Lean First, Then Automate: An Integrated Model for Process Improvement in Pure Service-Providing Companies

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1. ABSTRACT Born in manufacturing environment, only recently Lean Management has been implemented in service context. However, in literature we didn't find a strong empirical evidence to clarify how Lean Management can be applied in a pure-service context, such as banking/financial services, where there is an intensive use of automation and Information Technology Systems. This work aims to define a methodology to streamline and automate processes and reduce waste in the pure service-providing companies. To achieve the study aims we conducted three case studies. Based on the empirical investigation, a framework was developed. We found out that the automation of a process not streamlined can generate problems that can slow down the flow and increase errors. A process must be mapped to highlight waste. Only when the new process is streamlined it can be automated. In doing so the new process will automate only value-added activities recognized by the customers.

Keywords: Lean Management, Multiple Case Study, Lean Service

1 Introduction

Lean Management is recognized as one of the most effective methodologies to improve business processes. Lean Management aims to satisfy customers in terms of product and service quality and to reduce simultaneously the lead times [1] and [2]. These objectives are achieved through the use of methods and tools, which allow to eliminate waste, reduce process time and simplify operations [3]. In the past, Lean Management has been applied in the production of physical goods, the context in which it was born and has evolved. Also for this reason, Lean Management focuses

mainly on the flow of materials, on the layout design and on the study of production and distribution timing, but it omits the study of the automation flow and the interactions between Information Systems and manual activities. The introduction of Jidoka systems in the physical flow of materials (automated systems for detection of abnormal conditions) is the only element of automation provided by Lean Management [4]. In Lean optics, automation has to be avoided because it increases the rigidity and complexity. The automation of information flow is not examined, on the contrary, Lean Management tends to reduce the automation forms to manage the information, such as MRP systems, through the introduction of manual systems, such as kanban cards and the Heijunka boxes [4].

Both in literature and in practice we found that the main problem is the excessive separation between improvements of manual activities and automated activities, between optimization and automation, between "factory" and Information Systems. This problem is even more evident if we focus on pure service sector such as banking and financial services, where the processes are essentially driven by automation and Information Systems [5]. The main question that we pose is: "How can introduce Lean principles in the pure-service context, where the typical production elements are missing and information management prevails?" The lack of an effective response to this question generates a serious problem encountered at managerial level: a problem of sequence. Because it is not clear when streamline and when automate the processes, you could automate errors and waste.

The research presented in this paper aims to develop a model called “Lean first, then Automate”, a useful model to streamline and automate processes in the pure-service context. The scientific method adopted is the multiple case study. We analyzed three organizations involved in banking / financial sector that have adopted a methodology for process reengineering using Lean principles and automation and digitization techniques. Comparative analysis of these case studies made it possible to give a valid answer to the main question highlighted. The final model shows clearly the sequence of activities that should be done to integrate the methods of automation and digitization in the activities of process streamlining, in order to obtain competitive advantages, especially for pure service companies in which there isn’t the "factory". In order to avoid the automation of errors and waste, the research suggests to (1) map the manual and automated activities, (2) highlight and delete every non value added activity for the final customer, (3) redesign the new process made lean (lean first), and only at the end (4) automate and digitize (then automate).

The automation is like a magnifying glass that reveals, accelerates and exalts the improvements, such as the errors. While the automation of an incorrect process helps to wrong faster, it is equally true that the automation of a streamlined process accelerates the achievement of the objectives and amplify the competitive advantages.

2 Literature review

2.1 Quality-Efficiency trade-off in Service Management

The quality in the service context is a strategic element because it allows to gain competitive advantages, reduce costs and increase market share and profits [6] and [7]. Service processes are fundamentally different than manufacturing processes. The factors that differentiate services from manufacturing are: the active participation of the customer into the delivery process, the place of delivery and the place of use of the service are often the same, the service intangibility and the impossibility of service storing [8]. It is also proved that service processes are not as efficient as manufacturing processes [9]. This implies that, following a much debated topic by researchers and practitioners, there is the need to transfer in the world of services the practices commonly adopted in the manufacturing context [10], despite the substantial differences described above. The first author in support of this argumentation was Levitt, who has argued that the delivery of services should be designed and managed following the approach of the manufacturing process line [11]. Subsequently, other authors have confirmed the possible application of the methodologies for process improvement developed in the manufacturing sector, in order to solve performance problems related to inefficiency, poor quality and low productivity [12]. One of the most effective methodologies to conduce and execute projects for process improvement in the manufacturing sector is Lean Management.

