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*"Hoshin Kanri and Lean Accounting: an integrated framework.
The case of Unox S.p.A."*

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1 Introduction

In Chapter 1 will be presented a brief company profile of Unox S.p.A the company object of the business case and the research project.

Chapter 2 will present the Hoshin Kanri and will be disclosed the relevance of actors, the seven experiments, documents and communication process. The topic will be contextualized in the lean philosophy and the scientific thinking process used to deploy the present framework. The theory will be followed with the application case in Unox S.p.A.

Chapter 3 will be discussed the Lean Accounting idea and methods in order to transform traditional accounting function in a lean one, that support lean strategy setting. After will be discussed how the management accounting office in Unox S.p.A. made changes in order to integrate lean activities, improve workflow and generate more valuable information to management through stabilization of processes and standardization of procedures.

Chapter 4 will be discussed how the integrated usage of lean accounting and relative lean performance indicators will result an effective framework for strategy setting and support the redaction of documents in hoshin kanri process.

1.1 Company profile

The company took into account for the research is Unox S.p.A., here is provided a brief presentation of the business to analyse.



Figure 1 Unox Headquarters

Antonio Bassan founded Unox during 1990;

it was a small start up based in Padua, in which the business was to buy domestic ovens and upgrading them to meet professional standards. Initial idea was to exploit the ascending request of little ovens for preparing brioches to sell in the local market for professional customers. The ovens were enhanced with a new para-proofing feature that allowed frozen breads and croissants to be baked without first having to be defrosted.

Enrico Franzolin, the actual Owner and CEO step in after 2 years, and became the only owner after acquiring Bassan's share in 2005 (Franzolin 2015). Up to now Unox is property of the Franzolin's holding. Today Unox S.p.A. is a successful family business, Leader Company in producing combined ovens for professional users; its mission is *“Contributing to the quality, efficiency and simplification of our customers' cooking processes”*.

First ovens launched were the *Arianna*TM series, which roused great success, and the company became quickly protagonist in the European market, also with the introduction of toast cooking plates *Spidocook*TM. From beginning to the 1996 the company grown selling these little products; but then a great change was envisioned by the owners, the willingness to achieve diversification and launch new products: The first combined oven was developed and launched in the European market in the same year. This oven was not the best in class for quality characteristics but the cost was roughly half the competitors' during that period, this made available a great share of market to the company.

The rapid growth led the company to open the first foreign distributing subsidiary in Germany, Duex company was founded during 1998 in the homeland of the most important Unox competitor, Rational (revenues € 560M in 2015).

From 1990 to 2003 the growth of the company determined also further diversification and product lines sold became 50 from the starting number of 5. During 2003 the continuous expansion of the company led Unox products being shipped worldwide.

The company fully embraced the lean philosophy firstly to shorten delivery times that were about 30 days because of the batch production and the increasing number of products sold (from 5 to 50). The first step was to introduce the innovative line of *lineMiss*TM, with Unox VIP (vertical integrated process) program, after a period of trial of a manufacturing cell for a non-strategic product (the *SpidoCook*TM), increasing quality and at the same time reducing production costs and delivery time.

Lean philosophy impacted also on the integration process of suppliers, which improved lead-time of delivery and quality, which are traditionally associated in lean as value for the customer.

Furthermore Unox decided to sign agreements with small suppliers, instead of big one, to grow together and to obtain value stream improvement even beyond the internal supply chain (Slack 2006). The company experienced a fast pace growth since the application of lean principles even during the crisis period.

During 2008 all the assembly lines were managed through lean manufacturing methods and the business model was designed with the Unox ICE (individual cooking experience) program, in which professional chefs act as active marketing personnel and customer were able to try the product in their own kitchen without any requirement to buy, that determined great success since 9 out of 10 people who received the ICE program bought an Unox oven. This technique is then exported worldwide and from that moment up to now the revenues growth was about 10% on yearly basis (based on internal data).

Lean philosophy is part of the sustainability concern of the company; economic and environmental efficiency of its operative processes are considered two sides of the same coin. Materials come from sustainable production and are easily recyclable at the end of their life cycle. Resources are accurately used and up to 95% of the product are recyclable at the end. Innovative cooking methods of Unox ovens and the continuous research for higher efficiency allows the user to save energy in respect to the traditional ovens up to 60%, the result is saving for the customer and benefit for the environment.

Now Unox is an international company that produces oven for business and operates across

110 countries worldwide and actually present in 25 with offices and branches, with 330 people employed, of which 200 in Italy (February 2016). The production is organized in 2 value streams, one for the small ovens and spare parts and the other for the combined ovens, which include 8 lines of products. The company owns Metex that produces for Unox the stainless steel components, then founded in 2015 Mabix to produce the plastic component. Vexlex is a certified supplier actually owned by Enrico Franzolin and produces for Unox software and hardware components. Also Detix were founded in 2015 as formal spin off from Metex, the company provides detergents used to clean the combined ovens. The manufacturing site and headquarters are located in Cadoneghe and the aforementioned certified suppliers are closely located from the Headquarter, in Vigodarzere.

Revenues for the 2015 were €75 Millions and headquarter employed nearly 100 people; employees number is increasing due to the company's consistent growth, for 2016 the expectations are to raise above €80 Millions thanks to the success of the new line launched. In 2015 the company joined the ELITE program of the Italian Stock Exchange.

“On Monday 27th April 2015 Unox joined the Italian Stock Exchange's exclusive ELITE program. By joining ELITE– together with other ambitious and successful private companies – Unox has begun a structured program that through education, business support, mentoring and access to an ecosystem of professionals, fosters growth, innovation and investment. Via ELITE Unox intends to expand the reputation and visibility of the Group throughout business and financial communities, both locally and internationally. The hope is to get support to complete the managerialization of the company to and bring to Unox the culture of the very best companies in the world – Nicola Michelin, Unox Director of Customer Experience (2015)”.

1.1.1 Unox organizational structure

Unox has implemented lean production system since 2004 and now the production is divided in 3 distinct assembly lines physically located on 2 assembly plants, first is dedicated for production of combined ovens, second is dedicated for cooking plates and spare parts, third one assembly small ovens. Even though the company has implemented lean into the assembly line the company structure have still a traditional functional structure, each function is considered a value stream and redaction of A3-X is deployed taking into consideration the aforementioned assumption.

Functions are autonomous and led by manager but all of them work toward one unique objective, the customer satisfaction. Unox policy is to provide the best customer service and

frequently produces customized products for relevant customers in order to satisfy every customer's need.

This policy generates the need of flexibility and the need to work directly with suppliers to get the right piece as soon as possible. To face flexibility, the company outsourced all the production of parts to subsidiaries or certified suppliers that are able to provide standard and customized parts with daily lead-time. In this there is the strength of the group, which includes subsidiaries devoted to the production of different parts needed for main company. Assembly lines have only temporary workers.

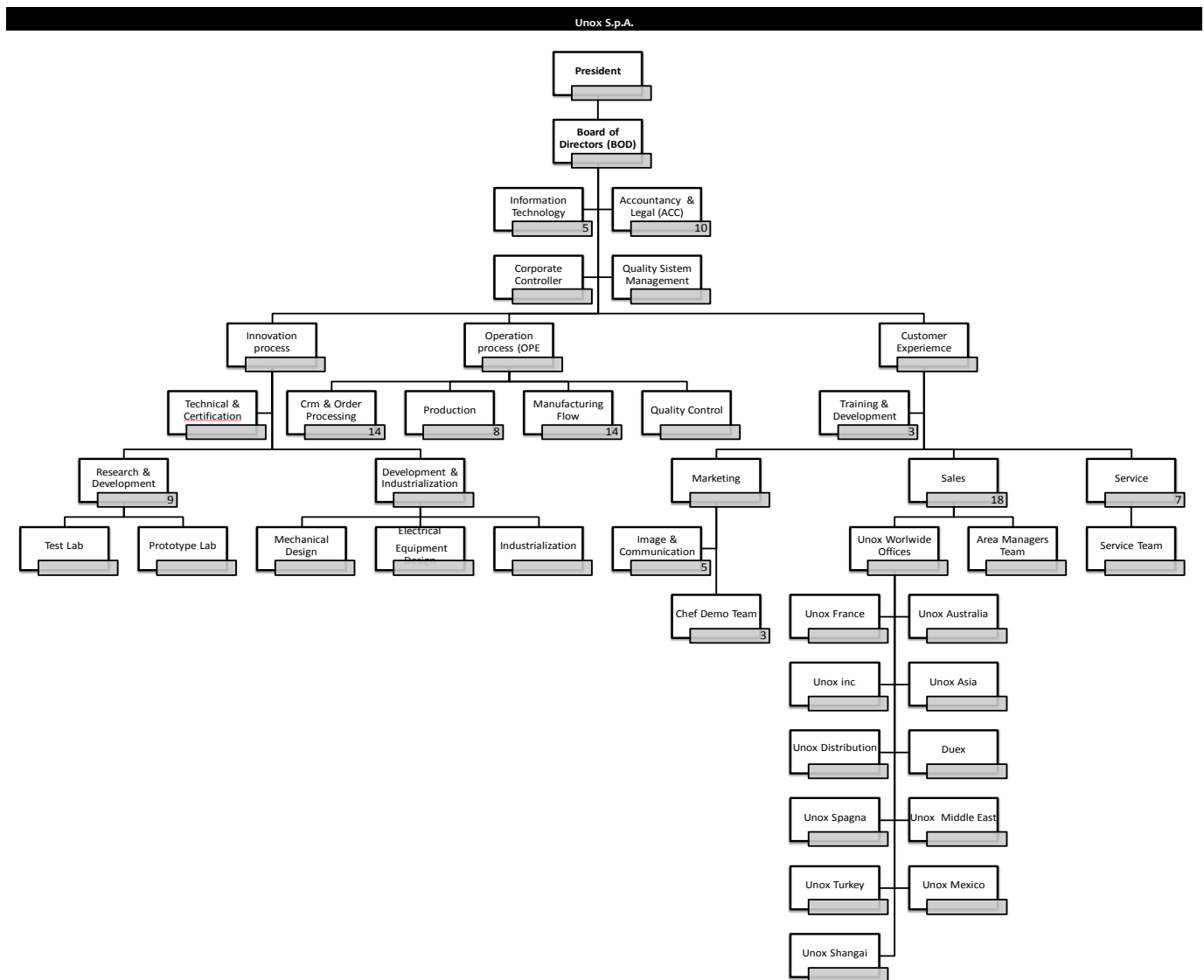


Exhibit 1 Unox Organizational Structure

The company has 3 main functions, research and development, operations process and customer experience, each function is then divided by other more specific functions, the company has a flat and centralized structure.

1.1.2 Some financials

Company experienced consistent growth during its whole life; financials reflect the health of the company As we can see revenues are constantly growing and CAGR is around 4,5% and EBITDA around 30% in slight decrease due to the increasing cost of personnel that increased the incidence during last 3 years passing from 11% to 13%, constant growth made the company need more experienced people given the increasing complexities to face during the growth of a family business. Cost of goods sold is around 40% and most of the effort is always done in order to reduce that percentage, since the company's tradition is to use the least pieces possible while developing a oven project, only useful and essential pieces are included to make Unox products cheaper, more reliable and environment friendly. Personnel cost is always increasing, even in relative terms because of the consistent growth of the company.

Profit and Loss statement	2015/12	%	2014/12	%	2013/12	%
Revenues	73.620.040	97,9%	68.123.307	98,8%	67.384.332	98,9%
Other Revenues	1.557.767	2,1%	837.214	1,2%	731.245	1,1%
Total Revenues	75.177.807	100,0%	68.960.521	100,0%	68.115.578	100,0%
Delta inventory Finished Products	(523.294)	(0,7)%	753.155	1,1%	(832.264)	(1,2)%
Materials costs	(31.114.830)	(41,4)%	(29.046.179)	(42,1)%	(27.496.124)	(40,4)%
Delta inventory materials	1.207.332	1,6%	496.729	0,7%	141.244	0,2%
Cost of Good Sold	(30.430.792)	(40,5)%	(27.796.295)	(40,3)%	(28.187.143)	(41,4)%
Other Industrial Costs	(1.682.466)	(2,2)%	(1.313.983)	(1,9)%	(1.203.083)	(1,8)%
Conversion costs (external labour)	(4.140.990)	(5,5)%	(4.279.195)	(6,2)%	(3.994.502)	(5,9)%
Commercial Margin	38.923.558	51,8%	35.571.048	51,6%	34.730.850	51,0%
Salaries	(4.098.206)	(5,5)%	(3.607.721)	(5,2)%	(3.336.883)	(4,9)%
Rake and other agency cost	(4.790.783)	(6,4)%	(3.893.055)	(5,6)%	(3.683.825)	(5,4)%
Administrators Cost	(1.088.659)	(1,4)%	(783.645)	(1,1)%	(714.706)	(1,0)%
Personnel Cost	(9.977.649)	(13,3)%	(8.284.421)	(12,0)%	(7.735.415)	(11,4)%
Services costs	(5.778.648)	(7,7)%	(5.378.342)	(7,8)%	(4.525.254)	(6,6)%
Cost for use of third party assets	(1.545.796)	(2,1)%	(1.557.666)	(2,3)%	(1.580.044)	(2,3)%
Other operating expenses	(341.992)	(0,5)%	(412.257)	(0,6)%	(440.157)	(0,6)%
Operative costs	(7.666.437)	(10,2)%	(7.348.264)	(10,7)%	(6.545.456)	(9,6)%
EBITDA Earnings Before Interests Taxes Depreciation and Amortization	21.279.473	28,3%	19.938.363	28,9%	20.449.980	30,0%
Amortization	(11.080.431)	(14,7)%	(11.127.898)	(16,1)%	(11.077.867)	(16,3)%
Depreciation	(1.052.613)	(1,4)%	(1.138.484)	(1,7)%	(1.197.556)	(1,8)%
Credit depreciation	(111.736)	(0,1)%	(114.912)	(0,2)%	(175.000)	(0,3)%
Total Depreciation and Amortization	(12.244.780)	(16,3)%	(12.381.294)	(18,0)%	(12.450.423)	(18,3)%
EBIT Earnings Before Interests Taxes	9.034.693	12,0%	7.557.070	11,0%	7.999.556	11,7%
Financial Earnings	388.000	0,5%	688.667	1,0%	897.934	1,3%
Financial Costs	(44.984)	(0,1)%	(28.572)	(0,0)%	(102.780)	(0,2)%
Commercial exchange revenues	143.332	0,2%	200.487	0,3%	(567.924)	(0,8)%
Finance exchange revenues	311.638	0,4%	414.530	0,6%	(274.589)	(0,4)%
Financial Income and Expenses	797.986	1,1%	1.275.113	1,8%	(47.359)	(0,1)%
Adjustments to the value of financial assets	0	0,0%	(716.963)	(1,0)%	(2.127.495)	(3,1)%
EBT	9.832.679	13,1%	8.115.219	11,8%	5.824.702	8,6%
Taxes	(3.539.764)	(4,7)%	(2.953.106)	(4,3)%	(2.769.652)	(4,1)%
Earnings after taxes	6.292.915	8,4%	5.162.113	7,5%	3.055.049	4,5%

Exhibit 2 Unox Marginality report

1.1.3 Realized strategy and new strategic addresses at corporate level

As already mentioned before, the company born to provide little cooking plate and ovens to cook brioches and sandwiches for local bars and little restaurants. Then with the aim to reach higher growth ratios, and to achieve also global markets, the company specialized on combined ovens and expanded product lines for different types of customer, starting from the little businesses to the biggest multinational chains like Mc Donald's, Walmart, ERG, chef express, Ali, Despar and so on.

By looking at the logistics process from a customer perspective, are identified two main value streams flowing throughout the process: one is that of the so-called "fast market", the other refers to the "slow market". Contrarily to what these definitions might suggest, the distinction between the two markets is not based on geographical nature, yet it is based on the type of customer. In fact, the fast market includes all deliveries toward dealers; key account customers like supermarket and hotel chains, and authorized service centers, while the slow market is made of all deliveries addressed to distributors and Unox distribution branches. As it is possible to notice in the distribution channel pictured below, except for key accounts that buy large volumes, Unox does not deal directly with the end users of its products, yet it receives orders from intermediaries and delivers them.

By the way, in order to maintain control over the customer, the holding company uses the AMC as key marketing figure (that is an Unox employee which promotes the product to dealers and improves the demand from customers by doing cooking demonstrations and being the promoter of the product).

