO, Mohd Southwee ABD RAHMAN, Effendi MOHAMAD, Anul Awzan ABD RAHMAN, Mohd Rizal SALLEH	Today, Industry 4.0 concerns a rapid advancement in manufacturing technologies which help industries increase their	Concluding, this paper shows an approach which enables companies to fully understand the changes and potential of DSS, in order to develop long term strategies to fit new business challenges. Interconnection of sensor devices providing the ability to share information across	https://doi.org/10.1299/jamds.2020jamds002	ITO, Teruaki, et al. Internet of things and simulation approach for decision support system in lean manufacturing. <i>Journal of Advanced Mechanical Design, Systems, and Manufacturing</i> , 2020, 14.2: JAMDS0027-JAMDS0027.
111	A case study in consolidating the loss structure of different manufacturing sectors under lean context	Tong, Hua LU and Dao, Thi Minh Trang	In the light of lean methodology, World Class Manufacturing requires continuous improvement in analyzing the losses to eliminate the wasteful	The degree project provided Tetra Pak with a better systematic way of categorizing losses and suggesting improvements. The newly proposed shared loss structure of level 1 and level 2 was introduced and proved to have a significant improvement from the current two separated	https://iup.lub.lu.se/student-papers/search/publication/9015870	TONG, Hua; DAO, Thi Minh Trang. A case study in consolidating the loss structure of different manufacturing sectors under lean context. 2020.
112	Investigating the enablers associated with implementation of Green Lean Six Sigma in manufacturing sector using Best Worst Method	Mahender Singh Kaswan, Rajeev Rathi	Green Lean Six Sigma is an inclusive approach, leads to optimum utilization of resources, reduces rejection and provides a path for sustainable	The increased concern for ecological and quality has enforced the organizations to adopt GLS concepts. GLS is a comprehensive approach that includes concepts of reduce, reuse, rework and minimum rejection to improve the manufacturing process, productivity, profitability, cycle time and	https://doi.org/10.1007/s10098-020-01827-w	KASWAN, Mahender Singh; RATHI, Rajeev. Investigating the enablers associated with implementation of Green Lean Six Sigma in manufacturing sector using Best Worst Method. <i>Clean Technologies and Environmental Policy</i> ,
113	Work intensification and employee involvement in lean production: New light on a classic dilemma	Paolo Neirotti	This paper contributes to the literature on lean production by exploring whether and how the involvement of employees in continuous	.....These findings have shed new light on the suggestions expressed by Adler and Borys (1996); Macduffie (1995) that workers are able to embrace the coercive elements of lean production, such as a lack of choice autonomy and intensified work pace, and still be intrinsically motivated. As such,	https://doi.org/10.1080/09585192.2018.1424016	NEIROTTI, Paolo. Work intensification and employee involvement in lean production: New light on a classic dilemma. <i>The International Journal of Human Resource Management</i> , 2020, 31.15: 1958-1983.
114	Synergizing Lean Six Sigma with human resource practices: evidence from literature arena	V. Raja Sreedharan, Anjana Balagopalan, V. Murale & P. Arunprasad	Human resource (HR) is one of the essential features of business activities. Moreover, the success rate of the business depends upon	Theory verification using conceptual and descriptive studies has been the centre of research on Lean, Six Sigma and HR practices. More research work reported in the literature are descriptive in nature when compared with the empirical studies.	https://doi.org/10.1080/14783363.2018.1439374	RAJA SREEDHARAN, V., et al. Synergizing Lean Six Sigma with human resource practices: evidence from literature arena. <i>Total Quality Management & Business Excellence</i> , 2020, 31.5-6: 636-653.
115	Effects of HRM practices, lean production practices and lean duration on performance	Vathsala Wickramasingha and G. L. D. Wickramasinghe	The purpose of this research is to investigate the structural relationships between HRM practices, lean production practices,	.....Third, although investigating the role of the HRM	https://doi.org/10.1080/09585192.2017.1407954	WICKRAMASINGHA, Vathsala; WICKRAMASINGHE, G. L. D. Effects of HRM practices, lean production practices and lean duration on performance. <i>The International Journal of Human Resource Management</i> , 2020, 31.11:
116	The mediating influence of organisational cultural practices in successful lean management implementation.	Trevor Cadden; Keith Miller; Raymond Traay; Paul Humphreys	Previous research shows a low success rate for lean implementations. Few studies have considered the role that organisational culture	Previous research estimated that less than five percent of lean adoptions are successful (Pay, 2008) Hence, there is a need for research which explores the contextual factors surrounding lean implementation (Vlachos and Siachou, 2018). The findings of this study highlight that LFs are	https://doi.org/10.1016/j.lipe.2020.107744	CADDEN, Trevor, et al. The mediating influence of organisational cultural practices in successful lean management implementation. <i>International Journal of Production Economics</i> , 2020, 107744.
117	Assessing the relationship of the human resource, finance, and information technology functions on reported performance in hospitals using the Lean management system	Stephen M. Shortell Thomas G. Rundall Janet C. Blodgett	Background: Given pressure to control costs and improve quality of care, one of the most prevalent transformational performance improvement approaches	There were significant positive associations between lean HR, finance, and IT functions and self-reported performance impact (controlling for organizational and market variables). Tests of mediation indicated that the associations of HR, finance, and IT functions with self-	https://createvalue.org/wp-content/uploads/Assessing_the_relationship_of_the_human_resource_99663.pdf	SHORTELL, Stephen M.; RUNDALL, Thomas G.; BLODGETT, Janet C. Assessing the relationship of the human resource, finance, and information technology functions on reported performance in hospitals using the Lean management
118	Lean manufacturing, human resource management and worker health: Are there smart bundles of practices along the adoption process?	Rachel BOCCUET, Sandra DUBOULOZ, Tarik CHAKOR	The effects of lean manufacturing on worker health remain poorly understood. Although recent studies show a moderating role of human	..... Results confirm the moderating role of HRM practices on the relationship between lean and employee health at work. They also show that the effect of lean practices on health depends not on the intensity of the lean and HRM practices firms adopt but rather on the combination thereof.	https://doi.org/10.3917/lje.p.1.0050	BOCCUET, Rachel; DUBOULOZ, Sandra; CHAKOR, Tarik. Lean manufacturing, human resource management and worker health: Are there smart bundles of practices along the adoption process? <i>Journal of Innovation</i>
119	Lean Smart Maintenance—Value Adding, Flexible, and Intelligent Asset Management	Hubert Biedermann and Alfred Kinz	Maintenance is a strategic factor and a key enabler for smart production. Therefore, it needs to be intelligent—smart—and cost efficient—lean. The	LSM combines these economic principles of an efficient input and output oriented asset management with a learning and knowledge based approach. It supports maintenance management to outline the contribution to a sustainable company's success. An efficient and	https://doi.org/10.1007/s00501-018-0805-y	BIEDERMANN, Hubert; KINZ, Alfred. Lean Smart Maintenance—Value Adding, Flexible, and Intelligent Asset Management. <i>BHM Berg-Pund Hütten-Bönnische Monatshefte</i> , 2019, 164.1: 13-18.
120	Corporate Social Responsibility and Human Resource Management: Towards Sustainable Business Organizations	Juan Herrera, Carlos de las Heras-Rosas	Today's organizations are immersed in a global market, where any detail can provide a competitive advantage over rival companies and condition	..... In the last period there has been an unprecedented increase in CSR and HRM, which means that their quantitative and qualitative enrichment has led to a multitude of adjacent lines of research. CSR maintains leadership of centrality. The most relevant topics are: Green-	https://doi.org/10.3390/su12030841	HERRERA, Juan; DE LAS HERAS-ROSAS, Carlos. Corporate social responsibility and human resource management: Towards sustainable business organizations. <i>Sustainability</i> , 2020, 12.3: 841.