2.2 Lean Management: recent developments

Back in the 50's, Eiji Toyoda and Taiichi Ohno joined craftsmen's knowledge and abilities with typical mass production assembly lines, defining the Toyota Production System (TPS), from which Lean Production was created. The "Lean Production" term was coined by James Womack, Daniel Jones and Daniel Roos in "The Machine that Changed the World" [3]. The main objective of Lean Production is the elimination of waste (Muda in Japanese). "Muda" were defined as every human activity which doesn't provide any added value for the customer [13]. He identified seven different sources of waste: overproduction, defects, transportation, waiting, inventory, motion and processing. Lean Production is therefore defined as a systematic waste removal from every value stream part, by every organization member. "Value stream" can be defined as the whole set of activities to obtain a finished product from raw materials [1]. Lean Production implementation provides several benefits, among which: cost reduction, productivity increase, quality improvement, lead time reduction, supplies reduction, flexibility and customer satisfaction improvement. Five main principles were set by [3], in order to achieve a lean business model: value, value stream, flow, pull and perfection. In the late 90's, the concept of the value stream has evolved and has been extended beyond individual company boundaries, starting with customer needs until raw materials [14]. This is the link between Lean Production and Supply Chain Management. Lean Production is not confined within the company, since the

mid 90's Lean Production has been applied to various activities: product development, relations with suppliers and customers, distribution, thus becoming a general methodology, called Lean Management. Lean Management has been applied in the service context through recent "Lean Service" studies, among which the most important are: [2], [15] and [16]. However, these studies focused on process streamlining of services associated with products (e.g. Taco Bell, Tesco, etc.), services in support of production (administration of a manufacturing organization) or services in healthcare. Almost none of these studies focused on the application of lean principles to streamline pure services, such as banking and financial services [5].

2.3 Automation and Lean Management

Sugimori et al. argued that the use of the information and communication systems for production planning introduces unnecessary costs, overproduction and uncertainty [17]. This theory contrasted with the trends of the 70's and 80's, when the interest on MRP systems, numerical control machines and production lines fully-automated was huge. The highly automated companies were less vulnerable to the typical problems of manual work. However, there were examples of over-investment in automation and digitization that have worsened the flexibility and the ability to respond to the demand changes (e.g. General Motors in the'80s; CIM) [18]. Lean Management focuses on flexible and "intelligent" automation and "low cost" technologies. MRP is replaced by Just-In-Time techniques such as Kanban and Heijunka boxes, much more simple and controllable, the numerical control machines and production lines fully-automated are replaced by cells with less automation. However, it is not clear how the principles, techniques, tools and approach of Lean Management can be applied in the pure-service context, where there is an intensive use of Information and Communication Technology and automation to process the huge quantity of information, representing the flow of the delivery process [19].

3 Methodology

To address the research questions we have chosen the exploratory multiple case study research design. Exploratory case studies are particularly suitable if researcher intends to extend the applicability of a theory in a new context [20], the purpose of this specific research. We decided to analyze several case studies, given the limited generalizability of a single case results [21]. After the review of literature, we selected organizations operating in pure service context which extensively automated information flows and 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 [20]. We selected three organizations operating in banking and financial sector, two of them were Italian banking groups (cases 1 and 2) and one Asian (case 3). However, firstly, we study an installation service organization in order to do a pilot and test the data gathering procedures [22]. 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 [20]. The interview was the main instrument used for the data-gathering [20]. The data collected through interviews were integrated with additional sources, such as analysis of company archives, records and direct observations [20], [21] and [22].

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 [20]. The interpretation of data, mostly qualitative, generated a description of the three case studies. Cause - effect evidence, supported by the qualitative data triangulation, ensured the internal validity [21]. The results of this analysis are three models that define the sequence of operations implemented to streamline and automate the delivery processes. The three models have 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 between the three models, and extrapolate the results in response to the research question: the final model "Lean first, then Automate". Comparative analysis, following the dictates of Ehsenhardt and Yin, was characterized by an iterative process of systematic comparison of the three case study with the literature references in order to integrate empirical evidence with the scientific basis, ensuring the external validity of results and, consequently, their generalizability [21] and [22]. Finally, to increase the research robustness, the "Lean first, then Automate" model was tested in two additional cases outside the banking and financial sector. The two organizations studied operate in the installation and testing services context. The positive results of both tests increased the external validity and generalizability of empirical evidences.