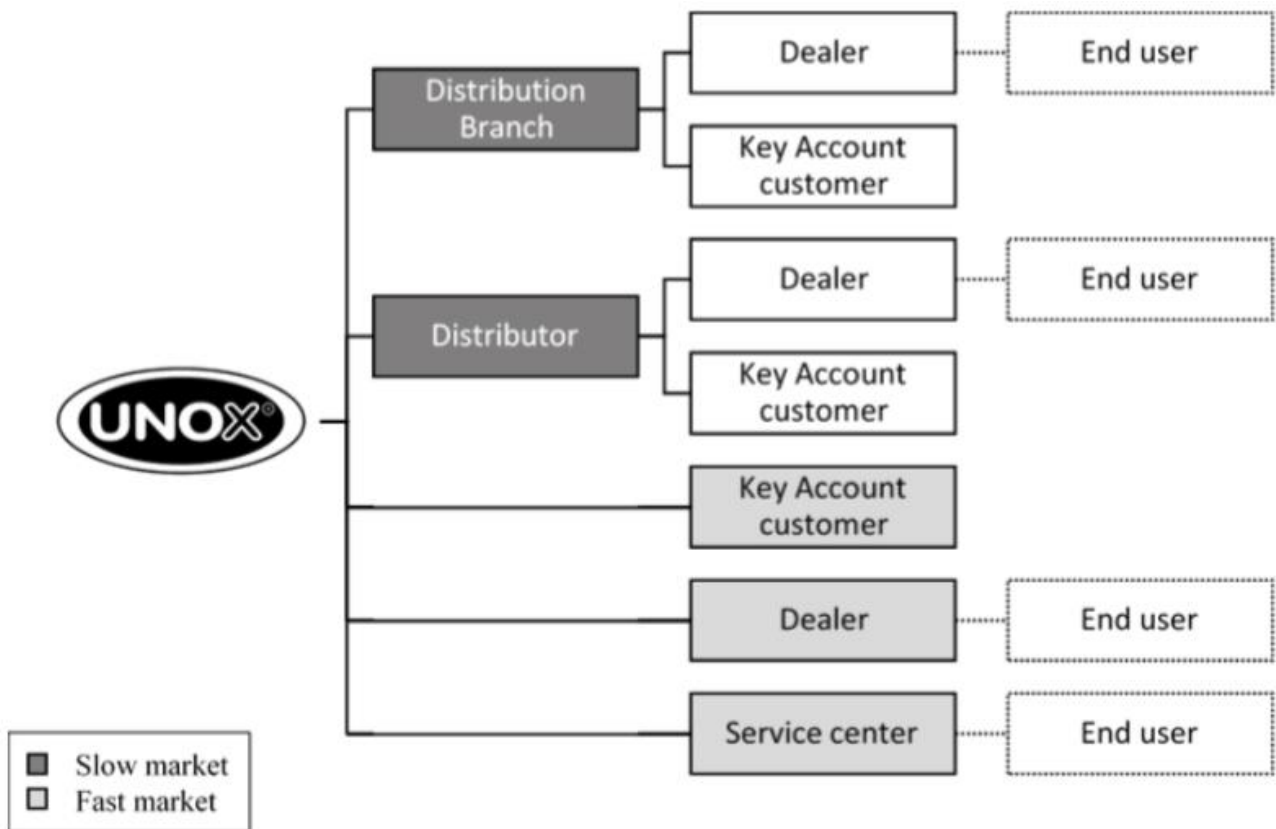


Exhibit 3 Distribution structure

Here the Unox commercial structure. AMC have the key role in the company to make the product visible and demonstrate their functionalities to dealers and directly to the customers. Also Unox sells products in two ways, by selling to the so called “fast market” where the structure is the aforementioned in the image above; or by the “slow market” in which instead of customer, the buyer from the dealer is a distributor.

1.2 Research purpose

Actual economic scenario requires all the companies to be successful, or even survive by being efficient and find what the customers needs, then adapt and offer to them the product or service that they want. This general view generates the need for the companies to be flexible and make strategic adjustments frequently; this process may lead confusion inside organizations, misalignment and subsequently frustration among employees. Here, the need of effective communication of these adjustments inside the company is fundamental to maintain the organization pointing toward the chosen direction and keep morale high.

In this sense, effective planning and usage of right performance measures that direct people toward expected results, ends in achievement of the projected strategy, or at least the company does the trial with the best effort.

Traditional western management uses the MBO and the Balanced Scorecard to depict strategy then leave to the redaction of business plans and action plans the realization of the projected strategy, sometimes with some pitfall in communication since not all the process are clearly defined *a priori* and strategic matters are often lost in the process.

Rather oriental management tradition that derived in lean production system realized overtime a capillary management deployment, focused on detailed strategy setting and planning of all the actions to realize. Depiction of strategy for lean companies is done by the usage of a comprehensive framework called *Hoshin Kanri*, the usage of this framework consists in a redaction of a series of documents and the communication and mutual agreement of proposed action to pose in action for executing strategy. With the spread of lean production system to western companies, also strategy setting and deployment tools changed with the culture of the companies. Lean path for western companies passes also through the usage of this kind of framework.

What is crucial to make this kind of framework effective stays also inside the people working in the company, lean culture have to be rooted in people in order to make the usage of lean tools effective.

Further to make effective the usage of *Hoshin Kanri* in companies, the entire infrastructure must change and reflect principles of lean that Womack and Jones with their bestseller explained to the world in all the business functions of the company. Starting from production, lean culture must

spread also in technical departments, commercial departments and even administration and accounting functions.

Accounting, and management accounting are relevant functions for creating information given the company data, lean companies must focus on improvement of this offices by improving workflows with lean office techniques and start implementing lean accounting reporting system that support the drawing up of A3-X which is the most relevant document created by management in planning phase while using hoshin kanri. In this sense performances have to be aligned with the company culture and production style. Lean company need lean performance measures to support effectively the strategy setting.

By managing projects or broadly, entire value streams, value stream costing system allow the valuation of projects by converting them into money values. It translates the process improvements into money and integrates hoshin with budgeting and financial management by giving adequate measures for the decision-making from a lean perspective despite traditional accounting systems that cannot translate lean decision into money because miss to translate the five lean principles. Value stream P&L shows then in an understandable way, the business process and the cost items. Empirical research support that a simplified and strategically aligned management accounting practice is found positively associated with value stream costing, so lean firms that applies lean thinking to their accounting functions by simplifying and strategically aligning their management accounting practices are more likely to see the value and need for value stream costing, and provide direct product cost information for the value streams, supporting better decision making, also is found that value stream costing is positively associated with visual management (Fullerton, Kennedy & Widener 2014). Fullerton's (2014) research also supports the effect of the VSC on operational and financial performance.

Here the aim of the research: explain how the strategic setting is supported by accounting measures and KPI setting, and how the lean accounting tools and performance measurements are fundamental for correct strategy setting and for complete fulfilment of A3-X, heart of the hoshin kanri framework. Traditional accounting measures does not fit for lean culture since the maximization of production is a different goal than the maximization of value for the customer through building the house of quality. All the processes have to be mapped and integrated, to explore interdependencies and eliminate waste.

Lean accounting provides a comprehensive framework that allows company measure right performance variables and support strategy setting, it gives relevant information about progresses and achievement of objectives in lean key, also envisioning of non financial performances and qualitative measures allow the company to get a broader understanding of what's happening inside the company and outside.

Since lean focuses on value for the customer by definition the accounting function generates no value for the customer, all the work done must be eliminated, but this is impossible because most of the documents are created to be compliant with legal requirements. By the way accountant people may work toward creation of value for internal customers in the company and drive improvement with their knowledge about numbers of the company.

Hoshin kanri have to be used by the company as a strategic framework which needs to be communicated top down and upgraded with the bottom up feedbacks, the process of disclosing the plan, communicating it and updating with feedback received is called catch ball. This process is fundamental part of the framework since the strategy is effectively communicated and agreed by the people, which are intended to develop it. Great strength of this framework is also given by the fact that the big plan is linked to each action plan and relative actions to do in order to achieve the biggest aim chosen in the mission statement, therefore actions are valued also on non-financial performance indicators, which are subsequently linked to financial ones. Here there is the necessity to develop a performance measurement system that is adapted to lean manufacturing companies, which differ from the traditional costing and budgeting systems devoted to the maximization of production and profits instead must be built upon the maximization of the value created for the customer by increasing the quality and reducing waste from the company processes.

Successful deployment of standard framework for communication of strategy may become a critical success factor in fast changing environment, whilst company is more flexible and adaptable to changes. The business case will focus on the analysis of the instruments used for the strategy deployment and the relevance of the integration among hoshin kanri and lean accounting for the strategy setting phase, since the communication and spread among the company people of the strategy is made by communicating them easier achievements together with the biggest aspirational aim of the company, which may be a little bit more difficult to understand properly. By giving people a clearly addressed KPI management can be confident on the fact that employees will work toward the KPI improvement.

2 Hoshin Kanri, a management framework to align company to strategic intent

The term “*Hoshin Kanri*” was firstly coined during 1964 by the Japanese Bridgestone Tire Company, which published its “*Hoshin Kanri Manual*” in 1965 (Jackson 2006). The company subsequently won the Deming Application Prize in 1968 (Kondo 1998, Miyaji 1969). Bridgestone firstly envisioned the idea and developed a “*best practice to solve perceived problems of policy deployment such as communication, allocation of resources and also focus and align actions*” (Lee, Dale 1998, Witcher, Butterworth 2000). The system spread through the Japanese companies during ‘70s, whilst striving for becoming competitive in the open markets created after the IIWW and introduced to the Western companies throughout mid 1980s after the new management concept introduction of improvement of operational efficiency, customer satisfaction and corporate profitability (Yang, Su 2007).

From Japanese language the characters *hoshin* (方針) is composed by 2 Chinese characters, *ho* which means method or form and *shin* which means shiny needle or compass, combining them we can translate as *compass* that indicates the direction to follow or better, “methodology for strategic direction setting” (Akao 1991), while *kanri* (管理) typescripts refer to *management*. Building together the meanings we can translate as *policy deployment/management* by giving a direction. Lee and Dale’s (1998) study recommend other non-literal translations that offer a more comprehensive meaning such as:

- “Perhaps the most accurate term for hoshin kanri would be target-means deployment” (Watson 1991);
- “Deploy and share the directions, goals, and approaches of corporate management from top management to employees, and for each unit of the organization to conduct work according to the plan. Then, evaluate, investigate and feedback the results, or go through the cycle of PDCA continuously improve the performance of the organization” (Eureka, Ryan 1990).

Such translations point out the importance of the Deming Cycle as the basis of the hoshin kanri, but what is very relevant is the **feedback** mention. Bastian Brouwer (2015) gives another suggestion of the Hoshin as a tool for supporting the long-term survival:

- “[...] The Hoshin process, which means compass. The key to success of this process is to decompose the company's goals, often large and complex, into small tasks manageable for

all functions. In this way, every employee at every level of the organization knows how to contribute to the success of the company”.

When choose this approach the fundamental considerations suggested by Akao (1991) are the following:

1. Measuring system as a whole;
2. Setting core objectives of the business;
3. Understanding the environmental situation in which the business operates;
4. Providing resources to perform business objectives;
5. Defining processes that constitute the system (activities, goals, performance measurements and performance feedback adjustments)”.

Measuring the system in creating a plan is critical, when establishing the direction to point out is difficult to establish at the first attempt the right direction, which is not the perfect one for all the business system considerations. Hoshin Kanri encourages so the ability to be adaptive, then the need to regularly review the strategy is fundamental not only once, but also frequently throughout all the path of the company.

Setting core business objectives must be discussed and communicated to all the people who execute the plan, in this sense the plan will be better understood and execution will be more effective, catch-ball process is well designed for this purpose.

Understanding the environmental situation is achieving the full understanding of what management’s customer (including stockholders, Board of directors, analysts, and employees in addition, of course, of external customers), is central to the hoshin method of continuous improvement. First step toward this objective is to perform a complete environmental analysis of the situation in which business system functions.

Providing resources consists in managing continuous improvement on both strategic objectives and daily management control.

The following process illustrated below represents definition phase as conceived from Akao:

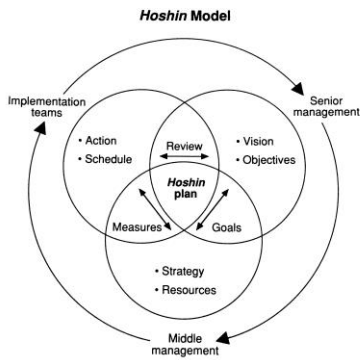


Figure 2 Hoshin Model (Akao 1991)

To define process that constitutes the system we must start from senior management; which has the duty to set the starting point of the company, vision and main objectives to be accomplished in order to be successful. These are communicated with middle manager through the main goals. Middle managers are responsible for strategy setting and resources to be used in order to achieve main goals agreed with senior management.

Implementation teams agree with middle management performance measures that must reflect results in a comprehensive way; they are responsible to put in place the right actions and to adhere to scheduled projects. Senior management main responsibility then is to check the quality of the system then reviews action and schedules.

Is remarkable that to be effective senior management have to point out the “what” must be done, middle management has the responsibility of the “how”. Hoshin kanri is a developed framework for lean enterprises and works only when lean enterprises use it. Since the underlying principles are the same, makes sense to introduce which are the historical reasons and the value definition of a lean company.

2.1 *Lean philosophy*

Global competition has prompted many companies to adopt new manufacturing processes such as lean manufacturing in order to be more competitive (Shah, Ward 2003), this pressure led to generate new competitive strategies in order to improve operational performance, and it is found that the choice of Lean as a competitive strategy impact on all the outcomes such as cost, quality, delivery speed and reliability, mix and volume flexibility (Hallgren, Olhager 2009), to achieve cost leadership and even on financial performance by implementing Lean thinking in a comprehensive manner (Hofer, Eroglu & Hofer 2012).

Lean manufacturing (Womack, Jones & Roos 1990) can be defined as an extension of the just in time or the Toyota production system. Main feature of such system is the research and elimination of the 7 types of *muda* (Ohno 1988), which are:

- (1) **Overproduction**, producing more than requested from the customer;
- (2) **Inventory**, each type of inventory, because standing inventory does not add value for the customer;
- (3) **Extra processing steps**, are the non value adding activities;
- (4) **Motion**, far components that require the movement of the operator, that is time consuming and non value adding;
- (5) **Defects**, product that do not meet the specs or any document with errors, have to be reworked;
- (6) **Waiting**, as the operator that stands in front of the machine without doing any value adding activity;
- (7) **Transportation** of materials or product from one place to another.

Lean philosophy is based on 5 principles that help people thinking effectively to do better product with less waste in less time.

These wastes are easy to detect once the people do “Gemba” walks inside the production site and look for these, on the other hand, detect this kind of wastes in the office is a little more difficult. Inventory waste in manufacturing is easy to detect by counting the WIP on the workstation, but is more difficult when the WIP to identify are the pending items to be elaborated in the office or backlogged documentation. To find extra processing in office duties, people have to understand clearly its path and see the value stream inside, which cannot always be seen by eye since most of the time the WIP is an electronic document and travels through servers, sometime the

process does not even have only one process owner and the job needs many steps in order to be accomplished. Defects are easy to detect in production by counting the amount of scraps, but in the office is not easy to distinguish whether the task is failed or not, because of the greater amount of variables that influence the results. Waiting in production is valued by counting the idle time of the machine or the operator, however in the office is difficult to judge because some tasks require confirmation by supervisors or customers. Transportation can be easily measured by computing the time measured while moving the WIP or the finished products, in the office, most of the duties are “moved” by emails, causing variation on the time consumption, and correct arrive and departure time are difficult to determine (Chen, Cox 2012).

I. Value

Value is the first of the five principles, the most important concern of the company is to address what is value for the customer, it is critical to define it by talking with customer and understanding whether the product reflect the value and what can be done to increase it by means of *target cost*, which is the hypothetical cost for producing a specific product if all the muda is removed from the actual process. The identification of value should lead to a constant alignment between customer needs and producer’s activities, in contrast with the traditional profit-driven logic. Producers often tend to let value coincide with profit, hence leading to the adoption of the following equation:

$$cost + profit = price$$

What lean thinking indeed is a reverse logic based on the belief that the value basis of the calculation and adopt the subtraction principle (Shingo 1988) that states that the price is chosen by the customer, given this fixed data the desired profit is subtracted from this and the result is the cost. This cost is the target and final aim for the company

$$price - profit = cost$$

Given this different perspective the company focuses on value creation, and not merely on cost reduction, which is direct consequence of the removal of waste and by adding value adding features that are relevant for the subject that matters at the end of the day, the customer (Hines, Holweg & Rich 2004).

II. Value Stream

Understanding and making clear the activities done by the company for manufacturing the product is necessary for improving the process, without a prior identification and analysis, processes cannot be improved in a consistent and persistent manner. Value stream is the way to keep track of the practices and improve them toward best ones.

Once the activities in the manufacturing site are adequately mapped by product or group of products it is easier to understand where value is created and where is not. Is important to highlight also that the value stream does not derive from the function of the company, instead from the material flows, information flows and workflows, which are not directly linked to a specific function. These flows also follow different path, for example considering the material flow, this moves from the supplier stage toward the customer stage, the information flow instead follow the opposite direction.

Activities identified during mapping activity can be classified in three:

1. Value adding activity, which are the only activities that the customer is willing to pay for, that must be improved;
2. Non value adding activity but necessary (so called type one muda), that cannot be eliminated immediately because of legal regulatory requirements or technological constraints, have to be minimized;
3. Non-value adding activity (so called type two muda) that needs to be eliminated straight away.

Categorization is useful to make the right choices toward improvement; the non-value activities that are not necessary have the priority in elimination, the other non-value adding activities instead have to be analysed first in order to address if there is possibility to eliminate them without introducing additional waste or exist any obstacle that impair the possibility to remove them.

III. Flow

Once the value is understood and the streams are mapped, focus is on generating value continuously, without waiting, reworks or stops. The aim is to eliminate costly WIP (work in process) inventories and to produce from materials to finished products in the shortest time possible. To make flow possible, first step is focus on the specific object of analysis, then is to go

beyond the boundaries of functions and departments following a logic of lean enterprise, then finally must be reconsidered all the adopted practices to eliminate existing backflows and stoppages between stages. Nevertheless this process may seem counterintuitive from a traditional batch and queue thinking, there can be many benefits for the business by adopting it (Liker 2005):

- Built-in quality: since the small size of lots is easy to check and defect are immediately identified and corrective action are took with promptness;
- Flexibility: smaller lots reduce lead times for production and delivery, elimination of waste reduce them even further, this result in more flexibility and adaptiveness when there is necessity to change. This characteristic makes the company more able to face changes in market demand;
- Lower costs: although the traditional thinking of cost savings deriving from economies of scale, flow and small batch size reduce costs in term of inventory space and obsolescence
- Enhanced safety: since the moving small batches or even single pieces reduces chances for accidents;
- Enhanced morale: by eliminating non value adding activities, workers perceive their usefulness at work since their activities lead to immediate results.

