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# Lean and agile project management concepts in the project management profession

**ABSTRACT**

Lean and agile concepts have been the focus of researchers and practitioners since 1990. The lean concept started in the Japanese manufacturing sector to eliminate waste and enhance customer satisfaction. Whereas agile was introduced into the 20th-century manufacturing enterprise strategy report. The agile concept concentrates on quick response to variations in the market environment. The lean and agile concepts have emerged becoming managerial paradigms applicable to different industrial sectors and processes. However, the plethora of lean and agile implementations and settings makes the recent literature diverse and fragmented, and comprehensive analysis of the latest contributions on this space is deemed essential. Therefore, this research uses a systematic literature review of 160 related articles published in peer-reviewed academic journals between 2012 and 2018. The study applies descriptive and thematic analyses to the recent trends in this area and provides a framework that organises lean and agile researched issues into developed, intermediate and emerging based on their position in the research lifecycle

**Introduction**

Lean management principles have been used by organisations in indifferent industries to reduce waste, organise processes and minimise costs (Simon & Canacari,2012). According to Kaplan et al. (2014), to create transformation, lean should be part of an inclusive management system along with an organisation's change and new leadership. The lean principles have been applied in different types of industries, including construction, healthcare, and manufacturing. Therefore, lean is portrayed with the concept of "Doing more with Less" where everything that does not add value is waste and should be diminished (Putnik & Putnik,2012). The lean focus of removing inefficient processes is one of the most popular businesses approaches in the last decade, where the operation is created efficiently along with concepts such as Just In Time (JIT), Total Quality Management (TQM), and Supply Chain Management (SCM) (Jadhav et al.,2014). Browaeys and Fisser (2012) stated that the lean thinking paradigm pursues the improvement of the business processes.

In contrast to the traditional approach where the techniques are push-oriented, the lean methods are pull intended, abolishing the overproduction of material and focusing on the right customer at the right time (Tyagi et al.,2015). The selection of the correct and proper lean tools/practices can lead to success or failure in leanness and is crucial in a day-by-day more competitive environment (Anvari et al.,2014). Demir et al. (2012) state in some situations lean needs to be more agile, recognising and identifying the barriers and limits of lean concept in construction and approaching to the flexibility of agile bringing into focus the desire of satisfying the client and giving the relevance to the team as the factor of expertise.

The agile methodology focuses on three factors: 1) the skilfulness of the team, 2) the client's satisfaction, and the reaction to uncertainty (Demir,2012). The agile approach was initially developed in the IT industry to tackle common issues in service delivery activities and software development (e.g., budget exceed, poor-quality deliverables, missing deadlines, and customer's dissatisfaction). Moreover, agile has been integrated into other industries such as construction and manufacturing due to its flexibility, high-quality in the outputs and processes and the business value (Sohi et al.,2016). The agile methodology adopts the incremental planning with the information available instead of the upfront planning, labelling risks as soon as possible, reducing the impact of any change requirement, delivering continuous and permanent business value to the organization, incentivizing the active communication among the stakeholders, empowering the team members and involving the client in all the stages of the process (Sohi et al.,2016). According to Stare (2014), agile is characterized due to the roughly defined and open to change specifications at the beginning of the project which is more detailed by the client at each interaction which usually takes no more than eight weeks.

Moreover, the client participates in the development of the product and report any inadequacy to the team which regularly discuss, always looking for new ideas and solve main concerns. Scrum and Kanban are a pair of the agile methods used to identify the bottlenecks in the processes and address them to the corresponding team. However, there are differences such as in Kanban there are no predefined rules, and the products are delivered on an as needed basis. Whereas at Scrum, each member has a predefined rule, and the outputs are delivered by sprints (Fitzgerald et al.,2014).

The implementation of lean and agile in the project management profession eradicates waste in the process and react to change (Demir,2012). Wang et al. (2012) argued that lean development expands the theoretical foundations of agile in software development by applying the well-known lean principles to software development. Moreover, lean thinking provides credibility and strength to the main concept of agile. Putnik and Putnik (2012) stated that the link between lean and agile are based on mutual support, where lean is an antecedent to agility. According to Mostafa et al. (2016), the combination of agile and lean are the answer to the global-class market competition.