121	Development and validation of a lean supply chain management measurement instrument	José Moyano-Fuentes, Sebastián Bruque-Cámara & Juan Manuel MaquieiraMarín	It is widely argued that to be competitive, a company not only needs to focus on internal aspects but on the entire supply chain. Lean supply chain management	..... This instrument might also be of interest to practitioners working in the consultancy industry. It can be used in LSCM projects to help with both planning the lean implementation stages and improving the operational aspects of LSCM. The scale provided here can also be an effective tool	https://doi.org/10.1080/09537287.2018.1519731	AMARO, Paulo; ALVES, Anabela Carvalho; SOUSA, Rui M. Lean thinking: a transversal and global management philosophy to achieve sustainability benefits. In: <i>Lean Engineering for Global Development</i> . Springer, Cham, 2019. p. 1-
122	Lean Six Sigma in financial services industry: a systematic review and agenda for future research	VASHISHTH, Abhishek; CHAKRABORTY, Ayon; ANTONY, Jiju	The purpose of this paper is to explore the trend and most common themes about Lean Six Sigma (LSS) implementation in the finance sector, and also to	There is a noticeable increase in the popularity of LSS and the level of LSS deployment in the financial services significantly in the banking industry in the last 10 years around the world, especially in developed economies such as the USA, the Netherlands and the UK, and in some emerging	https://doi.org/10.1080/14783363.2017.1308820	VASHISHTH, Abhishek; CHAKRABORTY, Ayon; ANTONY, Jiju. Lean Six Sigma in financial services industry: a systematic review and agenda for future research. <i>Total Quality Management & Business Excellence</i> , 2019, 30.3-4: 447-465.
123	Increasing Competitiveness through the Implementation of Lean Management in Healthcare	Prado-Prado, Fernández-González, García-Arca, Mosteiro-Arón, M	The main aim of this paper was two-fold: first, to design a participative methodology that facilitates lean management	Internal management of healthcare is incredibly complex and a vast quantity of data are collected. In general, it is still not possible to easily identify how a hospital is performing in terms of quality, cost and delivery of services, because a great deal of the information gathered is not linked to	edselc.2-52.0-85088020557	Increasing competitiveness through the implementation of lean management in healthcare Por: Prado-Prado, J. C., Fernández-González, A. J., García-Arca, J., Mosteiro-Arón, M., <i>International Journal of Environmental Research and Public</i>
124	Viable supply chain model: Integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic	Ivanov, Dimitry	Viability is the ability of a supply chain (SC) to maintain itself and survive in a changing environment through a redesign of structures and replanning	..... To summarize, the SC and operations management community has created impressive methodical fundamentals, techniques and tools for legality, resilience, sustainability and digitalization of SCs	https://doi.org/10.1007/s10479-020-03640-6	Ivanov, D. Viable supply chain model: integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic. <i>Ann Oper Res</i> (2020).
125	Contribuições do Lean Healthcare para o Combate à Covid-19	Michelle de Oliveira Menezes, Lara Camilla Nery Vieira, Cristiane Agra Pimentel, Grace Kelly Sampaio Juventino, Marilane	The Covid-19 disease pandemic caused by the SARS-CoV-2 coronavirus is evolving and some countries in the world are experiencing overload in	As ações elucidadas para unidades de assistência médica, principalmente aquelas que recebem casos de Covid-19, trazem mudanças de perspectivas no âmbito do trabalho e gerenciamento, assim como auxiliarão na questão de repensar processos e os fluxos, direcionando	http://dx.doi.org/10.9771/cp.v13i2.COVID-19.3613	DE OLIVEIRA MENEZES, Michelle, et al. Contribuições do Lean Healthcare para o Combate à Covid-19. <i>Cadernos de Prospecção</i> , 2020, 13.2 COVID-19-313.
126	Reorganization of a large academic hospital to face COVID-19 outbreak: The model of Parma, Emilia-Romagna region, Italy	Tiziana Meschi, Sandra Rossi, Annalisa Volpi, Carlo Ferrari, Nicola Sverzellati, Ettore Brianti, Massimo Fabi	Since 21 February 2020, Italy has developed an outbreak of coronavirus disease 2019 (COVID-19) by severe acute respiratory syndrome	This model shares some common features, including pre-acting and reconversion of wards, with models implemented in other hospitals of Northern Italy. However, the inclusion of chest CT at an early stage of patient management and clusterization of medical and ICU beds represent	https://doi.org/10.1111/eri.13250	MESCHI, Tiziana, et al. Reorganization of a large academic hospital to face COVID-19 outbreak: the model of Parma, Emilia-Romagna region, Italy. <i>European Journal of Clinical Investigation</i> , 2020, e13250.