IV. Pull

Unlike the batch and queue system that pushes production, lean thinking adopt pull process, in which production is not requested until the process downstream ask for it. At the end of the process there is the customer, so only when demand is generated production starts. The only concern so is to be enough fast to meet the demand, this is why lot of effort must be made in order to face demand in small time. Pull logic make possible the downsizing if inventories because self-regulated systems (such *kanban*) avoid overproduction.

V. Perfection

The ultimate goal of the company is to achieve perfection, and not only a benchmark in the market. The challenge is faced day by day by seeking the improvement, which can be of two types, the continuous radical (*Kaikaku*) and continuous incremental (*Kaizen*). Improvement must be made and maintained by standardizing them, in order to avoid to come back to produce the same muda. To achieve improvements value stream leaders must focalize on the first four principles and then decide which kind of muda to attack first by means of *Hoshin Kanri* (Womack, Jones 2010).

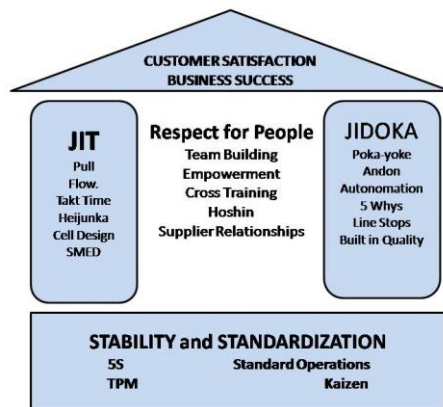


Figure 3 House of Quality(Liker 2005)

making machines to be self-dependent and error proof. The roof of the house is the final goal of the company that is the customer satisfaction, this is reached by enhancing *quality*, reducing *costs*, and shortening *lead-time*.

For the company is critical to understand exactly where the value is created and where non value-adding activities can be eliminated to bring down product cost and ensure quality by the means of continuous improvement and radical improvement activities. Processes must be organized by value streams, sequences of processes through which a product is transformed and delivered to the customer (Haskin 2010), and wasteful activities must be banished because hinder the flow. Value stream mapping is a tool in which all the activities such flow, information, and material are drawn in a visual way and gives information about cycle time, takt time, inventories, and so on (Rother, Shook 2003). Lean manufacturing offers tools to improve operational performance resulting in higher efficiency and less costs, and eventually, the increase in the net profit.

A lean enterprise cannot be considered truly lean if the lean culture is not widespread among all the plant and offices, is easy to adopt some of the lean tools in production to see improvements, but without the right effort to sustain the new techniques to adopt, production may fall in the old fashion style. Lean failures happen because the lean is not rooted in the organization, and it is only considered the flavour of the month by the most. The secret of the efficacy of the philosophy is to “communicate” the culture, top managers have to be the first lean promoter and truly have to believe in it. Lean philosophy does not work by imposing it to workers and expect the results. Even more important is the environment in which the culture establishes a no-blame environment is

These five principles translate in the *lean house* in which at the basis there are processes devoted to the standardization to keep constant the performance and then, processes for improvement. The two pillars of the house are JIT (just in time) which means getting the right quantity of goods at the right place at the right time, while the second pillar Jidoka enable the separation from men to machines for reaching more efficient work, minimizing defects by

essential to make treasure from the problems, because problems arise from the wrong processes and not from the people and are the opportunity to improve by envisioning a better process.

To enable enterprise to become lean, some structured methods such as hoshin kanri are used to deploy strategy and ensure that the continuous improvement culture is widespread among people (Jackson 2006, Chiarini 2011), to release the power of lean and hoshin kanri, a cross-functional management view is needed, and also the figure of the accounting people has to change. It is not only about operations department. Some resistance against lean thinking is found because some firms use to adopt traditional accounting methods to measure lean performances, in this way missing to see the operational improvement generally made by the reduction of the inventories that negatively impact in the financial performance. Maskell and Baggaley (2011) provide an alternative framework, that overcomes the traditional absorption costing and activity-based costing, the value stream costing, supported by the means of lean office activities that free up time of administrative personnel to involve them in value adding activities.

2.2 Scientific thinking, the PDCA cycle

Hoshin Kanri definitely offers a wide range of applications in industry, but the most important feature is that enables an “*organizational learning method and competitive resource development system*” (Jackson 2006); that allows discovering and solving problems throughout the use of scientific problem solving. Is widely used into quality and operation improvement system Japanese total quality control, total quality management and lean manufacturing for deployment and review of the system (Chiarini 2011). There are various scientific methods for problem solving that can be used like PDCA or DMAIC, both are valid tools and basically equivalent.

PDCA, also known as Deming Cycle or Stewhart Cycle describes the scientific method in 4 steps.

1. The **Plan** phase involves an examination of the problem

by collecting and analysing data to formulate a plan intended to improve the current situation;

2. The **Do** phase comes after the improvement plan is been agreed, in this stage the experiment is implemented;
3. The **Check** phase measures the actual output arisen in the Do phase and any deviation from the planned output;
4. Finally the **Act** phase is the one where experiment is judged and proven hypotheses are standardised, if not the cycle may start again.(Slack, Brandon-Jones & Johnston 2013)

DMAIC is a framework for improvement mostly used in Six Sigma approach (Slack, Brandon-Jones & Johnston 2013) is articulated in 5 stages:

1. **Define** the goals of the improvement activity, to understand the scope of what needs to be done and define the requirements for the process improvement, the most important goals are obtained from customers;
2. **Measure** the existing system and validate the problem, in order to make sure that the problem is worth solving. Establish valid and reliable metrics to help monitor progress towards the goal(s) defined at the previous step.
3. **Analyze** the system to identify ways to eliminate the gap between the current performance of the system or process and the desired goal. Begin by determining the current baseline. Use exploratory and descriptive data analysis to help you understand the data and develop

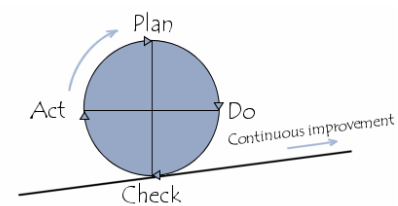


Figure 4 PDCA continuous improvement

hypotheses as to what the root causes of the problem are. Use statistical tools to guide the analysis.

4. **Improve** the system; insofar the work can begin in order to solve the problem by removing the root causes. Then solution are tested and standardized if worked well against the problem. Be creative in finding new ways to do things better, cheaper, or faster. Use project management and other planning and management tools to implement the new approach. Use statistical methods to validate the improvement
5. **Control** the new process, to check if the improvement is sustained over time. After this point the cycle can be repeated to improve further the process.

(Pyzdek, Keller 2003, Slack, Brandon-Jones & Johnston 2013)

Both methods start with the problem statement and the study of the possible corrective actions which may solve it, then the action is implemented and controlled whether is performing an improvement or not; if the implementation is successful then the idea is standardized and the cycle can restart to seek the continuous improvement (*kaizen*) or the radical improvement (*Kaikaku*).

For hoshin kanri these items are the most important items of control; for example in PDCA, first step is to make a plan that is based on the policy (plan), then you take action accordingly (do), check the results (check), and if the plan is not fulfilled, analyse the causes and take further action by going back to the plan. Is an important tool for setting up the policy itself, by analysing the variance between the actual results from the proposed one (Akao 1991), the results are valued on the basis of a target one, not by themselves.

Management, so can analyse the causes that generated variance, here 5Why¹ analysis is widely used, in the same way used on the line to solve problems. Fundamental requirement is that every component involved in the hoshin process must be a PDCA



Figure I-1. Nested Deming Cycles

Figure 5 Nested Deming Cycles (Jackson 2006)

¹ 5Why is a technique implemented in lean plants to investigate which is the root cause of the problem, by asking why the problem is arose most of the time is not enough to understand where the primary problem is. By asking themselves why the problem arose and what is the cause that generated this problem going upstream in the process, the person is likely to find the generating cause of the problem. The answer to the 5th why is generally considered the solution of the real defect that generates problem downstream.

practitioner, so the Deming cycle used is a “nested Deming cycle” because in the do phase the next layer of management start itself another theming cycle to solve the problem posed, it is also a way of activating people and make them involved in the planning phase. All the actors of the organization involved then pursue Continuous Improvement.

2.3 Actors and the 7 hoshin experiments

Jackson's (2006) model, through the use of the above-mentioned PDCA method, explains how Hoshin Kanri is used to deploy the strategy (considered as a scientific hypothesis) in a lean environment, by identifying the critical factors for company's success and the linkages among them. Strategic aim is deployed using 4 different level teams that can be gathered in a cross-functional or even inter-organizational manner, which are in charge to develop 7 different experiments. Each team prepares different forms of documents used for hoshin kanri deployment called A3 (the name derives from the width format used to print the document which is A3, bigger than the standard paper format, used to improve visual communication), and present them during the various meetings so called catchball rounds of the planning process. The A3 documents are used also for the standard format that help people focusing on PCDA cycles and think in systemic way in addressing problems.

Preparing A3 documents, drawn by the teams and presented during meetings forming part of the catchball process, enables the communications through the different levels of the organization and participation in the planning process.

The teams are divided as follows:

1. **Hoshin Team:** has the overall responsibility for the strategic planning process and develops the first three experiments, generally is the top management of the company and is composed by an heterogeneous team that have general knowledge of all the company processes;
2. **Tactical Teams:** are employed by the hoshin team and develop fourth experiment, the team is formed by combining various knowledge and technician to verify the possibility of the project and organize it;
3. **Operational Teams:** commissioned by tactical teams for developing the fifth experiment, the composition is studied to make the team able to get toward result in the term projected and usually have specific competencies needed to implement best practices;
4. **Action Teams:** chartered by the operational team for doing the sixth and seventh experiments.

The 7 experiments are:

- 1 **Long Term Strategy:** the general plan for a very long term to make adjustments or changes to the mission and vision of the company;
- 2 **Medium Term Strategy:** a partially complete plan of actions that aims during 3-to-5 year timespan to develop capabilities and align the business with the long term strategy;
- 3 **Annual Hoshin:** is a 6-to-18 months action plan that implement the medium term strategy;
- 4 **Tactics:** are the concrete initiatives to apply in the 6-to-18 months term already defined by the annual hoshin applied to general business processes;
- 5 **Operations:** projects of 3-to-6 months term undertaken to apply new technologies and methodologies to the specific business processes;
- 6 **Kaikaku:** (Japanese word meaning radical improvement) projects developed within a shorter span of time of 1 week to 3 months usually started after the deployment of the annual hoshin to apply new tools and techniques in the standardized daily work;
- 7 **Kaizen:** is a real time problem solving that is used when a problem occurs during the standardized daily work.

All these experiments are linked to the long-term strategy since are result of it, in fact hoshin team generate and deploy the strategy as a consequence from various catchball rounds and take into account the feedback from the lower levels. The communication standards created in order to make the catchball process active through the company generate an effective tool to make the company strategically updated and flexible. Changes are promptly received and feedback makes the upper levels aware of what is going on at lower ones.

2.4 A3 The business memorandum

The most important communication tool used to deploy the strategy in a lean company, which adopt hoshin kanri, is A3. It is a technical writing format designed to communicate visually and in a standardized way, the name derives from the standard format of the A3 papers in which should be printed on. The format of these documents facilitates technical writing about scientific investigation and project management. Also enable scientific thinking at all the level of the organization; the usage of this tool is fundamental for efficient communication and organizational learning. In Toyota the tool is also used for coaching, in which the mentor (coach) helps the mentee in approaching the problem in the right way, improving the problem solving skills of the latter (Rother 2010) and developing the human capital of the company. The Deming cycle is iterated at every level of the organization, favouring the progressive improvement.

2.4.1 A3 for planning: A3-X and related A3s

Among the different types of A3, the most used for the Plan phase are essentially two, A3-X and A3-T. Jackson proposes different types of A3, each one have a specific function and serve to make solid all the strategic structure proposed in the A3-X.

The first draft of the A3-X is made during the plan phase by the hoshin team after the scan of the environment and the definition of the long-term strategy. It supports the hoshin team in developing visually the midterm strategy and the annual hoshin. It is designed to bundle several A3-T together developed for each value stream, explore interdependencies, and relate them all to bottom line results.

The first block filled is the strategy, from which derive tactics and subsequently process and finally results. Then must be assigned correlations among these four blocks. In the right side of the panel there is the smart organization block in which are included the people involved into the hoshin kanri and their level of accountability. These people are the hoshin team since they are responsible for the generation of this matrix. For each tactic must be linked one people of the team which is strongly related, in this sense must be the process owner of the tactic and has the main responsibility of following the evolution of the subsequent A3-T and generate the expected results.

Is critical to fill the strategies with few lines, which must describe the company most important goals, there is evidence that hoshin kanri is successfully deployed in western companies

Given the aforementioned difference, there is the need of controlling different variables than the traditional ones, since consolidated theory explains that measurements must be set with care since they will be the drivers for directing people, these measures should be objective, complete and responsive and verifiable (Lawler, Rhode 1976), can capture all the relevant information and most importantly can reflect the effort and action of the measured performance of a given individual. Performance indicators are set to make people focusing on targets related to strategy, diagnostic control systems highlight the importance on monitoring the results on lower-level decision and activities (Simons 2013) on these critical performance variables that affect strategic results.

For a lean company that uses a profit and loss which takes into account value creation instead of production maximization, then, KPIs have to be set taking into account the three variables which are the foundation of lean culture as described in the house of quality:

1. Quality, perceived and effective quality that concerns customer of business' product;
2. Cost, that must be reduced to the essential in order to use resources to provide the best possible quality to customer;
3. Delivery, promptness in logistics is very valuable asset and have to be considered in strategic planning

Furthermore some companies add another component, very relevant to the long-term growth of a company, empowerment of people. An effective strategic plan must take into account all these objectives to maximize value creation for customer and integrate control systems, which are able to control these variables.

Is not possible to discern the strategy setting from the management accounting given this format, in fact actions have to be linked to financial results that reflect the lean philosophy. A3-X format is designed to make available the contribution of each process on each relevant item of the value stream, also strategies are linked with the same design and is easy to check if the assumptions made on strategies are consistent with the processes. Value stream profit and loss is generated by logics that differ from the traditional variance analysis which come late and does not add value to the end user. This profit and loss is result of a series of performance measurements that take into account the value stream by itself instead of the singular function of the company and are result of value stream aggregation of costs and revenues.

The resulting output by itself is not sufficient to make the strategy effective and well understood by everyone in the company, in fact supporting the main A3-X other A3 are drawn up,

A3-T add details to Tactics, A3-I is used for scan and assess the environmental situation. The redaction of A3-X is also the final result of the strategy setting, as after the round of catchball which is devolved for feedback purpose, that make possible the necessary adjustments to chase success. Also other documents are redacted after the plan phase of hoshin kanri, we will talk further soon. Is important to mention the purpose of the continuous improvement inherent in the hoshin framework, in which the PDCA cycle is proposed and reiterated again at the various level of the organization. This makes possible the company to go further and look for improvement in systemic way.

A3-T is a team charter developed to conduct a strategic, tactical or operational hoshin experiment and inserted into Tactic box of the A3-X. Starting from the top left panel, the problem statement in which the problem and the reason why an improvement is required are discussed, move down to the target statement in which is proposed an objective to achieve and then in the bottom left panel the analysis is used to describe the root cause of the problem that supports the proposed action. On the right side the proposed action includes the suggested tactics for achieving the target, then in the implementation plan are included the specific actions and actors responsible for the implementation. In the last panel is usually included a timeline to check if the plan is implemented as planned.

A3-T								
Proposed team charter	Theme:							
<div style="background-color: #2d3748; color: white; text-align: center; padding: 2px; font-weight: bold; margin-bottom: 5px;">PROBLEM STATEMENT</div> <div style="border: 1px solid black; height: 80px;"></div>	<div style="background-color: #2d3748; color: white; text-align: center; padding: 2px; font-weight: bold; margin-bottom: 5px;">PROPOSED ACTION</div> <div style="border: 1px solid black; height: 80px;"></div>							
<div style="background-color: #2d3748; color: white; text-align: center; padding: 2px; font-weight: bold; margin-bottom: 5px;">TARGET STATEMENT</div> <div style="border: 1px solid black; height: 80px;"></div>	<div style="background-color: #2d3748; color: white; text-align: center; padding: 2px; font-weight: bold; margin-bottom: 5px;">IMPLEMENTATION PLAN</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%; text-align: center; font-size: small;">Action</th> <th style="width: 20%; text-align: center; font-size: small;">Responsibility</th> <th style="width: 20%; text-align: center; font-size: small;">Date</th> </tr> </thead> <tbody> <tr> <td style="height: 80px;"></td> <td></td> <td></td> </tr> </tbody> </table>		Action	Responsibility	Date			
Action	Responsibility	Date						
<div style="background-color: #2d3748; color: white; text-align: center; padding: 2px; font-weight: bold; margin-bottom: 5px;">ANALYSIS</div> <div style="border: 1px solid black; height: 80px;"></div>	<div style="background-color: #2d3748; color: white; text-align: center; padding: 2px; font-weight: bold; margin-bottom: 5px;">CHECK AND ACT (verification and follow up)</div> <div style="border: 1px solid black; height: 80px;"></div>							
Date:	Reporting Unit:							

Exhibit 5 A3-T (Jackson 2006)

The company can develop the aforementioned A3s only if there is already a mission statement and the vision is clearly defined, when there is the need to redefine these strategic components, another A3 can be used in order to manage scanning tools such as SWOT analysis or positioning maps (Porter 2008a), analyse them and provide the implication for the business and the strategic proposition, then analyse the five forces (Porter 2008b), also can be useful to use Value Stream Maps or Value Stream Profit and Loss Statements.