Furthermore, the lean-agile characteristics are associated with the end-user service level, value metrics lead time, and cost and quality (Mostafa et al. 2016). Given the current market pressure, organisations are required to propose a lean strategy to reduce costs and minimise times in production, while agile react fast to any change even detecting them before occurring (Sabri & Shaikh, 2010). Graber and McCormick (2012) refer at integrating lean and agile in PM are merging to the workforce planning approach, starting with the point that what is required in the product or service to meet or exceed the customer's expectations, preserving the quality to react quickly to dynamic demands.

Despite the vast number of articles on lean and agile implementation in different industrial sectors, more studies are required to discuss the integration of lean with agile within the project management profession. Therefore, this research aims to present a systematic analysis of the lean and agile practices in project management for future practice using a systematic literature review. Furthermore, this paper explores the usage of both practices and their influence on the complex world of project management.

## ***Methodology***

This research employed a systematic literature review (SLR) to identify and comprise the current topics within the lean and agile project management landscape. The SLR also used to evaluate contributions and synthesising the records produced by different researchers. The SLR was conducted in three main stages as follows.

- Stage 1: Planning the documents review identifying the purpose and protocol and search the literature using key terms such as "Lean," "Agile" "Lean Manufacturing" Lean Construction," "Agile development," "Agile manufacturing," "Lean-Agile" "Lean industry" and "Agile industry."
- Stage 2: Screening the research paper by precisely reading the title, the abstract and keywords
- Stage 3: Synthesising and documenting the papers reviewed using descriptive and thematic analyses

In total, 160 papers published between 2012 and 2018 in peer-reviewed electronic research databases (e.g., JSTOR, Springer Link, ScienceDirect, EBSCOhost, SAGE Publications, and Emerald Insight). These articles reviewed for fulfilling the research aim and objectives of this research. The papers also scrutinised based on the methods of data collection and coverage of the lean and agile project management themes.

### *Literature analysis*

#### Descriptive Analysis

The descriptive analysis of this research recognises a total of 160 documents from 2012 to 2018. The number of articles was based on doing research based on agile, lean, their tools and their approach to the Project Management and the PMBOK. Based on the research, there was found that the significant majority of studies on lean were done between 2012 and 2013, while the number of studies that covered the agile concept was increasing after 2015. Using the same categorisation proposed by Altay and Green (2006), this research developed a summary of statistics, including the research context, the method and the scope of the documents. As shown in Figure 1, the research theme of the majority of the papers is Lean Six Sigma (32.3%), followed by lean management (15.4%), lean construction (15.3%), and the general practice (14.7%) of lean and its implementation (11.4%).

