

# Lean & Digitize Project Management

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## Abstract

Traditional Lean thinking initiatives have focused on improving business processes by using statistical methods, team involvement and manual approaches. The results tend to be not effective in the frequent situation that there is an intensive use of Information Technology and Communication (ICT) Systems. This work aims to define a project management methodology to streamline and digitize business processes and reduce waste by using a novel approach labeled “Lean & Digitize”. Based on empirical experiences and field implementations, we developed a framework which is presented. The digitization of a business process not streamlined can generate problems slowing down the process and increasing errors. A process must be mapped to highlight waste and low quality. Only when the new process is optimized taking also into account the potential ICT supports, it can be re-engineered and digitized. The project in this way will digitize only value-added activities for the users and the organization.

Keywords: Project Management, Lean thinking, Digitization

## Introduction

We're living times of a deep economic crisis characterised by scarcity of raw materials, energy and credit and by an increase of volatility and globalisation. All these conditions imply that competing is now a towering challenge, as regards quality and price of products and services offered. This challenge is caused, on the one hand, by increase of knowledge, demands and power of customers, and on the other hand, by the aggressiveness and number of competitors. In this situation, it is fundamental to focus on improving business processes. The most effective methodologies for leading and implementing business process improving projects are Six Sigma and Lean Thinking. However these methodologies do not effectively answer the research questions examined in this paper:

- Is there a coherent model to cover both Lean and Six Sigma methodologies and process digitization features?
- Which are the factors for a successful implementation of this methodology in business process improvements projects?

Lean and Six Sigma linger mainly in the analysis and subsequent optimisation of physical and organisational flow, leaving out the study of automation flow and of the interaction between information systems and telecommunication networks, with physical and organisational activities. So the risk is that these improvement initiatives be confronted unprepared with the constrains imposed by such systems. One empirical rule states that 50% of the business processes improvement can be obtained also without digitization, while the remaining 50% of improvement of processes is connected with digitization and dependant on information systems and networks (Nicoletti, Nuovo Pignone, *l'arte di fondere Lean Management e Six Sigma*, 2006). These percentages are currently changing and automation is acquiring more and more relevance.

Business processes digitization must be examined in context according to analysis of organizational and physical flow, in order to be able to cut any waste source from logic flow formed by physical and digitization activities and by interfacing them. Only after streamlining and redesigning the new process, it will be possible to introduce or reintroduce digitization in an effective, efficient and economic way. In this way, the activities which have a value added recognised by customer can be speeded up and disengaged from human labour. Moreover, the implementation of eventual wastes in information and communication systems and in digitization flows can be avoided. These waste can be the cause of slowing or blocking the entire productive process or paid jobs.

## Literature Review

There are several generally accepted Project Management methodologies (e.g. IPMA, PMI, Prince2, etc.) (Archibald, 2003). Also, there are several systematic approaches for information and communication systems

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(Information and Communication Technology ICT) and for digitization, from the project management point of view (e.g. dPMM, digitize Project Management Methodology, in GE or PLC, Project Life Cycle, of the European Union) or from the operative point of view (e.g. ITIL, Information Technology Infrastructure Library, or a set of guidelines inspired in the practice of the management of services ICT) (Introduction to ITIL, 2005).

In the last few years there have been many discussion on new approaches to project management (G. Howell, Macomber, Koskela, & Draper, 2004) . The paper (Koskela & Howell, 2008) explain the novel features of two project management methods, which radically deviate from the conventional doctrine of project management: Last Planner and Scrum (Schwaber, 2004). Both methods have emerged since mid-nineties as practical responses to the failure of conventional project management methods, Scrum in the field of software projects, Last Planner in the field of construction projects. It is shown that both methods reject the underlying theoretical foundation of conventional project management and instead subscribe, implicitly or explicitly, to alternative theories, which better match the situation in question. Another approach has been labeled Lean Construction (Alves & Tsao, 2007) (Walker, 2007). Lean construction is a translation and adaption of lean manufacturing principles and practices to the end-to-end design and construction process. Unlike manufacturing, construction is a project based-production process. Lean construction is concerned with the holistic pursuit of concurrent and continuous improvements in all dimensions of the built and natural environment: design, construction, activation, maintenance, salvaging, and recycling. This approach tries to manage and improve construction processes with minimum cost and maximum value by considering customer needs. Another approach has been labeled Critical Chain and improves greatly on respect to the traditional Critical Path methods by taking into account resources and a multi-project environment (Leach, 2005)

There are no approach integrated blending the use of a methodology such as Lean and Six Sigma with digitization.