A3-i is a useful tool to integrate information and make discussion on it, once defined it makes visual the result of the strategic thinking, is useful for internal purpose of definition of the strategy by the top management and also an effective communicative tool for the personnel who have the opportunity to take view of the document and understand the company direction. Even if the strategic proposition is already established and communicated can be useful to propose this form to build consensus about definition and changes made.

Here is a presentation of a blank A3-i to be fulfilled, on the top left panel called observation collect the various tools proposed for scanning the environment and the business, summarize observations of supply and demand conditions, then the other 2 panels called analysis are used to disclose the tools in an extended way. Last panel called implication for the business is fulfilled with the explanation of the value proposition resulting from the previous analysis.

A3-i	
Competitive information report	Theme:
OBSERVATION	IMPLICATIONS FOR THE BUSINESS
ANALYSIS	
Date:	Reporting unit:

CD Form 1-1
Hoshin Kanri for the Lean Enterprise © 2006 Thomas L. Jackson
Page 1

Exhibit 6 A3-i (Jackson 2006)

2.4.2 Planning Process

Hoshin Team must start by performing a review of Mission, Vision and Long-term strategy of the company, it is possible by using a series of tools to get a broad understanding of market conditions and competitive resources. Akao (1991) suggests some point of caution, which must be considered in order to create a long term and medium term effective plan:

1. When generating long or medium term plans is better to avoid projections of past performances which are likely to generate no value because there is no added information included on it;
2. It is important to clarify expectations for the company which are the result of the analysis of critical problems, current capabilities and changes of the environment
3. Is important to start inspecting what's inside the company to discover problems and prioritize the kaizen process.

Then Medium term strategy must be defined by means of value stream mapping method, in this phase, hoshin team draws the map for each value stream at the current state and then draw the future state map that is willing to be reached, highlighting the midterm opportunities and the gap between actual and future state, a plus may be to set a meaningful KPI that monitors the ongoing situation and the result that people are willing to achieve. Data used to analyse this tool must reflect operational and capacity performances, in addition to the financial data; in order to do so traditional accounting systems are not suitable to give meaningful information to the hoshin team, and can impede the lean projects.

Once defined long and medium term strategy by scanning the environment and analysing the data, the hoshin team is ready to develop the first draft of the annual hoshin, in which plan how to outline and deploy the strategic objectives, check for interdependencies to assure coherence of the plan and how to design and implement KPI and a measurement system that allow to link the goals of each project with the operating result in 6 steps:

1. Identify opportunities for the next 6 to 18 months;
2. Prioritize, analyse, choose, and record high-impact opportunities;
3. Establish contribution targets for result;
4. Establish annual targets for process improvement;
5. Study interdependencies;
6. Assign teams for each tactic and provide accountability.

Gaant charts can be used to define duration and activities to be done for each core object, then in the same sheet the inclusion of the management owner and the plan versus actual status are useful since generate visibility of the planned schedule and milestones to achieve. The inclusion of the Gaant chart and its periodical review is useful check and act phases to help people where the variation occurred and take corrective action on it (Cudney 2009).

Hereinafter hoshin team is ready to proceed with catchball process to communicate and align company to defined strategy.

2.4.3 Catchball

Catchball process is designed to align all the 7 aforementioned experiments and all levels of the organization through discussion, is both a top-down and bottom-up process. It involves a large base of people in the organization and assure that strategy is shared and understood by all the levels of the company and is linked to operations; is also considered important to gain consensus and involvement of the team members in a cross-functional environment (Tennant, Roberts 2001). Is subdivided in rounds; start and end of the process involves the hoshin team. The first round starts after the hoshin team finishes its annual hoshin, it charts the tactical teams and the general business process to deal with. Usually an expert and independent moderator to drive the meeting are required in order to have a successful catchball round. The first round of catchball develop as follows:

- Preparation of the meeting: the meeting is carefully prepared, some rules are established and eventually an expert is hired for moderate the meeting
- Hoshin Plan Introduction: the hoshin team introduces the hoshin plan to the tactical team leaders and tell them what is requested to accomplish
- Hoshin Plan Discussion: is an open discussion in which tactical team leaders ask question and clarify points. It is possible that them have suggestion for improvement.
- Team Charting: once the tactical team leader got its task, needs to formulate a tactical plan to insert into A3-X establishing a specific target for the project, then choses team members.
- A3-X Preparation: team leader is asked to prepare an A3-X that explains how to deal with the specific initiative undertook and completes the project plan.
- Final stage of the first round of catchball is the discussion of the tactical project inserted in the A3-X with the hoshin plan and to revise the interrelationships.

Structure of the second round of catchball is basically the same, but the dealing is among Tactical teams and Operational teams, and the subject of discussion are operational A3-X; it is possible to continue the process in a top down perspective up to the action teams. Once the top-down phase of catchball is completed, start the bottom up stage where the A3-X and A3-T are discussed and revised.

2.4.4 Do phase

Once the plan is completed and the action for each team is defined, the do phase starts. In this phase fundamental issue to make hoshin team and tactical leaders effective mentors for teams, engage people is even more important, because success is made by thousands little actions made right. Everybody must be involved and participate to the success of the business plan. Once do phase starts, action plans have to be integrated with further detail like implementation roadmaps, budgets, schedules and even reviews.

Implementation roadmaps add details and help people controlling the work and assign direct responsibility and accountability for each action; details add information to A3-X and are important to translate actions in budget since also financials have to be considered.

Schedules, or milestones have to be prepared to give a time constraint to people, and focus on the objective. Without a due date, it is easy to miss opportunity to get the adequate effort required to accomplish the task, even for people who want to write a master thesis, if does not set a due date for each stage will be late.

During do phase, training is executed in different fashion by famous companies like Toyota or Kaizen Institute, like kaizen blitz or train-the-trainer and is proposed with the aim of applying reliable PDCA method in training employees. Employees need ability to adapt and use PDCA methods; managers have to delegate some authority even they seldom are unwilling to.

Reiterative use of PDCA lead people thinking on processes and rethink them when problems arise, so problems generate variances from the planning schedule and action plan predefined in the planning phase.

Hence the planned activities are often rearranged to fit the actual condition and processes can be even further improved due to the check and act activities made. To be successful high degree of training must be applied to employees.

2.4.5 A3 formats for check phase

Once plan phase is concluded the do phase starts, each tactical team has his own tactic to execute, detailed reports have already validated and the A3-Ts contain the action plan with due dates and KPI to control performances. At this point is useful to use other format of A3 to follow the progress made and the problems arose during the action phase.

Is natural that what is planned often is not achieved straight away at the first attempt, often problems occur and the planned action must be modified in order to achieve the result. Also problems can generate new thinking process that generate useful countermeasures that can be used to improve the process and generate even better results from the planned one. To face important problems arose in the do phase Jackson proposes another format of A3 which is called A3-P. This tool is useful to use when an important problem arise and needs significant capital investment or multiple actions are needed to solve it. The structure is similar to the A3-T and proposes all the phases of the Deming cycle, plan, do, check and act.

A3-P							
Proposed team charter	Theme:						
PROBLEM STATEMENT	COUNTERMEASURES						
TARGET STATEMENT	IMPLEMENTATION PLAN						
ANALYSIS	<table border="1"> <thead> <tr> <th>Action</th> <th>Responsibility</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Action	Responsibility	Date			
Action	Responsibility	Date					
CHECK AND ACT (verification and follow up)							
Date:	Reporting Unit:						

CD Form 1-6

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Exhibit 7 A3-P (Jackson 2006)

The left side of the document is devoted to the plan phase, which includes problem statement, target statement and analysis. Problem statement describes the problem and the

improvement solution proposed; must be fulfilled with an explanation of why the problem is important and why the improvement action is required, it can be a bottleneck that impairs the flow process or a quality problem which generates defective product of services and requires rework. Under this panel the team provides a target statement, which takes into account the new problem, and can also revise the target statement proposed in the A3-T released in the plan phase.

The last section on the left side is the analysis and must be fulfilled with the causes that generated the problem, is quite useful to analyse the cause with the 5 why technique to find the root cause and to support the proposed action which solves the problem.

The right side of the A3 is proposed with 3 sections, countermeasures, action plan and check and act (verification and follow up). Team must fill the countermeasure block with the corrective action implemented and the projected corrective action to put in place in order to solve the problem; subsequently in the implementation plan a schedule the due date of the main steps, parties responsible of implementation of the corrective action are included. The last block, check and act is helpful in generating a visual timeline to facilitate the verification of adherence to new standards.

To assess the status of the project and analyse the PDCA investigation process the usage of A3-SR is very useful. A3-SR is the document, which provides a periodic and quantitative progress report, linked to the A3-T; which also incorporate the A3-P (discussed below) whenever present.

A3-SR				
Status report		Theme:		
BACKGROUND		IMPACT		
TARGET STATEMENT		UNRESOLVED ISSUES		
IMPLEMENTATION STATUS				
Action	Responsibility	Due	Complete	
Date:		Reporting unit:		

CD Form 1-4

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Exhibit 8 A3- P (Jackson 2006)

Background field is used to explain what is happening now and why an improvement activity is needed, usually is linked directly with the problem statement present in the A3-T. Target statement is the one present in the A3-T or the revised version present in an A3-P. Implementation status provides detail about the action plan; the contents are basically the same as the one present in the A3-T or the one in the reviewed A3-P, with an additional column of the completion date, this additional item provide a visual detail about the progress of the action plan, is easy to spot if the actual implementation status is on time or the previous projection are not attended.

On the right side the impact field summarizes the effect of the actions executed to achieve the original targets, may be useful to provide graphs and other visual information to promote quick comprehension. Last panel includes the most important information, the problems pertaining the project addressed but still not solved. This panel can include various kind of information, including data that have to be gathered or information that must be created, the inability to obtain resources (including human resources) planned for the project, or also new resource requirements not already planned. The resulting information provided by this report is a complete report comprehensive with visual instrument to assess the overall situation of the project. Its design helps people on focusing discussion on key indicators and critical details of process improvement.

Another useful A3 used to monitor the status of the projects is the A3-SSR, a summary report to be used on a quarterly basis, to check progress made during the period of the various A3-T bundled in the A3-X. On the left side category lists the main types of issues discussed during periodic meetings such:

- Progress toward targeted reported on A3-T and confirmed through catchball process;
- Progress made toward resolution of the unanticipated problems, which are discussed on A3-P
- New information acquired during the period (even through collection of new data in an A3-i), which are considered relevant to modify the tactics, or even at companywide level for review the strategy.

Under the steps taken column is provided further detail on the category listed on the left.

lean principles in the transmission of the strategy; information flows from top management to the shop floor through catchball and feedbacks follow the reverse path to align top management about the availability of resources and the effective possibility to engage the challenge of strategic achievements; enterprise should organize itself in value streams, in which cross-functional teams cooperate to maximize value for the customer and make the processes flow.

By using a standard format of communication all the waste generated by organizing communication and misalignment of people is avoided. Company people have the consciousness of the path that the company is going to follow and everybody gives the right contribute in order to go further toward objectives. Continuous feedbacks and update of the framework tools aforementioned keep the company balanced and gives the possibility to the management to make proper adjustments that are easily captioned by the whole company, this ability translates in high flexibility.

Strategy setting and deployment through hoshin kanri strengthen the strategic flexibility of the company, since is easy to see deviations from the plan and corrective actions can be executed in a timely manner. When the structure is rightly implemented all the actions are linked and impact of each project is measured through operational performance measurements and translated in financial impacts.

The usage of this framework can effectively manage the policy deployment and is effective in aligning all the people in the company to achieve results, since the strategy is clearly communicated and discussed during catchball rounds, then implemented by following detailed action plans presented by various A3-T. All the actions are directed and linked to strategies and people follow them in order to achieve mutual goals together with all the other people in the lean enterprise.

Integrated usage of all the A3 in all the steps of the PDCA cycle helps all the people involved in the projects to be updated and immediately understand whether or not the action plan is going toward the right direction.

The explained structure of translation of strategy, by the way have to be adapted and not adopted by the company; copy formats from different business can affect the effectiveness and even disturb the communication process, by creating noise and waste of time.

Also this is a standard format, it can be replicated; once people is trained to read and draw up this format of document, it can be used also for other projects

Hoshin Kanri, starting from the A3-X matrix helps manager to deploy strategy communicating in a visual manner and by keeping the link from the overall strategy to the results. This is made possible with the interconnection of each A3-T and related periodic reports to the A3-X. In this sense the final objective of the project is strictly linked to the action plans and the performances required to attain the expected results. In this sense performance indicators have to be considered as glue that pastes the strategy to the results. They help people in being focused on what is relevant.

Some scholars compare this framework with the balanced scorecard (Kaplan, Norton 1995): *“The scorecard and hoshin kanri may represent two alternative ways for ensuring that strategic plans are implemented if they (in the end) represent two fundamentally different cultures: a Western one centred on selecting and monitoring the right measures to drive change (an “ends justifying the means” approach) and a Japanese culture centred primarily on the capability of a firm’s organisational processes in delivering value to the customer (the means contributing towards the ends) (Ghobadian et al. 2007)”*. Ghobadian tries also to explain differences in application of hoshin kanri depending on cultural model, from which depend most of the difficulties on implementing this model on western companies. Even though the cultural differences, scorecard and hoshin kanri are proposed to be used together because of the potential benefit of the strength of each framework; balanced scorecard is considered more effective in setting the strategic objectives and strategic themes, by translating the long term purpose, instead hoshin kanri may be effective in the implementation and execution system given the well-organized communicating structure. This can be done by translating the scorecard objectives and the needs of business model firstly into medium term plans and challenges, then as short-term priorities within the annual planning cycle.

Nevertheless, happens that this framework is misused and not fully understood in western companies; for example management may expect too much from this tool and set too many strategic objectives, then target and means multiply over control (Witcher 2002). Difficulties arose also in catchball phase where management did not feel fully involved and instead of communicating and agreeing, prescribed what is needed to achieve and how. Also management of HP complained difficulties on keeping documents up to date during early implementation phase, because often performance indicators are used for firefighting purpose and not to assess the process and also because there is the possibility to have managers grown un in systems that did not trained them to be good team players (Witcher, Butterworth 2000).

Even though the benefits described seems relevant, lot of companies that have implemented lean production systems and are in early stage of adoption, does not implement also hoshin kanri, this may indicate a low level of implementation of lean into the company. At early stage lean culture is still not widespread in the company and management may not fell still comfortable in using these new strategic tools. Too early implementation of hoshin kanri may also lead people toward misuse of this framework, because lean principles are still not well understood and also because management does not commit on putting the right effort on the study and implementation of this instrument.

Here the relevance of having a good management accounting system that integrate strategy setting with production through well designed control framework, fills the gap existing from a mature lean company and an early adopter of the philosophy. Effective usage of this kind of framework needs a proper value stream mapping and relative control systems that monitor the right key variables that affect processes. Strategy have to be communicated then by using a control framework that reflect the aim of lean principles

To understand which are the relevant key performance indicators must focus on which are the pillars of lean culture; starting from value creation for the customer the deriving action that a company does in order to maximize this value is to eliminate waste, then implement flow production systems, are better able to meet customer demand by using pull systems instead of push one and pursue perfection. This reasoning stress out which are the relevant performances that lean company must focus on. Lean accounting framework exert on giving the right answer on this question and address the answer in value stream profit and loss which is also the bottom block of A3-X, the document adopted to put all the pieces of the strategy, adoption and results together.

2.5 Business case application: A3-X in Unox S.p.A.

First lean cell in Unox was deployed during 2006; from that moment the company devoted lot of effort toward lean implementation on the shop floor with results. From that moment up to now the company experienced lot of operational improvements and increased value adding activities that led to high improvements in value delivered to the customer.

Top management in Unox decided to start using hoshin kanri for discuss and deploy the strategy since 2012, helped by professionals (Auxielli consultants and academic personnel from Venice university) tried to implement this structure and spread the lean thinking through the company. After the first draft of the A3-X management periodically review the document and updated it. The structure is not exactly the aforementioned and the principal A3 used are A3-X but is not an unique A3-X for all the company but instead is included a second layer of A3-X for each value stream identified under the main one, the main is used to give the guidelines for the redaction of the A3-X for each value stream. Structure is adapted to the company culture, and the choice of avoiding a complete structure is coherent with the willingness to eliminate what is not considered relevant into the management.

To better understand the purpose of hoshin kanri usage is proposed an extract of interview made to the company CEO:

“Why and how hoshin kanri is used in Unox S.p.A.?”

The company uses this framework for conceiving the vision of the company and build the strategy to deploy. I propose an A3-X in which is present the company vision and guidelines and then I ask to the top management to think about that and propose their own A3-X draft for each value stream. The Vision is reviewed every two years from the top management and is presented by managers in management meeting through the Why, How, What which explains the reason and the purpose of the job done by each value stream manager. Further management proposes the Ambition statement, which is the declaration of intents for the 5-year plan envisioned. The first round of catchball is done when I ask management to prepare the draft of their A3-X. Then for each project is prepared an A3-SSR, which represents the Gaant chart of, the project and then we execute the plan.

How the KPI are set in Unox S.p.A., in particular what is their communication intent?

KPI are set for each value stream, but only few of them are communicated throughout the organization because of understanding and focus concerns. Each KPI is conceived in order to reflect our aim, which is the maximization of value for our customer, in this sense for example in order management team we use the time needed to answer a call or another example we monitor how much time we use to provide technical support when required. KPI in Unox measure value streams performance and are present in the main A3-X, the most relevant then are communicated to each team to make them focusing on that performance and deliver as much value as possible to our customer.