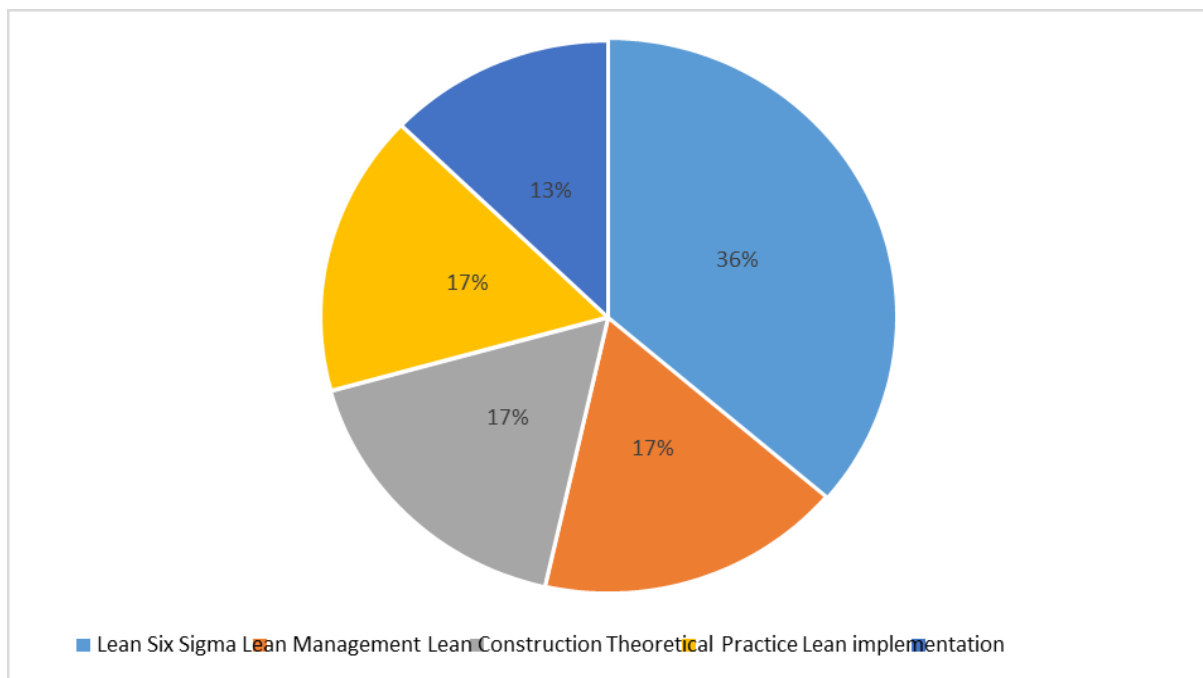


Figure 1. Main research themes for lean

The rest of the documents are a combination of different perspectives and implementations of lean and agile in various industries. An interesting fact is that the majority of approaches of agile PM are in software development. Nevertheless, a couple of documents of implementation of agile in production and construction open the doors for new visions. Moreover, 92 of the 160 papers found in the research are based on the global context as per Figure 2.