## **Methodology**

To address the research questions we have chosen the exploratory multiple case study (Bortolotti, Romano, & Nicoletti, 2009) (Voss, Tsiriktsis, & Frohlich, 2002). We decided to analyze several case studies. After the first phase of literature review, we selected business process projects that use extensively the automation of information flows and have adopted a methodology to streamline their delivery processes. We used the method of retrospective analysis, for this reason we chose examples of Best Practice in order to analyze the critical factors of success. We selected several Italian organizations in service industries, engineering and logistics operating worldwide (Nicoletti, Nuovo Pignone, l'arte di fondere Lean Management e Six Sigma, 2006) (Nicoletti, Servizi di logistica industriale attraverso il "lean and digitize", 2009) and two Asian service organizations (Nadeem Ahmed, 2008) (Theyventheran, 2009) . However, firstly, we study an engineering organization in order to do a pilot and test the data gathering procedures. For each Best Practice case, we selected the experts to be interviewed to gather empirical data. The managers interviewed were chosen for their role and their skills in relation to the topic investigated. The interview was the main instrument used for the data-gathering. The data collected through interviews were integrated with additional sources, such as analysis of company archives, records and direct observations. The collection of information relating to the same phenomenon through different methods and tools (e.g. interviews, archives, observations), allowed us to execute the data triangulation. The interpretation of data, mostly qualitative, generated a description of the case studies. Cause - effect evidence, supported by the qualitative data triangulation, ensured the internal validity. The results of this analysis are a methodology that define the sequence of activities implemented to streamline and automate the delivery processes. The methodology has been interpreted through the literature in order to highlight the strengths and weaknesses.

Afterwards, we carried out the comparative analysis of the case studies to find similarities and differences and extrapolate the results in response to the research questions: the final methodology "Lean & Digitize". Comparative analysis, following the dictates of Ehsenhardt and Yin, was characterized by an iterative process of systematic comparison of the case studies with the literature references in order to integrate empirical evidence with the scientific basis, ensuring the external validity of results and, consequently, their generalizability.

## **Methodology Results: the model "Lean & Digitize"**

This paper introduces a suitable methodology for processes improvement, optimisation and digitization. The methodology is indicated as "Lean & Digitize". It meets the demand of a coherent and integrated methodology which:

- Manages and optimises organisational, physical and automation flows simultaneously;

- Uses information system and telecommunication networks as a lever for processes improvement and for project management; and
- Helps solve non-alignment problems between organisation initiatives and ICT.

The Lean & Digitize methodology helps solve the following problems:

- Measuring redundancy;
- Excessive time loss in analysis phase;
- Impossibility of measuring and controlling improvements.

by engaging information and communication systems in the initiatives for process improvement and optimisation. The availability of system data allows to quickly and accurately measure processes, during the analysis or control phase, thus facilitating and accelerating all project activities.

From an organisational point of view, the Lean & Digitize methodology:

- Engages information and communication systems in improvement initiatives. In this way, it is possible to improve and optimise physical, organisational and automation flow;
- Aligns all information and communication systems installation projects improvements
- Integrates with processes improvement and optimisation projects;
- Digitizes only processes which have already been improved and optimised.

The Lean & Digitize methodology is based on a process which includes several macro-phases: Preparatory, Define & Measure, Analyze and Process Design, Architecture Design, Develop, Test & Deploy, Verify and an optional macro-phase Replicate (Nicoletti, 2010) (Bortolotti, Romano, & Nicoletti, 2009). It is essential to apply this methodology and its tools (Nicoletti, 2010) in strong partnership between the sectors of the organization, quality and support departments (such as ICT, finance or operations). Stakeholders from all parties need to align in setting up and staffing the project team. Lean & Digitize specialists can assist, and even help to lead these projects at a client organization. Perhaps more importantly, the organizations must treat the initial Lean & Digitize project as the beginning of an iterative cycle that generates continual improvement. Process improvement should not be triggered by a 'problem' or 'challenge', but rather become ingrained in the organizational culture.