How is communicated Hoshin Kanri plan through the company and to external stakeholders?

I've tried to communicate the plan and KPIs to all the employees and to external stakeholders but I've stopped doing it because of lack of interest met and the confusion generated to the personnel during the presentations. People require less detailed communications, easy to understand and that make them feel safe, so I prefer to communicate in aspirational way a vague plan to make people understand that the company is able to plan and execute a strategy, that the company is growing and the business is safe.

Does the A3-T are used during the planning phase of the project?

No, we don't. At the moment the usage of A3-T is not used because we don't think are worth enough the time spent. I'm planning to use it after the actual situation of the company in which we have urgency to solve and backlogs on projects to fix. After this we think to start using them to make people more responsible about their projects and plan using scientific thinking methods."

As temporary result of the management meeting done during 21st of January 2016, the A3-X developed by the operation department was the following:

strategy. Great effort, in fact, is made in order to find the right measurements. Measurements must be set with care since they will be the drivers for directing people, these measures should be objective, complete and responsive (Lawler, Rhode 1976) verifiable, can capture all the relevant information and most importantly can reflect the effort and action of the measured performance of a given individual. Here is shown that Unox uses a data driven Hoshin instead of a process driver tool. The thinking is that measures control behaviours and align organization toward the objectives. It is widely discussed that performance indicators are set to make people focus on targets, which are closely related to strategy, diagnostic control systems highlight the importance on monitoring the results on lower-level decision and activities (Simons 2013) on these critical performance variables that affect strategic results. Diagnostic control systems in this environments attempt to measure variables that are relevant for the execution of strategy.

This adaptation highlights the performance oriented culture of the company, which tries to keep the connection of strategy to result by usage of operational key performance indicators for each project and keep track of them to see the results. Given the relevance of these instruments, great effort is put in order to find the relevant KPIs.

A3-X itself can be considered the control system generated inside Unox, the resulting KPI included in the A3-X are the strategy based KPI needed for strategy deployment. These KPI translate in result based KPIs that monitor the operational performance in terms of flow and generate the operative control framework.

The matrix was not completed because of the time constraint of the meeting; KPI and targets will be filled on the next meeting, after a round of catchball in which the hoshin team will discuss with project teams; that will include targets and KPIs when mutual agreement will be achieved.

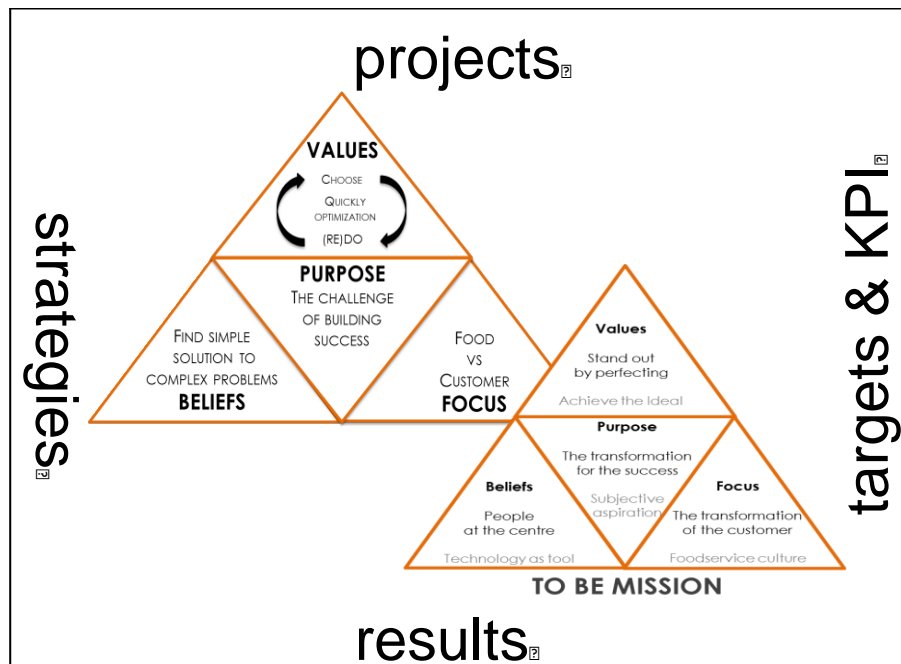


Exhibit 11 Extract from Unox A3-X

Company’s mission is exposed in the centre of the matrix and starting from the actual purpose, it explains in a visual way values, beliefs and focus of the company. The mission statement derives from Bagnoli’s theory of the entrepreneur’s paradox².

² Bagnoli (Bagnoli 2014) theory proposes the entrepreneur’s paradox of innovation versus the strategic coherence, explains that in the traditional point of view the business definitions come as the first step to define the strategy, the proposed review is to check the three fundamentals for positioning:

1. How to propose with efficiency and efficacy;
2. What to propose;
3. Who are our customers?

When formulating an innovative strategy the analysis starts from the first proposition, then formulate the second and at the end identify the customer to serve. Then, to listen the voice of the customer the next question to pose is why customers want to buy the proposed product? The emerging strategic innovation poses the basis to make the business in the condition to aim in being leader in all the dimensions with excellent in productive processes, being leader of product and having high level of intimacy with the customer. Strategic aim focuses on excellence on all the dimensions of value proposition.

Strategies are declined in order to accomplish the actual mission, that is the left-hand composed triangle, that will attain to achieve the to be state of mission; these strategies are judged consistent with “the challenge of building success”, which are:

1. Build a Consistent company
2. Build the “D IF” Diamond company (which is in jewellery jargon the finest and purest Diamond available on earth)
3. Build and being perceived as the company for people that rise to the challenge of building our mutual success
4. 43 /15 / 4 / 4 / 4, which are the “target cost” on revenues present on results,
 - i) 43 for material costs
 - ii) 15 for Customer experience costs
 - iii) 4 each for Development, Conversion and Operation costs.

Strategies are actually declined in projects, which are:

1. Vision 20YX
2. Map Processes & Activities, Standardize Processes & Activities, Measure, Improve TOP - DOWN, Improve BOTTOM – UP
3. Communicate: “The company for people that rise to the challenge of building our mutual success
4. Product leadership (speed, homogeneity, cooking quality, insensibility of the load, reliance, energy efficiency, cleanness, IoT, design, physical and virtual interfaces)
5. Customer Experience (Sales, Services, Data) Leadership
6. Growing people and Team
7. Track product lifecycle and customer experience within 4 clicks

On the right side of the matrix is present the Hoshin team in charge to accomplish the goals, filled circles identifies the high rate of contribution on projects, designate the process owners of each project, blank ones medium rate of contribution, blank cells indicate none or low level of contribution.

The hoshin team is composed by:

- Owner
- Director of R&D department
- Research Team Director:

2.5.1 *Catchball rounds*

Since organization has few hierarchical levels, there are only two catchball rounds; CEO communicates the strategy to top management and then management speaks directly with interested people in the organization. Usually management asks each team for each project, and make agreement of what are the schedule and the steps to be taken in informal way. The feedback from the people to the top management at the moment is made by developing the “Why How What” format which explains why the value stream exist, how adds the value and what does to make this possible. Once agreed the terms, teams start working on the project and management periodically ask for report on the status then the feedback purpose is used mainly to get update on the status on the project and to update schedule or resource requirement if needed.

What is missing is a formal and written standard, which defines actions and steps to complete the project, means needed and time required for each step. This happens because extensive planning is not culturally rooted in the company. The only mean provided is the A3-SSR which is filled by manager and includes only the timeframe of the project to be done and the first two phases of Deming cycle, plan and do.

2.5.2 *Project: Map Processes & Activities, Standardize Processes & Activities, Measure, Improve TOP - DOWN, Improve BOTTOM – UP*

Mapping processes and activities and then standardize them is an important activity in Unox, each function has its own value stream and activities have standard procedures. This kind of activity is deeply rooted in the company and management, perceives standard works as the heart of a solid structure. In the strategic deployment matrix this project is perceived highly correlated with success and cost control. Strategic aim is to manage knowledge and make available cross training inside the company with extensive use of procedures. The company Director of Operations, in collaboration with the HR department, want to create a library of procedures that cover all the tasks that involve all the people of the company that are available to be checked frequently and used for training session of new entrants or for cross training of people. The library may be also a communicating tool, which provides to people outside the specific office indications of what is done.

Drawing up standard works gives people working on these processes the possibility to share knowledge with colleagues and by combining them is possible to draft the best practice available in company to perform a specific task (Locher 2011). When people have to commit their effort in doing a standard procedure, they have to think with method, so they act using a PDCA cycle and this generates improvement also in offices. It can be used as the company benchmark. The presence of procedures as standard condition for working environment makes visible every non-standard condition, so variability can be easily detected and avoided by analysing the situation

Key performance indicators of this project discussed are primarily two:

1. *Standard Works Coverage* = $\frac{\text{Processes with standard works}}{\text{Processes}}$
2. *Training Coverage* = $\frac{\text{Trained people of Unox}}{\text{People of Unox}}$

These KPI are the first draft set and have the aim to motivate people in achieving the 100% on both. To communicate this project, hoshin team put lot of effort in analysing with lean masters, which are the processes present in the company and make them traceable. Then address employees to write procedures and discuss among colleagues about the best methodology to apply, then verify whether non-standard conditions occur.

To compute the second index is useful to know which are all the processes to be known by personnel in order to monitor knowledge on the basis of those. Third key item proposed to better understand these performance indicators then have to explain whether or not a person is trained or not, suggestion may be the following:

3. *Trained people of Unox* = $\frac{\text{Process known}}{\text{Processes to be known in the specific area}}$

Even though some formalization was explained, these KPI have some form of subjectivity, in fact there is still not objective way to valuate if the people effectively know the processes. To valuate knowledge is required a sort of examination to establish if is effective.

What is missing on this project is a specific action plan, since it is a diffuse task to be accomplished by all the company people, there is only a guideline that tries to sensitize the usage of standard works and explain the usage and power of it.

From this project is driven out the necessity and the willingness of the company to take specific actions in order to make more efficient all the processes (including office processes) by exposing in visual manner the value streams and understanding their relations with other processes,

suppliers and customers. This kind of project is directly linked with the aim of the management of being a successful company and to get the objective of reaching the target cost chosen for each area.

Management expects so that this project translates in less labour cost required to produce more, in this sense the expected result are to keep the workforce saturating as revenues increase.

2.5.3 Steps taken toward results

Once strategic matters are defined and declined in projects, hoshin team put effort on finding the right key performance index that communicate strategic matters in simple way to each project team member. Once discussed through informal and quick meeting, first draft of KPI is set. Then managements with informal meetings explain the project to the various teams, receive some feedback and proceed. KPI setting is perceived relevant part of the PDCA cycle because the valuation of processes through these must direct employees toward desired results. In the specific case the aforementioned KPI should make people focusing on processes and the formalization of all value streams and procedures known.

2.5.4 From strategy to results: 43/15/4/4/4

Strategy is translated primary in projects and then KPI to monitor performance are set. At the last stage, on the bottom line results are what matter. Each decision made and each relative action have an impact on financials, hoshin kanri here provides the link among these items. Starting from Revenues, Unox generates its own value stream profit and loss with some further detail added to maintain focus on relevant cost items.

Value stream profit and loss starts with Revenues from which are deducted a series of cost items already take into account in the last strategy line item.

Here the perspective P/L present in the A3-X expressed in €M:

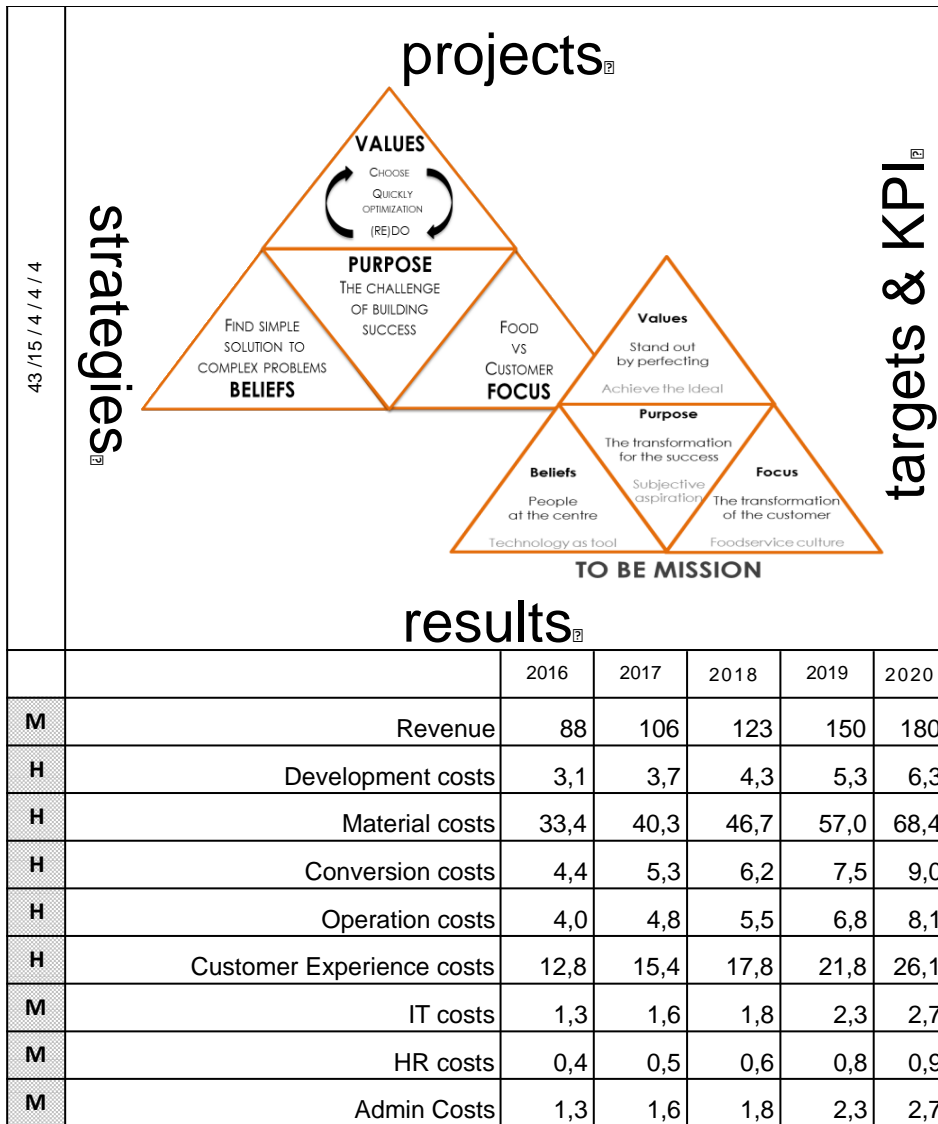


Exhibit 13 Value stream Profit and loss statement depicted from A3-X

Given the prospected revenue result the target of most of the relevant cost items is already chosen. Here all the line item have a precise target value for the prospected future, planning is not based on revenues and then see how the costs evolve, instead each line item has its own target cost, which is the basis of lean accounting. In fact the projections in Unox are made taking into consideration “how” value is created for customer and make processes more efficient by eliminating waste, non on the revenue growth basis, which is less relevant. The consciousness that the price is already set for the market put the focus on what can be improved, perhaps processes by eliminating waste and by dedicating the saved time and resources in order to increase value delivered to the customer.

This is a prospective milestone, this is not what the management realistically expect to achieve in term of revenues. Actual data are result of the financial part of the box score that reflects the results of the whole company. From that data are added few extra cost items that cannot be directly broken, since supporting function are not generally dedicated to only one value stream.

These costs are the Information Technology costs, Human Resources management costs and Administrative costs. At the moment is not useful for the company to break these functions for each value stream since the dimension of the company does not permit this separation.

2.5.5 Disclosure

As shown from the application above, strategy setting is declined firstly in projects, then in a KPI framework that is used primarily for directing actions; an effective control framework in this sense is necessary for a successful strategic deployment. Since the purpose of the company and hoshin kanri itself concern in following lean path, the integrated usage of hoshin kanri and lean metrics is needed.

Aforementioned project is directly linked to the lean culture since standardization phase in offices is natural consequence for a company after experiencing success in application of lean culture in the line. After eliminating the variability and introducing standards the office workflow start to improve and the employees are able to do more and do for useful purposes. Strategical interest in target costing reflects the need of having a lean accounting system that depicts the costs reflecting the lean improvements resulting from projects.

Since the continuous growth of the company the costs structure is still similar to the prospected one, but since is possible that there will be significant investments on the medium term for sustaining the growth, is arising the necessity to include in the hoshin kanri structure the usage of more detailed action plans which include the planning for resource usage and capital investments required. This higher level of detail may create more awareness in management and more savvy investments. This is why accounting measures have to be aligned with the discussed framework, to make conscious investments and align the purpose to the main strategic aim, not only taking into consideration financials, but also the operating and capacity measures that generate value for the customer, also significant relevance have the investment on people and learning tools that make the company able to grow and build a consistent culture.

3 Integration of lean office and lean accounting into enterprise to focus on lean performances

Lean office, up to now identifies the application of lean management of enterprise in several kinds of organizations:

- Operations' supporting offices (as project, administration, sales etc.) of industrial enterprises;
- In tertiary sector, like insurances or healthcare
- In PAs

Lean office measurements and techniques are similar to the ones used for production, 5S and visual management are important; the immateriality of the service is analogue to a productive system without inventory, variance and overload are waste likewise the production area. Efficiency and the Overall Equipment Efficiency can be measured even in offices (Tonchia, Napoli 2011). Total Productive Maintenance, the preventive maintenance intended in production is translated in the activities involved in the organization with the aim to make the service flow without interruptions. From the office point of view the OEE can be measured in 3 factors:

1. Efficiency: the actual productivity on the standard productivity
2. Quality: the conformity to the specified requirements of the output
3. Availability: the operative time on the total available time

The last requirement by the way must take into consideration the target level of saturation of the employee that must be saturated a little bit less of the maximum level to ensure the flow, and to employ some time to do kaizen activities.