4 Results: the "Lean first, then automate" model

4.1 Define and Measure

The "Lean first, then Automate" model begins with the "Define and Measure" phase. "Lean first, then automate" projects must be supported by the company and assigned to a project team of people from all functions involved. Firstly, the project team has to "listen" the voice of the customer (VOC) to focus on what is really important for the success. It is necessary to detail the customers needs to understand what are the metrics that should be measured, monitored and improved. Generally the most important metrics are cycle time and inventories. After that, the project team has to map the "As-Is" process. The process mapping involves both the manual and the automated flows. Specifically, the project team has to observe the sequence of manual operations and the layout, to understand how the physical flow is regulated, and the applications, systems and automated sequences, to understand how the automated flow is regulated. Mapped the process, the project team measures the metrics and identify the critical points related to the "As-Is" process.

The analysis of case 1 revealed a point of weakness: the method adopted for the measurement, the interview, caused loss of time and poor accuracy of the data

gathering. The analysis of case 2 was rather an example of Best Practice: processes are measured extracting data from the Information Systems, which provides a fast and accurate measurement. This example shows how the involvement of the Information and Communication Technology in the "Lean first, then automate" projects would accelerate and optimize the measurement phase.

4.2 Analyze and Process Design

Ended the "Define and Measure" phase, the project team has to note every waste present in the "As-Is" process and redesign the sequence of activities eliminating all sources of waste and variability. The process was redesigned through: the elimination of non value added and not necessary activities; the redesign of operations that produce waiting times, unproductiveness, batches, queues, stocks; the outsourcing or centralization of activities with low value added but necessary; the simplification, standardization, optimization and automation of some manual activities; the reduction of excessive and not controlled automation (first lean, ...).

Case 3 is an example of Best Practice: The "As-Is" process of data cross-checking was managed as follows: printouts were printed, operators controlled manually matching data, and analyzed the exceptions detected. The "As-Is" analysis found waste of material and time in the print activity, a low value added activity in data control, while the analysis of the exceptions was considered a high value activity. The "To-Be" process was redesigned with an introduction of an automated tool: data streams are defined parametrically, the new tool automatically checks the data and highlights the exceptions, and operators can focus on the only high value-added activity: the exceptions analysis.

4.3 Architecture Design

The "To-Be" process describes the sequence of activities that will form the future delivery process. These activities may be part of the manual flow or automation flow. The tasks of the Architecture Design phase are to plan in minute detail the technical and functional characteristics of each activity, component and service that are part of the two flows, to design any interface between automated and manual activities, and to regulate the process flow to make it continuous and connected with the final customer.

4.4 Build, Test and Deploy

During the "Build, Test and Deploy" phase the "To-Be" process is implemented and tested. The new physical structure, new software and new interfaces are developed, following the functional and technical specifications designed in the previous phase of "Architecture Design". Every part is then tested individually to verify the correctness of development. Verified the correctness of the development, a pilot is launched. Following the design process and architecture, the process is

implemented and simulated on a small scale, in order to verify the real functions, and in case of disease, appropriate changes are made. Verified the correctness of the new process, it can be introduced within the delivery system (... then Automate).

4.5 Control

The model “Lean first, then Automate” ends with the “Control” phase. The process must be constantly monitored measuring the reference metrics. A process not monitored could degrade and cause huge losses due to a possible customer satisfaction decrease. At the start of the “Control” phase, when the process becomes effective, any changes after installation and the plan for decommissioning of parallel processes no longer active must be made.

5 Conclusions

The three case studies are examples of a quality and efficiency improving methodology, Lean Management, transferred from the manufacturing to the pure-service context, in banking and financial sectors. Starting from this statement, and with a focus on the “Lean first, then Automate” 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 a larger sample of companies:

Proposition 1: unlike the manufacturing context, where Lean Management requires a reduction of automation and digitization, in the pure-service context automation and digitization are desirable.

Proposition 2: In the pure-service context, automate and/or digitize a process not streamlined is counterproductive.

Corollary to proposition 2: in the pure-service context, it is convenient to take the sequence of implementation that provides firstly an accurate streamlining of the process by the elimination of any source of waste and then automates and/or digitizes (lean first, then automate).