Nº	Title	Author[s]	Abstract	Article Conclusion	Link	Citation
127	Rapid Implementation of Telesychiatry in a Safety-Net Health System During Covid-19 Using Lean	Paola Peynetti Velázquez, Gaurav Gupta, Gouri Gupte,, Nicholas J. Carson, and Jacob Venter	As the coronavirus pandemic progressed toward a critical surge in Massachusetts, leaders of the department of Psychiatry at Cambridge	Within a two-month period, we applied Lean methods to swiftly launch and scale-up telesychiatry for outpatient services. Without a preexisting telemedicine program or additional personnel, funding, devices, or platforms, 6,21,22 we observed comparable visit volumes and a 48%	doi: 10.1056/CAT.20.0319	VELÁZQUEZ, Paola Peynetti, et al. Rapid Implementation of Telesychiatry in a Safety-Net Health System During Covid-19 Using Lean. <i>Nejm Catalyst Innovations in Care Delivery</i> .
128	Lean Information for lean communication: Analysis of concepts, tools, references, and terms	Guilherme Alfredo Redeker, Gabriela Zucchetti Kessler, Liane Mahlmann Kipper	Communication and information processes are vital in any company. The use of lean manufacturing concepts applied to the communication and	Regarding the experiment conducted between the emergency department and clinical laboratory, some gaps and opportunities were found indicating that lean information should be improved. It was verified that there is no methodology (such as organized steps) to guide	https://doi.org/10.1016/j.iinfomet.2018.12.018	REDEKER, Guilherme Alfredo, KESSLER, Gabriela Zucchetti, KIPPER, Liane Mahlmann. Lean information for lean communication: Analysis of concepts, tools, references, and terms. <i>International Journal of Information</i>
129	Realizing Total Customer Experience through Six Sigma Marketing: An empirical approach	K. Muralidharan and Neha Raval	Loyal customer base is the key to successful business model and this pave ways to the intense customer orientation in contemporary business	In order to propose empirical approach to realize TCE through SSM, this paper proposed holistic approach with component identification of both the fields to proposing integration between them. The empiric approach proposed here attempts to integrate each dimension of	https://www.researchgate.net/profile/K_Muralidharan	MURALIDHARAN, K.; RAVAL, Neha. Realizing Total Customer Experience through Six Sigma Marketing: An empirical approach. <i>Productivity</i> , 2019, 60.3: 303-315.
130	Eco-Innovation Influencers: Unveiling the Role of Lean Management Principles Adoption	João Leitão , Sónia de Brito and Serena Cubico	This study analyzes the determinant factors of eco-innovation, considering business units with different levels of technological intensity	As key results, the importance of the technological factor was found to be essential in stimulating eco-innovation and is a determinant factor common to both high-tech and low-tech companies. The same applies to the market factor, where the focus is essentially on reducing labour costs per unit	https://doi.org/10.3390/su11082225	LEITÃO, João, DE BRITO, Sónia, CUBICO, Serena. Eco-Innovation Influencers: Unveiling the Role of Lean Management Principles Adoption. <i>Sustainability</i> , 2019, 11.8: 2225.
131	Extending the pursuit of flow (lean) management to encompass sales, general and administrative functions	Richard J. Schonberger	Operations management tends to be treated independent of other business functions—the silo syndrome. In this article, we call for	This inventory/SG&A research has centred on a core database of 133 companies (72 manufacturers and 41 retailers/distributors) whilst shunning off 132 companies (107 manufacturers and 75 retailers/distributors) that lacked meaningful trends in inventory and SG&A.	https://doi.org/10.1080/09537287.2019.1699971	Richard J. Schonberger (2020) Extending the pursuit of flow (lean) management to encompass sales, general and administrative functions. <i>Production Planning & Control</i> , 31.13, 1098-1109. DOI: 10.1080/09537287.2019.1699971
132	Market-driven management of start-ups: The case of wearable technology	Milad Dehghan, A. Mohammed Abubakar ,Mohsen Pashna	The purpose of this paper is to identify and describe the drivers of lean approaches and successful management of wearable technology start-ups. The	... A good strategy for start-ups to overcome the low usage rate and perceived value of IoT devices is to sponsor the reproduction of complementary goods or even sell them at low prices to increase awareness and boost the desirability of the technology. Availability and	https://doi.org/10.1016/j.aci.2018.11.002	DEGHAN, Milad; ABUBAKAR, A. Mohammed; PASHNA, Mohsen. Market-driven management of start-ups: The case of wearable technology. <i>Applied Computing and Informatics</i> , 2020.