Path toward lean must pass through the implementation of lean philosophy also inside offices; administrative and finance personnel must believe in lean philosophy to push improvement also from this side of the company. But there are also other areas that require lean improvement and other techniques are used, for example *sekkei kanri* is design framework that includes lean principles for design and development of projects. Lean philosophy must be rooted in the culture of the company and be part of every aspect and action posed from the people inside the company to achieve best results.

Lean office techniques reflect this philosophy and are thought in order to stabilize processes and generate efficiencies, usually the implementation on lean office techniques result in more stable and efficient processes inside offices, less errors and rework of documents or data and more employee satisfaction. The restructuring of the working environment through lean philosophy gives also the possibility of workers to get cross training session and start PDCA cycles to improve processes.

This new environment has also the effect of gaining involvement on people that uses the techniques and more satisfaction at work. Lean office must be considered strategic part of the lean improvement inside companies because can lead to radical changes in effectiveness of office job with relevant cost and time reductions. In growing environments these effect generate the beneficial effect to meet the increasing demand and the increasing office burden deriving from that.

Final aim is to save time by eliminating what is not value adding for the customer and saving time for doing value-adding activities.

3.1 Conducting preliminary analysis to find the current state of the office

To establish a lean office the first aspect to analyse is the current state of the office. Value stream mapping is a useful tool also for the office implementation. The value stream will make evident the “customer” of the process (which may be even an internal customer, think about supporting function like operations department or research and development). Once defined the current situation the starting point can be easily defined among one of the following steps proposed (Locher 2011).

The first step is **stabilize**; when the process is variable in terms of quality and times to perform the activities. The objective of this stage is to get a stable output, and to do so, the effort must be focused on the root causes that impair the stability, which may be the inadequate understanding of the customer of the process, which will have to wait for the output provided. Another cause is the poorly defined existing process, in this case different people may use different procedures to give the expected output and the final result may differ in terms of quality or time to elaborate it, in extreme cases the output may be even not the same depending on the person, which prepare it. In this case a specific process has to be defined (by formalizing a standard work and standard operating procedures which add details) for each person working in that office. Once defined this need, people inside the office have to be trained in order to listen the voice of the customer and give the right service, every time the service is needed.

Standardize is the second step to deploy in the office, once defined who is the customer and the relevance of serving what the customer needs and when him needs the service provided. Someone can question “why is important to standardize as long as the job is getting done?” the answer is that by standardizing the process is clearly identified in the value stream and it simplifies the work because by discussing the various alternatives that are used to accomplish the task, it is easy to find the best one among the used ones. By setting a standard the atypical conditions are clearly identified and can be solved promptly.

When standard are set for the recognised processes which are in the value stream, the office people may find some advantage in the third step, **visualize**. The key objective is to make the workplace a communicating place. Visual communication makes the workplace better manageable because relevant information is visually provided.

Once processes are stabilized and standardized and visual management is made in the office, the fourth step is the most important, the **continuous improvement** step have to start. Stabilizing and standardizing make the people aware of the rising problems that impair standard condition, but if people don't care improvement is not possible. For the accomplishment of the fourth step big effort has to be done by the managers, them have to be the first promoter of the continuous improvement and make the people engaged in the improvement process. If this step is not accomplished and there is no effort to improve, even the actual improvements can be lost. Also a safe environment for experimentation is needed.

3.1.1 *Muda detection in office*

Determining waste in production is a widely and consolidated practice in lean companies, which is done during the *gemba walks*, management people do this continuously even with consultants or lean master in order to extract them and improve process. More effort must be made in order to apply the same concept in the administrative area or office in general. Wastes in office are essentially the same 7 described by Ohno for production, plus the 8th which is very relevant, not only for the efficiency of the process, but also for the principle of empowerment of the people.

Wastes declined in office context can be described as follows:

1. **Overproduction:** by producing more information or service than needed, or even producing it without the right timing (think about over-detailed reports which lead to confusion and hiding of the relevant information, or think about financial planning too far in the future);
2. **Inventory:** the same concept of processing, everything that is not produced by using the "one-piece-flow" concept, instead by batching;
3. **Corrections:** human being make mistakes, so error can occur, but correction of these errors result in a loss of time. Processing an invoice in may take 5 minutes and, if issued wrong leads to lot more rework to correct an eventual mistake;
4. **Extra processing:** likewise the production area, and even more relevant in office, is important to distinguish the value adding activities from the non-value adding ones. Given the fact that most (if not all) of the activities made in office are not value adding for the external customer, have to be eliminated. Of course, some these activities must be accomplished for internal customers in the organization or for legal requirements, but is important to eliminate what is not needed;

5. **Motion:** consider the movement of office and service personnel to arrive to the archive, to the printer, or to move paper documents.
6. **Transportation:** the movements of paper documents or information by email
7. **Waiting:** customer or information waiting to be serviced or worked on, which are chained to other waiting of other people that may need the “piece” to work in order to go on along the information value stream or a service value stream.
8. **Underutilized people:** an added waste, which considers the underutilization of the office’s people skills and abilities by giving too narrow responsibilities, insufficient cross training or overly limited authority.

Make people aware of the different kind of wastes make them more proactive in the process of finding problems and consequently solution which reduce waste and improve the delivery of value for the customer.

3.1.2 *Lean Office techniques*

Lean in offices, administration and services may be considered even counterproductive because people blames that standardization is not always the solution by taking into consideration the creative part of the job, that not all the process are not standardized because the different situations that may occur and are not adaptable by a standard. This general kind of thinking is rooted in the consideration that the waste is not classified. While trying to classify wastes in office following the lean path, useful insights appear.

The first difficulty in establishing lean culture in the office is to overcome the mindset of the people working inside. To make easier the process is fundamental to make wastes evident and clearly identifiable, an early 5S program can make easier detection of *muda* and make people aware of the advantages of lean even in office. This kind of program is widespread among company but most of the time it comes as a procedure to adopt safety and good housekeeping rules. 5S are not only this but also a system that creates functionality and organized work environment, these 5S have origin from the Japanese words seiri, seiton, seiso, seiketsu and shitsuke that translated become:

1. **Sort:** to identify whether unnecessary items are present in the area and whether necessary items are present to do functionally and properly the duties;

2. **Set in order:** once identified necessary items, place them in the best possible location;
3. **Shine:** make the area clear of wastes and in good working condition, in respect of safety and good housekeeping standards;
4. **Standardize:** to put in place procedures and practices that have the scope of maintaining the other S working properly.
5. **Sustain:** by establishing discipline and keep using properly other four S.

At first glance, 5S program seems easy to establish but there is a lot work to make the office adherent to the aforementioned principles. Sort phase may involve only physical objects (in office may be a printer or the content of a toolbox) or also electronic objects like files and folders present in company's database.

Second, set in order have to be executed thinking about the best place for every item that maximize functionality. During this phase many objects can be relocated to check whether or not the location proposed is the optimal or not, then set a standard for each placement that remembers people where to place determined item, without a standard won't work. For example may be useful to use labels for placement of each tool or also images or a mold in which the tool have to be settled.

Third S in office, shine can involve make in order the working place making it safer and easier to keep it clean, it can involve straightening cables and preventing equipment damage or eliminate safety hazards.

Fourth S, standardize is the phase that establishes standards to be followed for firsts three S and set a parameter from which can be seen the abnormal condition.

Last S, sustain involve maintaining the other S working properly over time. Is suggested to implement the firth S (Locher 2011) by doing periodic audits of the area using a standard checklist and a scoring system, train new associates in 5S making them aware about meaning and purpose of this method and do periodic 5S kaizen events.

3.2 Lean Accounting, path to evaluate value streams

Many scholars argue that accounting practices, control and measurement systems have to be different from the traditional ones in the lean manufacturing companies because traditional ones bound firm financial results and decision-making (Maskell, Baggaley & Grasso 2011, Ruiz-de-Arbulo-Lopez, Fortuny-Santos & Cuatrecasas-Arbós 2013, Fullerton, Kennedy & Widener 2014). Lean accounting is generally defined as simplified accounting system that provides accurate, timely, and understandable information to support a lean transformation and improve decision-making. It uses visual measures and value stream practices to help maintain financial control (Maskell, Kennedy 2007).

Is increasingly relevant to focus on the goodness to fit to the business model in order to make an effective control framework that helps management setting the right measures to control, in this sense lean accounting fits the lean philosophy adding another piece of integration toward research of value for the customer. The fitness is stressed because measurements are useful only when are focused on improvement and direct people toward the desired direction, so management accounting function must be the communication vehicle among production and other functions, if this purpose is not well understood by management, the creation of control framework that support lean production will be weak and won't reflect what is needed to be communicated (Åhlström, Karlsson 1996).

Lean accounting practice seeks to eliminate traditional standard costing practices in favour of the *target costing* or *kaizen-costing* techniques, strategic cost management processes, which allow the company to understand prices without using the traditional practice of “cost plus profit on its head” (Jackson 2006). This happens because lean control framework focuses on value creation for the customer rather than maximizing production, so is useless to reduce costs without taking into account where the value is created. Rather than setting the price for the product that is unlikely to be possible given the fact the price is already set by the market, this accounting techniques starts from the desired profit, which will be deducted from the market price, the result will be the cost that the company have to achieve in order to be profitable.

Consequently is considered meaningful to consider and use lean measurements for lean enterprise as:

- ✓ Relevant and timely information that improve decision making process and also can be an effective tool to motivate people to improve continuously, sustaining lean transformation;

- ✓ A tool to apply to simplify accounting processes even in the respect of the Generally Accepted Accounting Principles (GAAP), guaranteeing the control efficacy.
- ✓ To focalize on projects and their ability to generate value for the customer, the ultimate objective for the enterprise, rather than focusing on standard cost product.
- ✓ To assess responsibility in the internal supply chain in order to follow the project objectives. (Cunningham, Fiume & Adams 2003, Solomon 2003)

“The biggest change at this point is the introduction of Value stream costing, which is used to eliminate most of the wasteful transactions associated with production control, materials, and product costing. VSC eliminates the need for standard costing and overhead allocations and creates a simple and effective cost accounting method (Maskell, Baggaley & Grasso 2011, pg. 21)”.

Change accounting practices may seem painful and difficult, accountant people will be always resistant to changes, as human being in all situations, but once implemented lean also in this part of the company, the relevant information provided by the new system rapidly can become a powerful engine that brings the power to go toward objectives and achieve better results. New focus on new objects can help decision-making in management meetings and make people focus on right measures. Starting point to make this important change is to assess the actual state, the as is state of the accounting office.

After first assessment, that usually reports traditional accounting methods, that support mass production, some effort must be given to new reports to assess value stream profitability; switch to value stream profit reports can be done by implementing it in parallel with standard reports for the first period, then use the new reporting system when stable and ready to be used.

Lean accounting focuses its attention on several key variables that affect the profitability of the company, which are not only the financial one but also operational and capacity variables. Taking into account also operational variables the quality of the product or the service provided is affected, value for the customer is maximized and long-term brand value increases. Reliance on only financial KPI lead the company to maximise unit sold without taking into consideration several other variables (Tillema, van der Steen 2015).

With the integration of lean office techniques already described, accountant staff has more available time to do value adding activities and focus on lean accounting improvement activities. During the first period of implementation, since the accounting process have legal requirements and changes require justifications, the new costing techniques can be used in addition to the traditional

one only for internal purpose. Then when the organization and the new approach are mature the company can make the switch to lean costing and demonstrate also externally the variations.

3.2.1 *Determine the lean maturity of the company*

To make lean accounting effective, first must be assessed the lean maturity in the accounting function of the company. Must be established if lean accounting is during early stage or management by value streams is already put in place. Then must be analysed if cost components are accounted in a lean way or not.

To support the Value Stream by accounting perspective, the standard costing is not able to understand the flow process, so there is the necessity for some adaptations, lean accounting provide its solution by assuming that overhead costs are related to the value stream as a whole and not to the production labour time and the maximum profitability comes from the maximum flow. To make it possible it eliminates the distinction among direct and indirect costs, which all are considered direct within the value stream and traces actual material and conversion cost to individual value streams (Fullerton, Kennedy & Widener 2013), then the relevant line items are:

- ✓ *Labour cost*, which is included irrespective of the function into the value stream;
- ✓ *Production material costs* (under the assumption that there is a low and controlled inventory) are calculated from how much material is purchased in the defined timespan by the value stream;
- ✓ *Support costs*, which are directly allocated to the value stream;
- ✓ *Revenue* is the invoiced amount for shipments from the value stream during the period;
- ✓ *Conversion costs*, which include labour, machine and supporting costs.

Given these data the *Value Stream profit* is defined by subtracting to the value stream revenues the material costs and the conversion costs. This method gives a result equivalent to the cash flow minus depreciation. The purpose of the value stream costing approach is to create the value stream profit and loss statement and a value stream performance measurement table.

Understood how lean line items correlate together to get to the bottom line of value stream profit, is useful to understand how each line item works and is accounted. Starting from labour cost which is traditionally recorded for each stage of work performed, the working hours are

accumulated on each work order and provide the basis to determine how much labour is included in each work order.

Since lean production aim is to avoid and eliminate variability, we can make some conjectures. For example we can track time of production for a stable work order and use this time as the standard for each similar work order executed. Some may argue that overtime have still to be recorded and by using this method some relevant information may be missed.

Lean organization adopt instead andon boards to keep track of problems, and if overtime is accounted is easy to spot the problem by going to the line and check these boards. By investigating reasons of these problem kaizen process starts. Second relevant line item is the material cost, this cost is usually accounted by automating the consumption of materials through BOM's and accurately record scrap and reworks; may be easier if material costs are accounted by only computing the materials bought over a given period. To compute with this assumption by the way the level of inventory must be constant and low, materials bought during the period reflect the consumption if these lean constraint are respected.

Some effort is needed to attach to each value stream the right support costs, in order to give real numbers accountancy team must divide support costs for each value stream; in mature lean company this computation is easy and straightforward since almost all resources are devoted to only one value stream, but in early implementation of lean in office monuments like the machine in production can appear. Difficulties occur when there are people working for more than one value stream, or function that work for all value streams. To solve this problem in an early stage is possible to divide the cost of each people for the number of value stream working for, but with time people have to be involved in only one value stream each. When all the line items are organized in this way value stream profit is easy to compute and accountants have lot more time to do value adding activities in the company.

3.2.2 Defining the value stream

Value stream consider all the steps taken by the business to provide the product or service to the customer, from first step up to the last, just by taking into consideration the flow of the product or service to be provided by the customer.

Value stream are defined as sequences of processes through which a product or a group of products are transformed and delivered to the customer (Haskin 2010), these processes are not only the production steps but must be included within all the steps that support the processes as the information and material flow. Here is where the money is made so it is important to deeply understand where the flow is hindered and where improvements must be made.

Value stream helps the people to focus on maximizing value for the customer and to make them accountable, especially the value stream manager for the operational improvement, growth and profitability of it. For this purpose the box score helps in showing the results by focusing on operational and financial measures on the actual state of doing and the future expected results. To create a value stream, as shown by Rother and Shook (2003), all the people involved must be able to read and draw it because it is also a communicating tool, like a language.

Mapping starts always from defining which product or bundle of products have to be taken into consideration, then draw the current state map, or rather the value stream as is up to now. The first step is defining the “demand” (starting point in lean thinking is the customer) then draws all the process. Once the map is drawn, it is easier to see which are the problems that obstruct the flow and to discover where improvement must be made, so it is possible to draw a new value stream map that describes the future state.

To initiate the continuous improvement in the value stream performance measurements are needed, to drive them in the right direction, so these indicators must monitor Lean effectiveness. These drivers must be used to focus on continuous improvement and not for firefighting purposes, to make this possible hard work have to be made in order to share and accept the lean culture among people.

Value stream mapping is widely used and proposed for production purpose in manufacturing area of the enterprises, and even “easy” to use because the wastes inside the process are easier to spot comparing to the service and administrative areas. A critical aspect of using the value stream mapping in the administrative areas with the right focus can distinguish the authentic lean enterprise from the superficial one, what is typically missing is the “link”; is critical to connect daily work to the strategic plans, in addition to the value stream management process (Tapping, Shuker 2003). Maskell (2011) provides a “starter set” of performance measurements made to reflect lean thinking that can be presented visually and is already used by lean manufacturing companies in a box score.

3.2.3 Performance measurements of the Value Stream

Box score is the framework for evaluating the effects of Lean by giving three categories of data, operational, resource capacity and financial. To evaluate a Value stream we need to analyse three main areas, the operational, the resource capacity and financial data. Starting from the operational point of view the following index are useful for understanding the overall performance:

Sales per person, the trend shows the value stream productivity, the ratio will be calculated simply:

$$\text{Sales per person} = \frac{\text{Value Stream Sales}}{\text{Value Stream Workers}}$$

Where the value stream workers are the people involved both full time and part time to the value stream, the part time workers easily distort the ratio, but in the lean enterprise the allocation of people in different value streams must be avoided as soon as possible. For highly automated industries an effective ratio may be rather the *sales per machine* in which the value stream workers are substituted to the standard machine hours available in the value stream.

On time shipment measures the percentage of orders shipped to customers and measures the level of control within the value stream, the ratio may be calculated by using alternatively the customer requested date or the company promised date. Is calculated by dividing:

$$\text{On time shipment} = \frac{\text{Shipments}}{\text{Scheduled Shipments}}$$

If data are available it is possible to use the on time delivery since here is shown effectively the value for the customer.