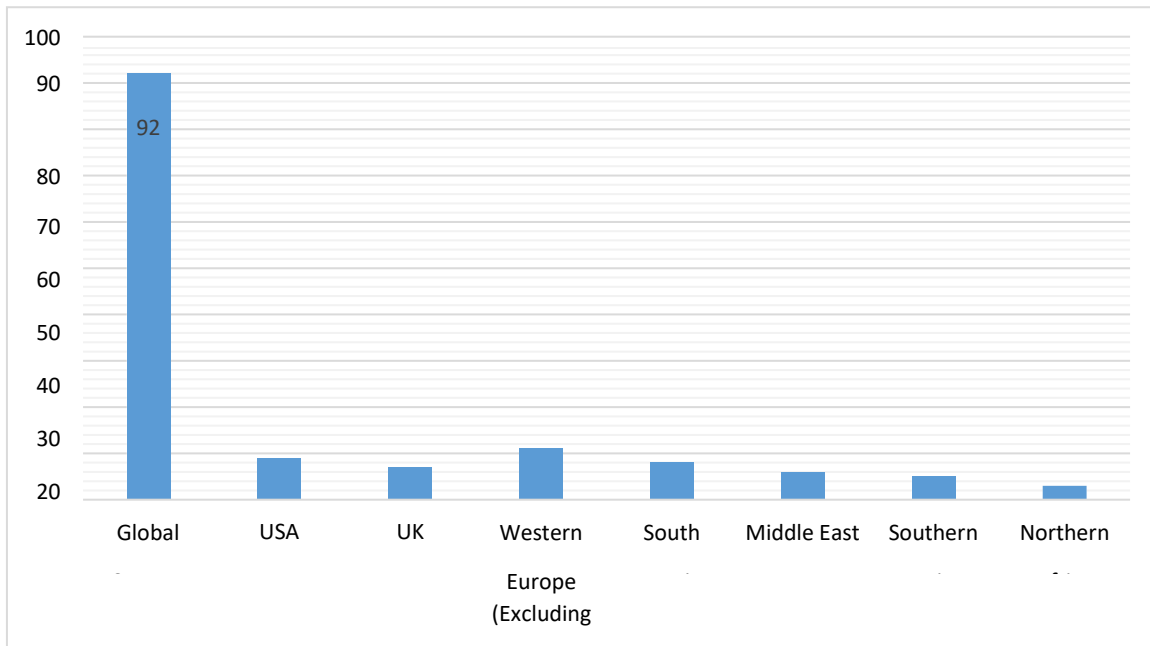
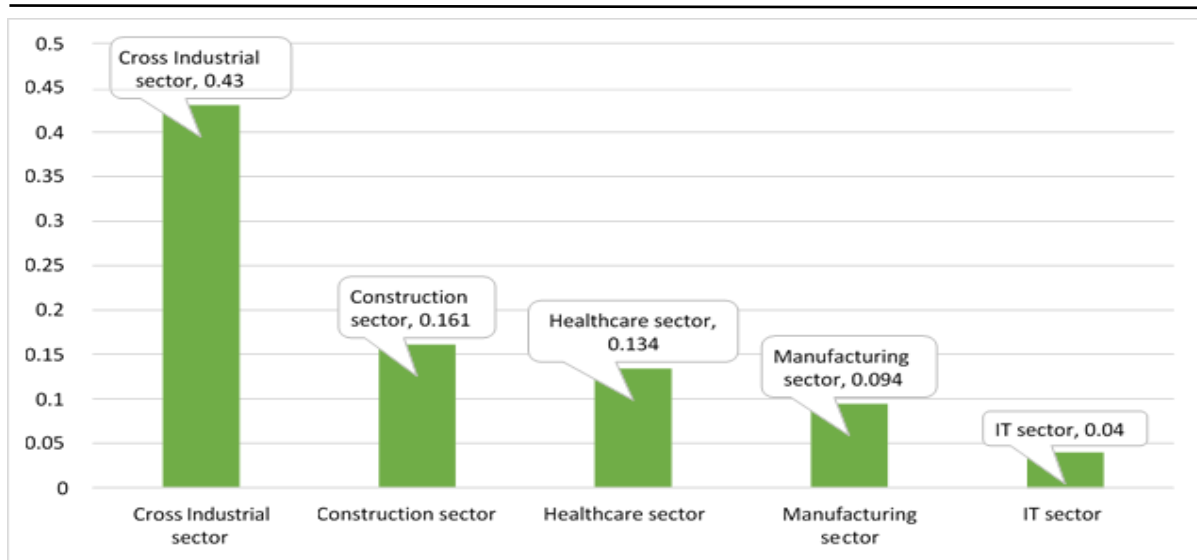


Figure 2 lean and agile research context distribution

In general, the lean and agile approach research have been spread around the globe. However, countries like USA (9) and United Kingdom (7) count with a slight more number of documents where researchers were advanced followed by nations in Western Europe (11, Excluding UK), South America (8), the Middle East (6) and Southern Asia (5) and Northern Africa (3). Furthermore, the significant part of the documents was developed taking into account the Cross Industrial Sector (43%), therefore a 16.1% were written by researchers based on the construction sector, 13.4% developed in the Healthcare sector, 9.4% in the manufacturing industry and the IT sector as represented with a 4% (see Figure 3). The rest of the documents were developed in different areas such as Telecommunications, Banking, Human Resources, and others.



**Figure 3 lean and agile research industrial context distribution**

### ***Thematic analysis***

To continue with this research, the papers were summarised, divided and analysed based on three categories such as lean concept, evolution, barriers and enables, agile concept, principles and objectives, and lean and agile relationship.

#### Lean concept, evolution, barriers and enables

This first category selected discusses the lean abstract idea. A fundamental principle of lean is to enhance the added value to the client by minimising any activity that does not add any value along to the flow. Moreover, lean is always intending to achieve quality across all the steps of the process, starting from the origin. Hence, lean is not only aiming to solve the issue but to prevent the problem take place again (Martinez-Jurado & Moyano-Fuentes, 2014). Fullerton, Kennedy, and Widener (2014) argued that lean should be used more like a business system that only a manufacturing system. Thus, lean thinking is used as a strategy to unify all functions and processes into a consolidated and coherent system capable of supply an improved service to the client, eliminating waste through continuous improvement. Therefore, relevant aspects such as teamwork, motivation, problem-solving, communication and cultural change are paramount for the correct development of lean.