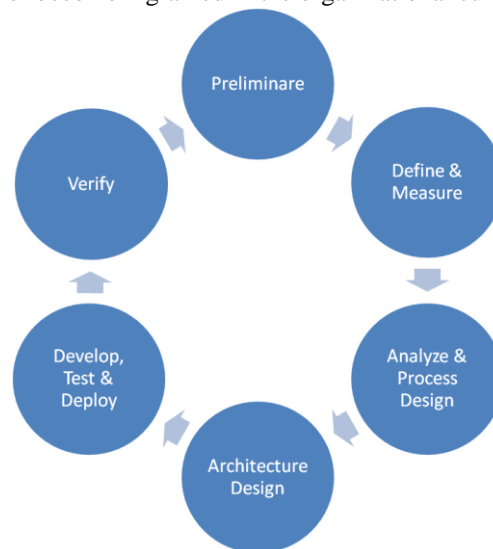


Figure 1 The Lean & Digitize process

Based on research and experience, the Lean & Digitize methodology can be summarized as follows: It can be subdivided into six macro phases and 20+1 phases. Phase 21<sup>st</sup> is optional. A progress control is necessary at the end of each macro phase, called Tollgate, in agreement with the terminology of Six Sigma.

Macro Phase 0: “Preliminary”

1. Context: Identify the requests of clients, partners and staff; the challenge of competitors, the respect for compliance (e.g. laws, regulations, etc.);
2. Culture: Detect the culture of the organization, of the community and of the nation in which the organization is located;
3. Vision: Tackle problems of effectiveness, efficiency, economy, process quality or, if necessary, the entire organization;
4. Strategy: Define the processes to be improved and the plans;

Macro Phase 1: “Define and Measure”

5. Kickoff: Launch the project, in a special meeting and notify it to all the stakeholders;
6. Governance: Conduct the project and set up the Project Team;
7. Voice of the Customer: Listen to the voice of customers associated to the business processes. In the case of public organizations, it is the Voice of Citizen. In both cases, the acronym VoC is used;
8. Metrics: Translating the VoC in Critical-to-Quality factors;
9. As-Is: Mapping of the existing process;

Macro Phase 2: “Analyze and Process Design”

10. Lean: Define how to improve the process by means of the Project Team in seminars and meetings (in GE, referred to as AWO! - Action Work Out);
11. Kaizen Plan: Define the business processes improvement plan.

Macro Phase 3: the “Architecture Design” macro phase

12. Architecture Design: Define the rules, policies and process structure;

Macro Phase 4: “Build, Test and Deploy”

13. Build and Test: Implement and test the selected solution (including the digitization of the relevant management aspects: Digitize);
14. Change management: Managing the changes on respect to what has been decided in the previous phases;
15. Deploy: Implement the selected solution;
16. Documentation: Issue the documents related to the new process;

Macro Phase 5: “Verify”

17. Verification: Control the improvements,
18. Benefits evaluation:
  - External: Take notice of customers/citizens, partners and staff satisfaction; - Internal Assess the profitability, market share, internal improvements related to the new solution;
19. Lessons Learnt: Learn from the accomplished initiative (Lessons Learnt);
20. Celebration: Acknowledge the project Group’s work ;

Possible Macro Phase 6: “Replicate”

21. Roll-out: Replicate the solution so that it can be applied to the different departments or organizations in the same group.

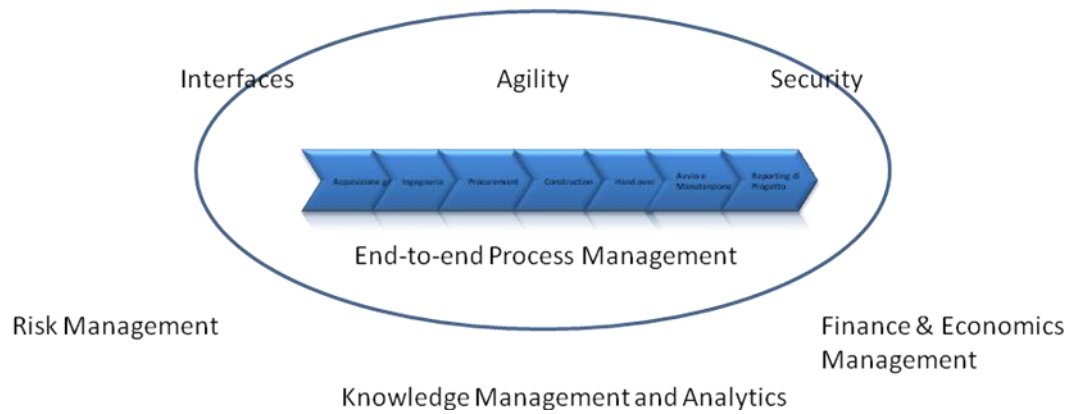
Figure 1 is a graphical representation of the methodology. For the purpose of continuous improvement, once the project has been completed, the approach must be the one of continuous improvement (using the DMAIC approach in Six Sigma). DMAIC typically leads to the need of a technological change.