Dock to dock time indicates the flow of materials and may be calculated by:

$$\text{Dock to dock} = \frac{\text{Inventory}}{\text{Average rate of shipment}}$$

This index shows if the pace of the flow is increasing or not and the level of the inventory.

First time through measures the percentage of products manufactured in the value stream without defect or any kind of rework. This index may be calculated by process or for the entire value stream by multiplying the ratio of each process within, the second option by the way may lead to very low results since even if only one process among the others show high rate of defect, it will impact on the value of the entire value stream.

Average cost per unit is a synthetic index, which measures the overall productivity of the value stream given the chosen period (weekly or monthly) is calculated simply by:

$$\text{Average cost per unit} = \frac{\text{Value Stream Costs}}{\text{Units shipped}}$$

Value stream cost item is the comprehensive voice of all the costs, it is a valid indicator only if the products within the value stream are similar. This index represents the overall productivity and inventory will generate an immediate negative impact on it.

Account Receivables days outstanding measures the days needed to collect the money from the customer since the receivable is issued, the standard measurement is:

$$\text{Account Receivables days outstanding} = \frac{\text{AR balance}}{(\text{Sales for the period}/\# \text{ Days})}$$

Lean management also questions how much capacity is available in terms of people and machines to achieve the stated goals. Lean improvement initiatives usually are made to free capacity by managing process and make them more efficient, so it is useful to state how much capacity do we have and how this capacity is used. By resource capacity is meant the working hours of people and machines, given a specific period of time (this may be a shift, a day or a week). To understand how the lean initiatives have impact on the resource capacity we have to divide this in three categories:

1. Productive: where labour or machine time is spent in creating value for the customer;
2. Non-productive: all the other activities that does not generate value for the customer, for example scraps, changeovers, maintenances etc....
3. Available: time not used during the period for any of the previous activities, and so free to be used for new initiatives to increase productivity or save money by alienating resources.

These measurements provide a report, easy to read and effective from a Lean perspective of the development of each value stream. By combining together we obtain:

BOX SCORE		<i>Current State</i>	<i>Future State</i>
Operational	Dock to dock First time through On time delivery Sales per person Average cost per unit		
Resource Capacity	Productive Non productive Available		
Financial	Revenue Material costs Conversion costs Value stream profit Value stream cash flow		

Table 1 Box Score (Maskell, Baggaley & Grasso 2011)

While financial data may be unchanged given a selected period, the first block of data shows operational performance and the resource capacity shows how the lean improvements free capacity. This tool is useful to evaluate the impact of the lean improvements in a comprehensive manner, so facilitates the management decision-making process.

This bundle of index has also the advantage of being more quick and timely compared to the traditional controlling tools that rely only on financial data, which are periodic and may be measured even long time after the event.

Usage of box score can be useful to communicate in extensive way since indexes are easily understandable from every worker in the company; this tool provides quick and simple information and can be used to communicate throughout the company the results of lean improvements.

Most important, this framework reflects what the lean improvements do in operational terms of quality improvements, reduced delivery times and reduction of costs by elimination of waste. Without this kind of framework, effects of lean improvements may be not seen and management make corrective action in order to improve measured financials, perhaps harming the learning and improvement process started.

Likewise production, value streams must be identified even in offices environment, even though is more difficult to define each step and to determine idle times, is possible and makes another step that a company has to make in order to follow the lean path. Establishing lean techniques on the line is relatively easy; modify the business culture, make people aware of lean

practices and make them believe and practice lean philosophy, is another story. The path toward lean so passes also through offices.

What makes important the switch to value stream management and accounting is the timely and relevant information provided by the box score, once established frees time of accounting people who can start provide service to value stream generating value adding activities.

This new environment generates the need of a new role for the finance people, the traditional CFO must integrate into the value streams to gather and analyse data to become a value stream manager. The role of the Lean CFO is to provide a good understanding of relationships among operations, measurements, and financial statements. By changing measurement systems the CFO measures frequently and consistently the delivery of value for the customer (Katko 2013).

Therefore the role of the CFO is a key role in determining the “translation of purpose” from the strategic aim sentence to numbers or percentages, easy to determine with a powerful communicating effect on people working on that performance.

3.2.4 Measuring improvement

Lean accounting biggest aim is to make the people aware of the decisions that have to be made for the future, in this sense the measures are not backward looking and does not take onto account historical performance, rather focus effort on what must be achieved in the future state of art. The company is then focused on future improvements and the relative actions to perform. By considering the fundamental forward looking ideal for the performance measurement setting, for human capital inside the company, performance on improvement for people are consistent with the purpose. Continuous improvement becomes part of the company philosophy and by measuring it people is more conscious about the improvements made.

3.3 Business case application: Management Accounting Office in Unox S.p.A.

Lean philosophy is rooted in the Unox culture, processes in the lines are balanced, and operators and the consultants who work with them always seek continuous improvement. Since the continuous growth of the company, hiring process is almost continuous and people needs to be trained when enters into the company, also the company knowledge must be maintained and shared. To facilitate the process of learning for office people, to sustain the knowledge, and to improve efficiency, lean office procedures are used. We will examine the case of the management accounting office.

The office is accountable for the generation of various reports that support the managerial decision-making; data are collected mainly by SAP, the company ERP and elaborated in the controlling module, which elaborates the data to provide punctual values of costs for every area.

The structure is based on cost and profit collectors, and a supporting structure of internal orders. Each function into the company has its own cost collector and costs are attributed; further, functions like marketing, service and sales that have direct contact with the customer are duplicated for each relevant country in which the company sells its product and provide customer service. The profit collectors are depicted in order to organize the revenues flow for each business line. This kind of collectors is hierarchical and has three levels. First level is subdivided in the three main value stream of product produced which are accessories, spare parts and finished products, second level divides finished products in the various business segments (big ovens, small ovens, etc.) and the third layer divides the products by series (6Series, 5Series etc.). The last controlling item used is the internal order, which is used to collect costs for single events and for single R&D project cost or for each vendor or AMC (Active Marketing Chef).

The allocation of costs on these items permits the elaboration of detailed reports that explain the profitability for each country, product, customer etc. Also the production cost is tracked at piece level and labour cost is directly allocated to each product, which has a standard cost agreed with the company who provide the temporary workers into the line. Lean accounting is implemented since profit collectors' structure reflects value streams; labour costs are allocated with a standard agreed with labour provider after time and method measurement. Inventory level is quite low since the majority of semi-finished products come from certified suppliers which are Unox subsidiaries working exclusively for holding company, these suppliers are also closely located to Unox

assembly plant. In fact all of them are located in less than 5Km range from the assembly line but material cost are still computed by consumption in BOM's and scrap calculations.

Result of this structure is a detailed marginality report, which gives to management quarterly information about value stream revenues, margins and other insightful information. Data provided can give useful information about margins and help the lean accounting system to develop. Data are always an increasing number since the consistent growth of the company and the result is that the office needs to grow passing from only one-person requirement to more than one. Since this step requires higher level of organization, further standardization processes and internal communicating tools are required.

3.3.1 Actual State

Starting by analysing the actual state of the office during January emerged that the controlling functions have several problems that impair the possibility to work effectively for the company in a smooth way. Also the corporate controller gave up and on February 29^h left the company, this event generated the need of succeeding the role, that is not easy since the controlling processes have one owner, the dismissed controller, so all the knowledge acquired by the company risked to be lost because of this.

Emerging problems were:

- **Lack of communication with other functions**, since the company is dynamic and follows the need of the customer, most of the time ovens and replacement kits are customized and rearranged, which are not aligned with the rigidity of the ERP programs. This generates problems in costing procedures and usually wrong cost estimates are used because ERP data does not fully reflect real data.
- **Lack of communications generates misalignment with the company**; emerged that controlling department does not clearly know how the warehouse and distribution are managed; the business model is not clearly understood, so there is partial understanding of the cost allocation that are just communicated and executed.
- **Problems upstream generate the analysis of data cumbersome and time consuming**, given the lack of communication, problems are rarely understood, so remain unsolved or unclear.

- **Absence of standard procedures and stabilization of the workflow generates some criticism even on workload**, which is not levelled, idle time occur because of waiting from other functions of the documents needed for proceeding in the duties of the office and generates high load of work that starts late and generates backlogs.
- **Last but not least, lean culture is not spread in the controlling office, which is defiant**; the utilization of standard procedures and the lean philosophy are considered as a tool to permit everyone to do the job, to avoid skilled people do it. Lean philosophy and the use of lean office are not perceived as a way to empower people, instead is seen as a way to depower it.

The actual state in January was an office managed by one person without clear formalization of the procedures in value stream and standard works, in fact actual KPI for Unox's project "Map Processes & Activities, Standardize Processes & Activities, Measure, Improve TOP - DOWN, Improve BOTTOM – UP" are very low or even without all the required data to set the ratio compared to other functions

$$1. \text{ Standard Works Coverage} = \frac{1}{\text{To be discussed}}$$

$$2. \text{ Training Coverage} = \frac{1}{3} = 33\%$$

There is only one standard work and only one person out of three is trained for working in controlling office.

During 11th of January the management meeting decided to integrate the personnel of the office with the Operation managing director, to follow the formalization process. Management decided to put effort on the formalization of the procedures and the drawing of the information value stream for management accounting in order to save the knowledge and keep using the controlling functions. Three people then composed the new team, which were the corporate controller (up to 29th of February), the director of operations and an intern (me). Further, from the February 1st a new employee were hired.

3.3.2 Value stream profit and loss statement for hoshin kanri

All the aforementioned activities are executed in order to manage and elaborate data, which provide management the relevant cost items presented in the A3-X matrix. Mayor mean that

provide cost items is the ERP with the integration of some software tools that help collecting data, filled by employees and other tools like Qlik view that generates reports from SAP database.

Value stream profit and loss statement in Unox is still not automatically generated but it can be acquired by using some elaboration of data.

Unox has the characteristic of being flexible given the demand of the customer, so most of the time products are updated in their component, so the itemized list of products are updated frequently or are even newly created “ad hoc” if the customer asks for relevant quantities. This flexibility translates in higher complexity on creating cost calculations that have to be updated frequently and in a timely fashion to provide accurate information. Since the problem of lack of communication present, the actual state of art is that operation department follows the customer and does not communicate timely with the management accounting office about the updates. Relevant problems in the process are different, the most relevant were:

1. No itemized list is uploaded on ERP for the latest products;
2. Itemized list is uploaded but with wrong components;
3. Labour is not quantified for latest products;
4. First time used items are not quantified in monetary terms.

Most of the concerns are about the impossibility to track in precisely the cost of materials and labour cost for each piece produced in the assembly line. Even though the company considers that is using target costing, there is lack of understanding on what is missing in accounting procedures required to obtain quick data. Bills of materials are used for double purpose by the way; these are required for assembly line, which assembly using the pieces in the itemized list indicated. There is necessity of keeping track of bill of materials due to the high variability of the replacement kits and ovens assembled, sometime updates of BOM does not exactly reflect the items used for the assembly because of frequent change of version of products which are tracked with different product codes.

Since cost of labour is standard tracked, the first assembly trial of a kit or oven is used for acquiring the time tracking and gets the production cost of the oven. After some trial the average time of the various assembly is registered on the ERP and after that moment whenever an oven is produced a standard cost is assigned automatically. The aim is to get the max degree of detail about each different product assembled, in order to value its profitability and the efficiency of production line.

Another problem that impairs the costing procedure is due to the missing price of components that are received from controlled subsidiaries, is frequent that first pieces arrive in house and are used for assembly prior to getting a price for that. The price usually arrives at the time of the first receipt, which has an average lead time of about 5 days, during that time the prices of the components are still missing or not updated.

3.3.3 *5s in office*

Since the procedures are executed without some form of standards the idea was to track all the operations that the office does throughout the year, which were not tracked before. First of all, was implemented an early 5S program (Fabrizio, Tapping 2006) on electronic machinery. The office was physically arranged by the 5S technique and 5S was adopted on electronic database and procedures.

The first phase concerned the first two steps, **sort** and **set**. That concerned the controlling folder of files inside the database, all the items were organized in a way that is easier to use:

- Paths were shortened to the necessary length avoiding extra folders if not needed;
- Unused files were archived
- Folders were ordered following the flow of activities that are executed during the quarter.

Third step **shine** consisted in cleaning the database from files with no utility.

Arrived to the fourth step people in the office had to stop and think about all the procedures were done by the office. The **standardize** phase consisted in writing all the procedures on a standard format already used by another office in the company that tracks all the needed procedures that company needs to keep going. The first idea was to list all the procedures on the blackboard using a matrix form in which on lines were written the procedures and on the columns the frequencies.

Once the first process to be done were found, people started to elaborate procedures that explain in details how jobs have to be done correctly, to avoid reworks and errors that flows downstream and generate waste of time for understanding the problem. Standard works keep track of main processes, and then standard procedures add details.

3.3.4 Future state

To improve the situation we considered both internal and external topic of improvement, on the internal side were the following:

- Have a deep understanding of the functions of the office;
 - Identify the processes and contextualize in the value stream;
 - Standardize process and make the knowledge available to the company;
 - Create a calendar to manage the tasks.
 - Use the freed time to do value adding activities.

On the external side:

- Establish a timely communication with other functions,
- Sensitize other functions to give the needed documents on time, to ensure flow, or to understand why the other functions are not available to give the relevant information.
- Provide valuable information to internal and external customers.

To make the improvement possible the plan was to make a 5s program on database in order to make research easier and faster, it also creates the possibility to make better standard procedures to follow. Then standardize and map processes through the office and understand the linkage of each process with other functions.

To establish timely communication with other functions will be scheduled a series of meetings to keep the personnel updated.

During the planning phase of the improvement project in the office the most important aim was the conservation of knowledge of the dismissed personnel, to do so, the scheme proposed by Locher (2011) of lean office was planned to apply, with mutual consensus of people involved in the controlling office, the first aim was to understand and stabilize processes.

The first step had the aim to find all the tasks to be managed and **stabilized**, with the support of the corporate controller, people understood what to be done in order to maintain the function working for the company. The first result was written in the blackboard as shown below:

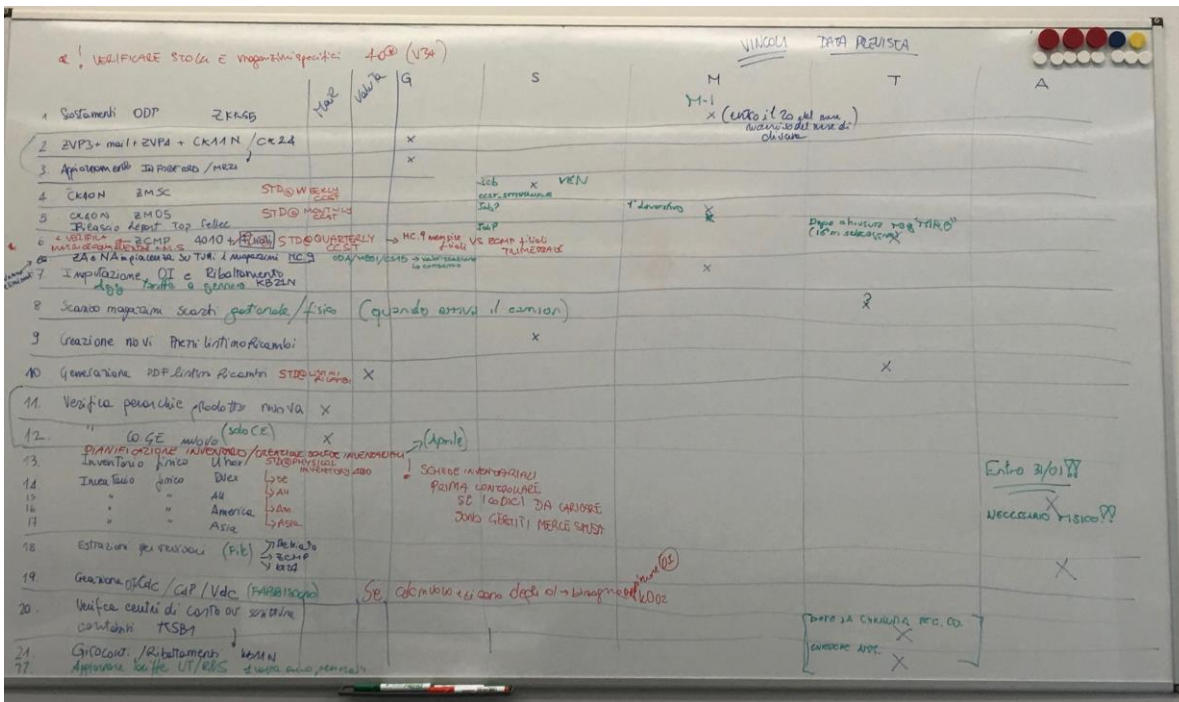


Exhibit 14 Calendar of activities

The most relevant processes were inserted onto the blackboard, accompanied with the frequency and some useful insights like the ERP transaction to be used and the prior requirements needed (from other offices or process to be done) in order to accomplish the task. Once the blackboard was fulfilled, next step was to try to make the job done, understand the time needed to accomplish each task and how to accomplish the task in the best possible manner. New processes were added in order to make the controlling office able to manage the information required by its own and avoid problems of waiting for the information. Most of the process were tested and tried but it was not possible to stabilize it at first glance, so the idea was to go on and start executing the second phase.