133	Lean and agile manufacturing: complementary or competing capabilities?	Tahir Iqbal, Muhammad Shakeel Sadiq Jajja, Mohammad Khurum Bhutta and Shahzad Naeem Qureshi	Purpose – Lean (TQM and JIT) and agile manufacturing (AM) are viewed as strategic capabilities that can help firms to meet diverse	Results show that lean manufacturing, AM, and supporting management and infrastructural practices have positive and complementary effects on firm's performance. Further, results depict that lean manufacturing and AM complementarity is a complete organizational	https://doi.org/10.1108/JMTM-04-2019-0165	IQBAL, Tahir, et al. Lean and agile manufacturing: complementary or competing capabilities?. <i>Journal of Manufacturing Technology Management</i> , 2020.
134	Impact of lean operations on the roles of finance functions and their application of lean	Henrik Nielsen and Thomas Borup Kristensen	This paper aims to study the relations between lean operations, lean principles in finance functions and the roles of finance functions.	The paper finds that lean-operation firms emphasize four different yet interdependent roles of finance functions. The paper also finds that lean operation leads to firms' finance functions adopting lean principles. Decision-makers in lean-operation firms should	https://doi.org/10.1108/ERR-10-2019-0277	NIELSEN, Henrik; KRISTENSEN, Thomas Borup. Impact of lean operations on the roles of finance functions and their application of lean. <i>European Business Review</i> , 2020.
135	Exploring lean generic and lean healthcare cultural clusters	Marc Dorval and Marie-Hélène Jobin	Purpose – Lean culture has been noted to be an underdeveloped concept. The purpose of this paper is to increase the understanding of Lean	Four emergent Lean's leading cultural clusters: operations, change, collectivity and humanity were identified inductively from ten 10 relevant keywords, namely, in order of importance: work, time, process, Lean, system, improvement, production, patient, people and team. Saliency of	https://doi.org/10.1108/IJPPM-01-2019-0057	DORVAL, Marc; JOBIN, Marie-Hélène. Exploring lean generic and lean healthcare cultural clusters. <i>International Journal of Productivity and Performance Management</i> , 2019.
136	Lean, streamlined machine: Digitalizing supply chains to boost organizational performance	Haddud, A. and Khare, A.	This paper aims to review the latest management developments across the globe and pinpoint practical implications from cutting-edge research and	Digital supply chains are a key facet of the Industry 4.0 revolution, and certain technological trends are seen as being key to implementing this in an organization.	https://doi.org/10.1108/SD-08-2020-0142	DIRECTION, Strategic. Lean, streamlined machine: Digitalizing supply chains to boost organizational performance. 2020.
137	Virtual workplaces and lean leadership: integrative conceptualization and organizational implications	Talina Mishra and Lalatendu Kesari Jena	Purpose – The purpose of this paper is to integrate the concept of lean in the world of virtual leadership by continuously engaging employees and building	Lean leadership can serve as a great way to boost employee morale and enrich their experience in times of global crisis. Employees can effectively contribute to the organization with the help of virtual lean teams and tools.	https://doi.org/10.1108/SHR-04-2020-0031	MISHRA, Talina; JENA, Lalatendu Kesari. Virtual workplaces and lean leadership: integrative conceptualization and organizational implications. <i>Strategic HR Review</i> , 2020.
138	Introducing a strategic perspective in lean thinking applications through system dynamics modelling: the dynamic Value Stream Map	Guido Noto and Federico Cosenz	Lean Thinking is an operation management discipline which aims to identify, map and analyse the activities forming a process to detect "value	Our results show that SD modelling provides robust methodological support to VSM and Lean Thinking due to its inner characteristics, namely: simulation, systemic view, explicit link between system structure and behaviour and effective visual representation	https://doi.org/10.1108/BPMJ-03-2020-0104	NOTO, Guido; COSENZ, Federico. Introducing a strategic perspective in lean thinking applications through system dynamics modelling: the dynamic Value Stream Map. <i>Business Process Management Journal</i> , 2020.