Moreover, in proof the social sustainability of the organisation, lean contributes to the social equity, incorporating employees' interests in the company's decisions and recognising efforts of the stakeholders based on their abilities more than the operations carried out daily. Thus, leaving a positive effect on employee's attitude (Martinez-Jurado & Moyano-Fuentes, 2014). In order to obtain a positive implementation of lean, there are required problem-solvers, learners, self-reflective and self-reactive workers not only to obliterate errors but to develop operations enhancements. Hence, there are required empowered employees capable to continuously improve their behaviour and their standards (Mazur et al., 2012).

According to Jadhav, Mantha and Rane (2013) organisations could be hampered in the process of implementing lean manufacturing (LMf) due to crucial issues in human, cultural, and geographical factors. Moreover, managers may spend considerable time and energies dealing with resistance to change (Stanleigh, 2008). Furthermore, barriers such as lack of leadership, involvement, training and commitment from management, also, lack of empowerment, communication, and training from the employees, as well as cross-functional conflicts, lack of

resources and slow response to market are some of the difficulties researched when lean is implemented in different organizations Jadhav et al. (2013). Therefore, lean relies on people's change, the desires for continuous improvement and the discipline to follow standards (Atkinson, 2010). Moreover, motivations such as a developed cost-efficient use of resources, and a clear identification, evaluation and elimination of waste in the business process, including the information flow has enhanced the transparency of the processes in an organization generating a feeling of trust among the stakeholders and a favourable customer's satisfaction (Magenheimer et al., 2014).

Lean principles were developed by Toyota in Japan in the seventies to raise the production processes; however, the origins of the Toyota Production System (TPS) are back of the beginning of the twentieth century (Womack, 2003). Besides, lean is browsing for waste in the process to minimize it. Hence, this reduction of nonessential activities, resources, or expenses that revolutionise not only the automotive industry but other disciplines and industries such as IT development, Construction, Healthcare, Education, Telecommunication, and Manufacturing in general (Muller & Thoring, 2013). Furthermore, modern management methods like lean Management (LM), TQM, Six Sigma, and Theory of constraints are associated with a current approach of management. However, LM and its continued search for excellence has evolved substantially over the years focusing on the sustained staff's training, and the positive relation and communication channels from management with the employees. Dekier (2012) indicated LM is the heir of TPS and Lmf, and its efficacy has frequently been demonstrated by a considerable number of managers in different industries, practitioners, and scientists. Some authors have developed theories as lean ligma which is a synthesis of lean and six sigma, the Theory of Constraints in manufacturing and LeAgile or lean-agile which is an amalgam of lean and agile, its integration, benefits, and differences.

#### The agile concept, principles, and objectives

The Agile approach aims to raise the applicability, business value, quality and flexibility of an organisation. Initially developed in the software industry, nowadays agile has been applied in different industrial sectors such as manufacturing, construction, telecommunication, and others (Sohi et al., 2016). Also, service delivery activities that has been affecting the IT industry like missing deadlines, cost overruns and lack of satisfaction of customers are intended to be tackled by agile. Furthermore, the agile methodology has the objective of adopting the incremental planning in order to work with information updated, performing in quality from the beginning of the process, pointing risks as soon as possible, empowering and entrusting employees, and enhancing the communication with the client and across all the business areas and team members (Cooke, 2012).

The Agile Manifesto (AM) developed in 2001 has created a set of values applicable to the Agile Software Development (ASD). These values are along with principles which are domain-specific guidelines for life (Lagerberg, 2013). The AM on its principles believes in customer satisfaction through continuous delivery, supply working frequently, and accepting change requirements around trusted, empowered and motivated employees. Additionally, the AM expresses the teams work better if they are self-organised, always looking for excellence, keeping work simple, and promoting sustainable development (Alliance, 2001). Agile is a tool used as a method of working implemented by practitioners with four primary objectives which are: Save costs, reduce time to market, meet desired characteristics, and accept change as soon as possible (Tyree & Akerman, 2005). Besides, Stare (2014) argues that agile could be applied to any industry, because more than the software approach, Agility is about recognised and implement feedback.