## The success factors in applying the “Lean & Digitize” methodology

It is important to understand which are the success factors connected with the implementation of the Lean and Digitize methodology. Out of several tenths of applications that we have done, these are the seven main points to consider. It is interesting that these factors can be considered both from a project point of view as well as from the point of view of the process being leaned and digitized.

The basic factors are essentially constituted by the need to consider the end-to-end process, take care of all the interfaces, be them with automatic systems or with persons, and finally manage all the knowledge and use advanced systems for getting the analytics out of the project. Two aspects are important. It is important to be agile all along the project but always taking care of the security aspects, relevant in all projects even if the consequences of a lack of security might be different in different situations. Finally it is important to manager the risks, the financial and the economics of the project.

In Figure 2, there is a graphical representation of these factors along the lifecycle of the project.



**Figure 2 The success factors of a Lean & Digitize project**

## The differences between a Lean & Digitize project management and the traditional approaches

Some of the differences between the Lean & digitize approach and the traditional approaches for project management are listed below:

- Managing the interaction between quality and waste elimination and possible digitization is a first concern in Lean & Digitize because their interactions highly affects the outcomes of projects;
- The project is structured and managed as a value generating process (value is defined as satisfying customer and business requirements). Optimization efforts focus on making work flow reliably. Downstream stakeholders are involved in front end planning and design through cross functional teams, applying the concept of pull from stakeholders rather than push from the project to govern the flow of materials and information through networks of cooperating specialists. In contrast, traditional project management approaches do not consider the five principles of Lean Management;
- Lean & Digitize utilizes tools of Six Sigma to improve quality and mitigate variations in every aspect (process quality, rate of work, etc.) and manage the remaining aspects of quality and its variations, while traditional project management methodologies do not consider quality improvements and variation mitigation and management;
- Lean & Digitize approach tries to make drastic and continuous improvements in the process, workflows and product all along the project management cycle;
- In Lean & Digitize, decision making is delegated to the project team; by comparison, in traditional decision making is centered to one manager some times;
- Lean& Digitize tries also by using ICT tools to increase transparency between the stakeholders, managers and personnel, in order to know the impact of their work on the whole project; on the other hand, traditional doesn't consider transparency in its methods;
- Lean & Digitize project management resists the tendency toward local sub-optimization or sub-optimization of the process without taking proper account of digitization and vice versa; however, the traditional methodology persists on optimizing each activity;
- The traditional-driven approach only considers managing a project at the macro-level. This is necessary but not sufficient for the success of projects. Lean & Digitize encompasses the Lean effort and the Digitization Management, and formally recognizes that any successful project undertaking will inevitably involve the interaction between the process optimization and the digitization systems.

## Conclusions

The methodology presented in this paper supports business process improvements. Lean thinking and Six Sigma are transferred to the project management context and integrated with digitization. Starting from this statement, and with a focus on the “Lean & Digitize” model, the result of this exploratory research, it is possible to assume two propositions, that will be the starting point for a subsequent study on an extension of the methodology (Bortolotti, Romano, & Nicoletti, 2009):

- Proposition 1: unlike the manufacturing context, where Lean Six Sigma requires a reduction of digitization, in managing a project for business process improvement a digitization approach is essential;
- Proposition 2: In managing a project context, digitize a process not streamlined is counterproductive.

- Corollary to proposition 2: in the project management context, it is important to take the sequence of implementation that provides firstly an accurate streamlining and quality improvement of the process by the elimination of any source of waste and then digitize.

The methodology presented responds to the lack in literature of a consistent methodology that manages and integrates the classical activities of streamlining and quality improvement of a process with the activities of digitization. In addition to the academic contribution, the methodology provides a logical sequence to the activities of improving the quality, streamlining and digitizing processes: first improve quality and streamline, and only afterwards, digitize the value-added activities recognized by the customer and the organization, avoiding entering in the information system any waste or low quality that could be the cause of delivery process delays or blocks.

In project management, the results of the methodology combined with an organizational approach that empowers multiple levels of the organization to help attain its goals (such as the IPMA model), can yield significant results, on average (Nicoletti, Servizi di logistica industriale attraverso il "lean and digitize", 2009):

- Cost reduction between 20% and 40%;
- Speedier responses to the need of the Business;
- More flexibility;
- A wider range and pool of talents from outsourcing companies;
- Reduction of risks with the Vendors.

The emphasis in this paper has been on project management for business processes improvements. It would be very interesting to extend the methodology to projects developed for the construction or the implementation of new products and services. Besides that it would be interesting to research more how Web 2.0 could help to further improve the Lean & Digitize methodology, which could be extended easily to take into more account support to collaboration (Nicoletti, 2008).

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