139	Operating room effectiveness: a lean health-care performance indicator	Thiago A. Souza, Guilherme Luis Roehs Vaccaro and Rui M. Lima	Purpose – Overall equipment effectiveness (OEE) is a performance indicator that is been used to measure manufacturing productivity. The purpose	The present study describes an adaptation of a performance indicator to ORs of hospitals, allowing to classify its types of operational losses in a lean health-care context. The application of this indicator and the development of improvement actions to a university hospital,	https://doi.org/10.1108/IJLSS-12-2017-0141	SOUZA, Thiago A.; VACCARO, Guilherme Luis Roehs; LIMA, Rui M. Operating room effectiveness: a lean health-care performance indicator. <i>International Journal of Lean Six Sigma</i> , 2020.
140	Similarities and differences between business process management and lean management	Mauricio Uriona Maldonado, Matheus Eduardo Leusin, Thiago Carrano de Albuquerque Bernardes and	Purpose – Business process management (BPM) and lean management (LM) are both recognized for improving organizational	Both methodologies seek continuous improvement with focus on the customer and process standardization, but they are divergent mainly in relation to the flow they intend to improve. Their possibility of implementing both methodologies in an	https://doi.org/10.1108/BPMJ-05-2019-0368	MALDONADO, Mauricio Uriona, et al. Similarities and differences between business process management and lean management. <i>Business Process Management Journal</i> , 2020.
141	A lean manufacturing road map using fuzzy-DEMATEL with case-based analysis	Sameh N. Selem, El-Awady Attia, Ahmed Karam and Ahmed El-Assal	Purpose – This paper aims to develop a lean manufacturing road map for industrial firms by selecting the appropriate lean tools relyi	The practical results indicate that diagnosing the manufacturing system and managing experts' knowledge to select the appropriate lean initiatives, and prioritizing these initiatives relying on the understanding of their interrelationship could support achieving the strategic targets	https://doi.org/10.1108/IJLSS-12-2017-0147	SELEM, Sameh N., et al. A lean manufacturing road map using fuzzy-DEMATEL with case-based analysis. <i>International Journal of Lean Six Sigma</i> , 2020.
142	Quality and lean practices synergies: A swift even flow perspective	George Onofrei, Brian Fynes, Hung Nguyen and Amir Hossein Azadnia	The purpose of this study is to investigate the relationship between investments in quality and lean practices, and their impact on factory fitness.	This study highlights that both investments in quality and lean practices have direct impact factory fitness. The results provide insights into the efficacy of the investments in manufacturing practices and their role in augmenting the operational performance. The investments in	https://doi.org/10.1108/IJORM-11-2019-0360	ONOFREI, George, et al. Quality and lean practices synergies. <i>International Journal of Quality & Reliability Management</i> , 2020.
143	A framework proposition to identify customer value through lean practices	Carla Beatriz da Luz Peralta, Mária Elisa Echeveste, Fernando Henrique Lermen, Arthur Marcon and Guilherme Tortorella	Customer value is the key to successful innovation management. This task is considered complex and abstract. For this reason, several models have been	In total, 33 practices were found to support capturing the value from the customer's perception. Additionally, a discussion is provided on the complementarity and differences between practices. A framework is proposed to integrate the five streams and the corresponding practices	https://doi.org/10.1108/IJMTM-06-2019-0209	DA LUZ PERALTA, Carla Beatriz, et al. A framework proposition to identify customer value through lean practices. <i>Journal of Manufacturing Technology Management</i> , 2020.
144	Effective after-sales services through the lean servitization canvas	Martin Rudnick, Jan Riezabos, Daryl John Powell and Annika Hauptvogel	Purpose – A lean approach is frequently applied in the primary processes of a company, but less in after-sales service. Servitization leads to a change from	The paper shows how value can be achieved for providers of integrated PSS by adopting the lean servitization canvas. For companies, the use of a lean approach to servitization integrates primary processes and after-sales services and offers new opportunities	https://doi.org/10.1108/IJLSS-07-2017-0082	RUDNICK, Martin, et al. Effective after-sales services through the lean servitization canvas. <i>International Journal of Lean Six Sigma</i> , 2020.