The final model responds to the lack in literature of a consistent methodology that manages and integrates the classical activities of streamlining a delivery process with the activities of automation and digitization. In addition to the academic contribution, the study allows to solve the managerial problem of sequence shown previously in this study. The model provides a logical sequence to the activities of streamlining and automating processes: first streamline, and only after, automate the value-added activities recognized by the final customer, avoiding to enter in the information system and in the automation flows any waste that could be the cause of delivery process delays or blocks. The main research limitation of this study is associated with the number of companies studied. The study used a selection of large enterprises, an other possible future research should be the adaptation of the framework in the context of Small and Medium Enterprises (SMEs). In conclusion, the framework developed provides a logical sequence to reengineer service-providing processes, as a matter of fact, we suggest “Lean first, than Automate”. To be more precise: lean the process first, then automate value-added activities.

References

1. Womack, J.P., Jones, D.T.: Lean Thinking: Banish Waste and Create Wealth in your Corporation. Simon and Schuster, New York, NY (1996)
2. Atkinson, P.: Creating and implementing lean strategies. Management Services, Vol. 48 No.2, pp.18--33 (2004)
3. Womack, J.P., Jones, D.T., Roos, D.: The Machine That Changed The World. Rawson Associates, New York, NY (1990)
4. Monden, Y.: Toyota production system: practical approach to production management. Engineering & Management Press, Norcross, GA (1983)
5. Piercy, N., Rich, N.: Lean transformation in the pure service environment: the case of the call service centre. International Journal of Operations & Production Management, Vol. 29, No.1, pp. 54--76 (2009)
6. Thompson, P., DeSouza, G., Gale, B.T.: Strategic management of service quality. Quality Progress, No. June, pp.20--52 (1985)
7. Zeithaml, V.A., Berry, L.L., Parasuraman, A.: Communication and control processes in the delivery of service quality. Journal of Marketing, Vol. 52 No. April, pp.35--48 (1988)
8. Fitzsimmons, J.A., Fitzsimmons, M.J.: Service Management for Competitive Advantage. McGraw-Hill, Inc., New York, NY (1994)
9. Lovelock, C., Gummesson, E.: Whither services marketing? In search of a new paradigm and fresh perspectives. Journal of Service Research, Vol. 7 No.1, pp.20--41 (2004)
10. Bowen, D.E., Youngdahl, W.E.: "Lean" service: in defense of a production-line approach. International Journal of Service Industry Management, Vol. 9 No. 3, pp.207--225 (1998)
11. Levitt, T.: Production-line approach to service. Harvard Business Review, Vol. 50 No.5, pp.20--31 (1972)
12. Hayes, R.H., Wheelwright, S.C.: Link manufacturing process and product life cycles. Harvard Business Review, Vol. 57 No.1, pp.133--140 (1979)
13. Ohno, T.: The Toyota Production System. Productivity Press, Cambridge, MA (1988)
14. Hines, P., Rich, N.: The seven value stream mapping tools. International Journal of Operations & Production Management, Vol. 17 No.1, pp.46--64 (1997)
15. Abdi, F., Shavarini, S., Hoseini, S.: Glean lean: how to use lean approach in services industries?. Journal of Services Research, special issue, Vol. 6 pp.191--206 (2006)
16. May, M.: Lean thinking for knowledge work. Quality Progress, Vol. 38 No.6, pp.33--40 (2005)
17. Sugimori, Y., Kusunoki, F., Cho, F., Uchikawa, S.: Toyota production system and kanban system: materialization of just-in-time and respect for human systems. International Journal of Production Research, Vol. 15, No. 6, pp. 553--564 (1977)
18. Bowen, D.E., Youngdahl, W.E.: "Lean" service: in defense of a production-line approach. International Journal of Service Industry Management, Vol. 9 No. 3, pp.207--225 (1998)
19. Uday, M.A., Chon, G.: Applying lean manufacturing principles to information intensive services. International Journal of Services Technology and Management, Vol. 5, No. 5-6, pp. 488--506 (2004)
20. Voss, C., Tsikriktsis, N., Frohlich, M.: Case research in operations management. International Journal of Operations & Production Management, Vol. 22 No. 2 pp. 195--219 (2002)
21. Yin, R.K.: The Case Study Crisis: Some Answers. Administrative Science Quarterly, Vol. 26, No. 1, pp. 58--65 (1981)
22. Eisenhardt, K.M.: Building Theories from Case Study Research. The Academy of Management Review, Vol. 14, No. 4, pp. 532--550 (1989)