On the other hand, agile focus mainly on the execution phase on the project and does not define the complete lifecycle of the project, compared with the traditional vision where all the conditions and needs are vastly determined, the project's plans are routine, and substantial changes are not expected (Stare, 2014). Studies of the use of agile in different industries has been published in the last few years. Furthermore, sectors like manufacturing are business that has been changing during the past of the years due to the use of new technologies and the new and different consumer markets. Thus, breaking down traditional organisational barriers, develop a concept of

unpredicted change control to cope with flexibility, and develop proactivity programs to tackle unexpected environments are some of the agile methods suggested for managing the manufacturing resources (Gunasekaran, 2001).

### Lean and agile relationship

Some research studies have developed different and interesting reviews of the relation between lean and agile. Agarwal et al. (2006) consider there is a supportive relationship between lean and agile, integrating them into a single word "Leagile." Moreover, Inman et al. (2011) classified the relation of lean and agile as mutually exclusive concepts, mutually supportive concepts, and lean as the predecessor of agile.

Agile is an instrument of lean. This is because if agile reduces the time to market, that reduction is a reduction of waste. Furthermore, under stable, linear or predictable conditions, management should use lean with regulated use of agile. However, in a highly dynamic environment, managers should decide to use Agile. In the case of complex projects, a merge of lean and agile Project Management is a possible solution to cope effectively in complexity.

Moreover, when comparing, the advantage of agile over lean is primarily the pro-activity of agile, as the pro-activity allows some effects which lean does not provide. Lean depicts one of the most robust attractors that efficiently drives the organisation to repeat the predefined pattern of behaviour inhibiting true novelty (Putnik & Putnik, 2012). On the other hand, Bruce et al. (2004) argue in the supply chain industry lean should be used to enable the cost-effectiveness in the operational upstream chain and agile to manage the unsteady marketplace in the downstream of the process. Furthermore, Mohammed et al. (2016) propose the development of flexible-lean-agile value chain to envisage and respond to the potential change in demand while keeping the higher lean standards.

## ***Discussion for future research***

This study was conducted to analyse the recent trends and existing knowledge of two of the most relevant and applicable principles in the industry, lean and agile. Therefore, rather than choosing a methodology, managers have the option to combine different approaches and obtain superior and efficient results. Despite the amount of literature found for lean and agile in different industries, little information was found in a hybrid approach. Therefore, this paper was intended to analyse the level of development and the current and prospective tendency of lean and agile. This paper can be considered as the foundation for managers, researchers, and professionals interested in understanding the fragmented and comprehensive information about lean and agile and interested in developing empirical research in the project management area. Moreover, after developing an extensive Systematic Literature Review (SLR) designed for identifying, evaluating and synthesizing the records produced by the different researchers, there was found the majority of the documents were designed in the cross-industrial sector on the global context; and for the lean principles the more significant part was using the lean six sigma. Finally, the authors believe this paper allowed those professionals and students in the project management area, to have a different alternative than the traditional project management approach that could provide a new option to obtain a positive outcome in their further projects.

## ***Conclusions***

This research employed SLR to examine and combine existent knowledge from the numerous research articles on lean and agile within the project management profession. The screening of the research found 160 relevant articles published from 2012 to 2018. The descriptive and thematic analyses were used to analyse the related articles and

report the research findings. The analyses identified the related lean and agile research studies that contributed to the advancement of the lean and agile concepts in a different context and industrial sectors. The analyses results revealed that most of the articles provided information on the lean and agile concepts have been spread around the global context (count 192) and developed focus on the cross-industrial sector (43%) and construction sector (16.1%). However, it was remarked that there was inadequate consideration of the integration of lean and agile within the manufacturing (9.4%) and IT (4%) sectors. Future studies can use the classified lean and agile themes in this research for further empirical studies. This can be done by exploring and mapping the relationship between these themes in the specific industrial sector. Furthermore, it is essential to develop an implementation strategy of integrating lean and agile within each industrial sector.

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