Nº	Title	Author(s)	Abstract	Article Conclusion	Link	Citation
145	Lean maturity and quality in primary care	Monica Kaltenbrunner, Svend Erik Mathiassen, Lars Bengtsson and Maria Engström	The purpose of this paper is twofold: first, to describe Lean maturity in primary care using a questionnaire based on Liker's description of Lean,	Lean maturity varied both between and within units. The highest Lean maturity was found for "adhering to routines" and the lowest for "having a change agent at the unit." Lean maturity was positively associated with satisfaction with care and with adherence to NG to improve healthcare	https://doi.org/10.1108/JHOM-04-2018-0118	KALTENBRUNNER, Monica, et al. Lean maturity and quality in primary care. <i>Journal of Health Organization and Management</i> , 2019.
146	Australian food retail supply chain analysis	Ferry Jie and Denise Gengatharen	The Australian retail food sector, comprising mostly small enterprises, is undergoing change as a result of the innovative supply chain approach	Statistical results suggest that lean thinking and the quality of information shared can lead to greater efficient supply chain performance. The small sample is the main limitation. The findings bear important implications for further research as understanding these dimensions can	https://doi.org/10.1108/BPMJ-03-2017-0065	JIE, Ferry, GENGATHAREN, Denise. Australian food retail supply chain analysis. <i>Business Process Management Journal</i> , 2019.
147	The effect of corporate social responsibility performance on financial performance: the case of food industry	Xanthi Partalidou, Eleni Zafeiriou, Grigoris Giannarakis and Nikolaos Sariannidis	The present study examines the impact of the different dimensions of corporate social responsibility (CSR) performance on the	Findings based on estimated generalized least squares (EGLS) indicate that the higher level of environmental performance (as described by an aggregate environmental index), the publishing of a stand-alone sustainable report and the implementation of quality principles, such as Total	https://doi.org/10.1108/RUJ-11-2019-0501	PARTALIDOU, Xanthi, et al. The effect of corporate social responsibility performance on financial performance: the case of food industry. <i>Benchmarking: An International Journal</i> , 2020.
148	Lean management and innovation performance	Ayman Bahjat Abdallah, Samer Eid Dahiyat, Yoshiki Matsui	The purpose of this paper is to explore the effects of innovation orientation (IO) on both the implementation levels of soft and hard lean	The results demonstrated that innovation-oriented companies tend to adopt aspects of both soft and hard LM. However, the results revealed an insignificant effect of soft and hard LM on innovation performance. The study also showed that innovation performance is positively	https://doi.org/10.1108/MR-10-2017-0363	ABDALLAH, Ayman Bahjat; DAHIYAT, Samer Eid; MATSUI, Yoshiki. Lean management and innovation performance. <i>Management Research Review</i> , 2019.
149	The Role of Big Data and Digitization in Just-In-Time (JIT) Information Feeding and Marketing	Kat Yamamoto, Robert A. Lloyd	Marketing management is racing to keep up with the technological advances that are disrupting how consumers connect and interact with business'	Use of data has become critical to marketing. The digital environment has generated an exponential explosion of data, also known as big data, to describe this phenomenon ...	https://doi.org/10.33423/ajm.v19i2.2074	YAMAMOTO, Kat; LLOYD, Robert A. The Role of Big Data and Digitization in Just-In-Time (JIT) Information Feeding and Marketing. <i>American Journal of Management</i> , 2019, 19.2.
150	On the application of Lean principles and practices to innovation management	Sam Solaimani, Jack van der Veen, Durward K. Sobek II, Erdogan Guliyaz, Venu Venugopal	Increasingly, a firm's innovation capability has become one of the key frontiers of competitive advantage. The Lean philosophy has a well-	A total of 88 publications are analyzed, leading to 34 Lean principles and practices relevant to innovation management, which are further integrated into a comprehensive model, dubbed the "Leanoovation" framework.	https://doi.org/10.1108/TQM-12-2018-0208	SOLAIMANI, Sam, et al. On the application of Lean principles and practices to innovation management. <i>The TQM Journal</i> , 2019.
151	Digitalizing supply chains potential benefits and impact on lean operations	Abubaker Haddud, Anshuman Khare	New technological trends continue to emerge, and businesses adopt them in different capacity in a pursuit of improving current ways of doing	The authors were able to confirm the significant impact of digitalizing supply chains on the five examined lean operations practices. Most of the examined potential impacts were found to improve certain areas that directly improve the practices of the explored five lean operations	https://doi.org/10.1108/IJSS-03-2019-0026	HADDUD, Abubaker; KHARE, Anshuman. Digitalizing supply chains potential benefits and impact on lean operations. <i>International Journal of Lean Six Sigma</i> , 2020.

Anexo B. PowerBI dashboard



Year: 2017 | 2020

Contagem de N°: **151**

Contagem de N°

▶ Faça uma pergunta sobre os seus dados (em inglês)

Escolha uma destas opções para começar

Contagem de N° por Country e Enterprise segment

Contagem de N° por Enterprise segment

Enterprise segment	Contagem de N°
Industry	56
Healthcare	16
Logistic	6
Services	5

Contagem de N° por Industry/Main topic specifics

Industry/Main topic specifics	Count	Percentage
Healthcare	16	19.28%
Management	6	7.23%
Human resources	6	7.23%
Operations	6	7.23%
Supply Chain	8	9.64%
Automotive industry	9	10.84%
Electrical industry	9	10.84%
Energy industry	9	10.84%
Food industry	14	16.87%

Média de Citations QTY por Enterprise segment

Enterprise segment	Average Citations	Percentage
Industry	9,074	26.1...
General	5, ...	
Services	8,65%	
Healthcare	6,2	17.87%
Public Sector	8,984	25.9%
Education		
Logistic		

Enterprise segment	Title	Author(s)	Link
Services	Effective after-sales services	Martin Rudnick, Jan	https://...
Total			

Year

2017 2020



Faça uma pergunta sobre os seus dados (em inglês)

Escolha uma destas opções para

Contagem de N° por Country e Application Area Master segment

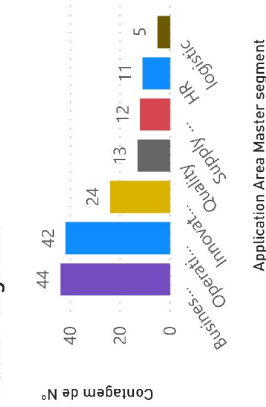


151

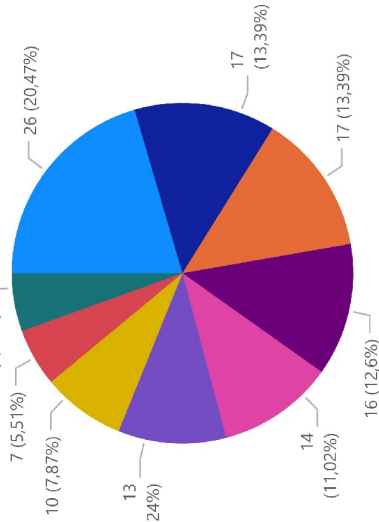
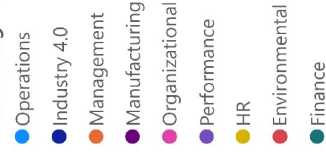
Contagem de N°

Contagem de N° por Area sub Segment

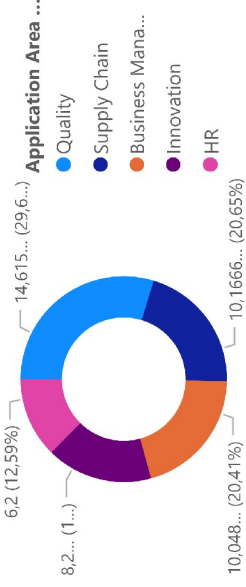
Contagem de N° por Application Area Master segment



Area sub Segment



Média de Citations QTY por Application Area Master segment



Application Area Master segment	Title	Author(s)
Operations	A case study in consolidating	Tong, Hua LU and
Total		