Here it came the **standardization** phase, in which corporate controller trained people for each of the task present onto the blackboard, since no one was fully trained. Processes were subdivided and each team member started to do the job of the corporate controller in its place. Each team member had the task to fully understand the task, analyse the time required to accomplish that and to elaborate a standard procedure. Since the people involved were new to the office also some question rose up on unsolved problems, which generated disclosure and a new approach in order to solve it. Given the situation the processes were not fully stabilized because of timing constraint, after the first step then the team members started to write down detailed procedures, which were

tested by giving to another team member who did not try the procedure in order to check the legibility and the efficacy.

If the person who followed the procedure could accomplish the task, that were validated and team could go on the drawing up of new procedures. During the early testing phase, procedures were checked with the supervisor who wrote it, and in many points the procedures were considered unclear and not useful for a new people who interfaced with it for the first time. After some elaborations the format of the procedure improved and as final result the written procedures were able to be read and followed step by step from each of the team members present in the office.

Given the partial fulfilment of the stabilization step, procedures were often long and included the step to solve the various problems, which can arise while doing the task. Other elaboration will be required soon, after stabilization of all the process. After this first step, an accurate analysis was needed to understand where, in the value stream are posed these activities, to understand the entire value stream, the first step was the drawing up of the part of the value stream analysed and start to pose question on how the process can be improved, by thinking about this, became relevant to understand upstream processes; here, the presence of former Operations Director helped because the question posed on process upstream concerning operations department have an answer.

Some failure of standardization of processes arrived soon, since the lack of experience of people managing the office, error occurred and standard procedures failed to keep the consistence of the processes since they are not stable and some changes occurred because of new problem arose on track. Experience teaches, and now is understood that stabilization of the process must be done right before trying to standardize, it have to be stable and only after stability is possible to make a standard and evaluate what is going wrong.

3.3.5 Act and follow up

After the first round of planning some corrective action had to be managed in order to fix problems and improve processes. Some rearrangements and were chosen in order to make the process flow better without less waiting and a KPI were set in order to get people working on that process focusing on relevant information to produce. In order to do so the controlling function centralized some information streams in order to make them flow and generate the correct information required. For example, since the external labour costs are not updated in the ERP,

controlling function took the task and fixed the process in order to obtain promptly information. An operational KPI for the labour cost determination was defined to make people focusing on the improvement of that performance.

KPI was set as the ratio among existing assembly codes without labour cost assigned (or with labour cost assigned at €0,01, which is a formalization to make possible the production through ERP but signals absence of pricing for employees) on existing codes:

$$\text{Labour assignment ratio} = \frac{\# \text{ Codes with assigned labour}}{\# \text{ Codes}}$$

After two months the percentage of codes with labour cost assigned passed from 50% to 70%. After some consolidation of the costing process, the percentage almost reached 90%. The process of improvement ran smoothly since no new product lines were added, but in period of high coding load the process can be impaired due to the higher demand rate for piece costing. Here is presented the scheme of labour assignment ratios subdivided by assembly classes. The result showed consistent improvement from January to June.

2016	January	February	March	April	May	June
X* Ovens	64,12%	66,74%	77,12%	83,13%	88,95%	93,73%
K* Spare Parts	43,75%	42,59%	69,87%	78,13%	82,13%	84,78%
J* Assembly groups	44,36%	43,01%	70,45%	81,15%	86,03%	87,43%
Average	50,7%	50,8%	72,5%	80,8%	85,7%	88,6%

Table 2 Complete cost calculation %

To further improve data quality another KPI were set for the account receivables lead times of registration, since most of the intercompany products bought for the first time enter without predetermined pricing and are directly used for assembly (most of the time are update of old components), the bill of material of the product assembled have a pricing bias and is undervalued compared to the real cost. To cover this issue more timely information of pricing is required and the estimated solution was to ask quick receipt to the suppliers in order to get the price as soon as possible. Lead time of account receivable then tries to focus on the time, which passes from the components entry to the pricing of those components.

Root cause of the low ratio was the communication gap among the information supplier (operation department) and final user (controller), the supplier have in this case to be sensitized in order to provide the information promptly and in a relevant manner, the introduction of labour KPI also increased the sensibility of employees on that matter.

A master calendar were crafted after having better understanding of the tasks and the result was the following:

Calendario	PDCA	Owner	TransazioneSAP	STD@W	Materials@	Giornaliera	Settimanale	Mensile	Trimestrale	Annuale
GestioneLavorazioniEsteme	●	L.P.	ZVP3/ZVP4	GestioneLav.	PRO_ZVP3	x				
CalcoloCostiSettimanale	●	S.C.	CK40N	WeeklyCost	PRO_ZMSC		x			
ScostamentiDDP	●	C.F.	ZKKS5	ScaricoCostoScostamenti	PRO_ScostamentiDDP			x		
CalcoloCostiMensile	●	L.P.	CK40N	MonthlyCost	PRO_ZM05			x		
CheckZAINAInpacenzaSuTuttiMagazzini	○	L.P.	SQ01+MC.9					x		
CheckCongruenzelPoloogiaMaterialiPresentiInMagazzino	○							x		
ImputazioneDIBRibaltamento	○	S.C.	LSMW	ImputazioneDIBRibaltamento	Pro_OI			x		
AggiornamentoTariffeLUT/R&S	○	S.C./L.P.			Pro_OI					x
VerificaCvSScrittureContabiliGiroconti	○	L.P./S.C	KSB1+KB11N					x		
AggiornamentoListatopSeller	○	C.F.			PRO_TopSeller			x		
RilascioReportTopSeller	○	C.F.						x		
GenerazionePDFIstiniRicambi	○	C.F.		ListiniRicambi				x		
CresionePrezziIstinoRicambi	○	C.F.					x			
Marginalità	○	C.F.		GrossMarginEBIT				x		
QuadraturaDC@Co.Ge.	○				Pro_Quadrature				x	
QuadraturaDimanenzeSchema	○								x	
SpeseRasporto	○									x
RibaltamentiPeriodici	○									x
CaricamentoCOPAlente	○				PRO_Caricamenti					x
CaricamentoCOPBase	○				PRO_Caricamenti					x
CaricamentoCOPAdatto	○				PRO_Caricamenti					x
ValorizzazioneMagazzinoEMP(4010)	○	S.C.	ZCMP+MC.9	QuarterlyCost	PRO_ZCMP					x
ValorizzazioneMagazzino(filiali)	○	S.C.	MC.9		PRO_ZCMP					x
ScaricoMagazziniCarti(gest/fisico)	○	L.P./S.C			PRO_ScaricoMagazzini					x
InventarioFisicoUnox	○	C.F.		PhysicalInventory						x
InventarioFisicoDux	○									x
InventarioFisicoAustralia	○									x
InventarioFisicoAmerica	○									x
InventarioFisicoAsia	○									x
EstrazioniPerRevisori	○									x

Table 3 Master Calendars

First column describes the activities to be done and on the right side the blue columns are crossed for the frequency. Second column represent the fulfilment of the PDCA cycle of any specific task, then there is the process owner for each task and then some useful details to help people accomplish the task. For example the calendar has the required SAP transaction to use for a task, then for further detail there is the hyperlink of a detailed procedure and the value stream standard-work.

Resulting situation provided a better understanding of management accounting function and better communication with other functions in the company improved operational KPIs that will provide more detailed and timely information. Stabilization of the processes and subsequent standardization freed capacity of the personnel that will use this time for value adding activities and make support to other functions.

All the action proposed and implemented was done in order to achieve better detail of costs and provide more reliable and quick data to management.

3.3.6 *Preparing the box score*

Once some time was saved due to the standardization of processes and elimination of variability, part of the time was dedicated to the application of lean accounting methods to provide lean information. First attempt is to complete the box score for the company by using data of the Marginality report, to check whether is possible to acquire all the relevant items from the ERP or if is necessary to make some adjustments to provide all the necessary data to gather information. For what is concerning the operational data the following indexes are calculated in the following manner:

1. Dock to dock is computed by dividing the inventory level of finished products for the number of units shipped for the period taken into consideration, the timeframe took into consideration is the month frame and for annual data is computed the simple average.
2. First time through data are collected by testing machine data, the data is collected only on finished assembly, then the value will be higher than the step first time through which can be consistently lower.
3. On Time delivery is computed by computing shipments on scheduled ones to detect failures of meeting delivery expectations.
4. Sales per person are computed by dividing value stream sales on the number of employees devoted to the value stream (assembly workers plus indirect employees).
5. Average Cost per Unit can be computed by using all the cost deriving from assembly, shipment and customer experience costs for the sum of units shipped.

Capacity data are given from the operation department who keep track of the productive capacity of each cell. Last block, the financial information can be elaborated by the marginality report directly. Unox also uses a more detailed value stream profit and loss since the indirect costs of each function are separately computed from the conversion cost which is considered only the direct labor. The resulting profit and loss is already mentioned in the previous chapter.

The structure of the Box score is the following:

Box Score		2015	2016	2017
Operational	Dock to Dock	611,6	435,6	340,0
	First time through	92%	95%	99%
	On time delivery	94%	91%	95%
	Sales per Person (€ Mln)	0,56	0,59	0,65
	Average cost per unit	911,35	907,52	897,06
Resource Capacity	Productive	69%	81%	88%
	Non productive	18%	12%	9%
	Available	13%	7%	3%
Value stream Profit and Loss	Revenues	75,0	88	106
	Development costs	2,6	3,1	3,7
	Material Costs	29,8	33,4	40,3
	Conversion Costs	4,2	4,4	5,3
	Operation costs	3,8	4	4,8
	Customer Experience Costs	10,2	12,8	15,4
	IT costs	1,4	1,3	1,6
	HR costs	0,0	0,4	0,5
	Admin Costs	0,8	1,3	1,6
	Value stream profit (€ Mln)	22,2	27,3	32,8

Table 4 Unox Box Score

Box score results showed the improvement on the Financial part but some critical elements are present in the resource capacity and operational indexes, in fact on time delivery is slightly decreasing from the previous period given the increasing volume of sales for the period and the resource capacity available is going under the 10%, provision of further increase impair this index so, some further improvements on eliminating nonproductive capacity is needed. Usage of box score can be useful to communicate in extensive way since indexes are easily understandable from every worker in the company; this tool provides quick and simple information and can be used to communicate throughout the company the results of lean improvements.

3.3.7 Skill maps of people

To have a comprehensive framework also a skill map for people is developed in order to make assurance that people is adequately trained for the role they have to cover in the company, the assessment is done in a scale varying from 1 to 4 and the assessment is made by self-assessment from the employee and assessment from the employee's responsible. The framework takes into account all the skills needed including soft skills, hence not only the relevant technical skills.

The following table represent part of the assessment grid from the performance required

OPERAZIONE	CONOSCENZA/HARD SKILL/SOFT SKILL	STRUMENTO PER IL TRAINING					RUOLI											
		CONOSCENZA	HARD SKILL	SOFT SKILL	TITOLO	DURATA (in ORE)	STATO	Supporto Logistica in ingresso	Accettazione	Supporto Produzione	Budget Contrattualistica	Rilevazione Tempi	Pianificazione Produzione	Pianificazione Ricambi	Qualità	KPO Fornitori	KPO Branches	KPO Uffici e Magazzini
GENERALE	Conosce la mission di Unox							1	1	1	1	1	1	1	1	4	4	4
	SA collocare i macro processi nell'environment Unox: uffici, produzione e logistica							3	3	3	3	3	3	3	3	4	4	4
	Conosce la business ambition di Unox							1	1	1	1	1	1	1	1	4	4	4
	SA collocare all'interno della mission skill, commitment							2	2	2	2	2	2	2	2	3	3	3
	SA che il coaching è un processo e quali sono le sue macro fasi							1	1	1	1	1	1	1	1	4	4	4
	Conosce l'importanza della comunicazione							1	1	1	1	1	1	1	1	1	1	1
	SA quali sono le macro fasi di assemblaggio di un prodotto							3	1	3	2	3	3	3	2	4	4	4
	SA cosa vuol dire essere un team							1	1	1	1	1	1	1	1	4	4	4
	SA utilizzare correttamente la rubrica telefonica interna e le regole di gestione telefono							3	3	3	3	3	3	3	3	3	3	3
	SA effettuato il corso sulla sicurezza con esito positivo							3	3	3	3	3	3	3	3	3	3	3
	SA con quali applicativi vengono gestiti i principali processi Unox							3	1	3	2	3	3	3	2	4	4	4
	SA utilizzare lo strumento (check con n esercizi di utilizzo strumento)							3	3	3	3	3	3	3	3	4	4	4
	SA quali sono le principali funzionalità del forno							2	1	2	2	2	2	2	2	2	2	2
	SA quali sono le funzionalità principali di un Bakerymap MiniMap							1	1	1	1	1	1	1	1	1	1	1
	SA quali sono le funzionalità principali di un Chefmap Mini Map							1	1	1	1	1	1	1	1	1	1	1
	SA chi sono i suoi report diretti e dei colleghi con cui collabora							1	1	1	1	1	1	1	1	4	4	4
	SA chi è la figura dell'ABC							1	1	1	1	1	1	1	1	1	1	1
	SA quali sono le principali argomentazioni di vendita dei prodotti Unox							1	1	1	1	1	1	1	1	1	1	1
	SA quali sono i macro step del processo di vendita al Dealer							1	1	1	1	1	1	1	1	2	3	3
	SA quali sono i macro step del processo di vendita all'End User							1	1	1	1	1	1	1	1	2	3	3
	SA quali sono i macro step del processo e le attività di cui sono costituiti							1	1	1	1	1	1	1	1	2	3	3
	SA quali sono i macro step del processo di spedizione IMPORTATORE e le attività di cui è costituito e ha preso visione							1	1	1	1	1	1	1	1	2	4	4
	SA quali sono gli indicatori che misurano il proprio lavoro e conosce i metodi e gli strumenti per raggiungere i target prestabiliti							3	3	3	3	3	3	3	3	4	4	4

Table 5 Extract of Unox Skill Map

The assessment is done taking into account all the relevant items and eventual discrepancies from the required to actual assessment are compensated with the projected training.

3.3.8 Disclosure

First objective of improvement in the management accounting office was designed in order to make the function aligned with the other functions of the company. Results showed that better communication and interaction among offices improved relevant information provided and helped the redaction of improved report to management. Time saved from the standardization of procedures gave people the possibility to give support to other and prepare other activities, such the support of studying the hoshin plan for future and make relations with numbers.

Redaction of box score showed how the big growth impacted on resource capacity and on time delivery ratio, which are problem to be addressed in order to keep competitive the business. Average cost per unit is slightly decreasing, which identifies an improvement in operational efficiency but have to be compared with the lower level of available capacity from the previous period. Given this three-perspective model the action plan included in the hoshin may be affected in order to address resulting criticalities. Without this kind of analysis, the relevant problem of capacity saturation may not be addressed on time and generate problems on later stage.

Skills map are effective tools used in the company by suggestion of Auxielli consultants to evaluate whether or not some higher degree of training is required from the personnel, this emphasis on training is generated from the need of having people always ready to make improvement and keep high level of commitment on the company purpose. Continuous training also reflects the principle of continuous improvement.

4 The link, lean management accounting for strategic management deployment

Starting from the quote “given our mission, how is our performance going to be defined?” (Magretta, Stone 2002) is suggested that performance measurement in companies are critical elements for translating the enterprises’ mission and strategy into reality. These metrics and performance measures have to be linked to strategy and to each other in order to be effective. Strategy is made useful only with effective performance measures; in fact these are relevant for three main functions (Melnik, Stewart & Swink 2004):

1. Control: effective metrics make managers and workers able to measure the performance of resources they are responsible for.
2. Communication: effective key performance index are able to communicate effectively in both internal and external environment what is important to be managed and valued
3. Improvement: metrics are able to identify gaps (actual performance versus the intended one), also with size and direction of it, that translates in information, feedbacks can be used to identify what is missing or what is wrong in the actual process that make the performance miss to achieve the intended one.

Management activity is made possible with performance measures, since “what gets measured, gets managed” (Drucker 1995) and communicating effectiveness of strategy is positively correlated with effective performance measures. If correctly set, measures are able to focus people on what is important and put effort on performances that affect the profitability of the company and the relevant operational critical items (cost, quality and delivery). Is correct to say that without a good performance measurement system is difficult to communicate and then perform strategy (Nicolaou 2003). Further considering the aim of a company which decides to implement hoshin kanri framework as strategic deployment tool, it cannot discern from lean accounting techniques since the bottom line analysed derives from the value stream mapping of processes, and related cost analysis differs from the traditional setting.

Managing by value stream impose the managers to take into account cost differently, there must be avoidance of cost splitting among different value streams, and workers have to be considered as cost for their wages and not for what is considered the standard cost for producing a

piece, activities can also differ; productivity as traditionally considered does not take into account the time spent in doing kaizen events, that are not productive time but value adding activities since there is a continuous research for improvement of processes. Managing a value stream is not only about measuring costs and revenues, managers must take into account also what is valuable for the customer, is worthless a cheap work if quality rate decrease and scraps or reworks multiply hindering brand value and increasing lead delivery. Is neither about pushing worker or maximizing productivity to excessive rates, also inventory costs and increasing the production and pieces produced, there is mayor need to allocate raw material and finished products; what lean culture aim is the flow, which makes unnecessary high level of inventory since good and quick suppliers are presumed to give the piece whenever is need with very short notice, and make also easy to detect defects since pieces to check are few. Maximization of production takes benefit from economies of scale, instead lean philosophy takes other kind of benefits that are increasingly relevant whenever flexibility and adaptability are requested to companies whenever customer changes its needs.

What must be established in a lean company is a performance measurement system that provides measurement for these relevant performances. When using a tool like A3-X in hoshin kanri, key performance measures are directly and visually linked with strategy, this format helps the drawing up of strategy and makes visual the link among strategy and performance indicators. It is itself a primary communicating tool over key performance indicators put inside the matrix.

To be effective, in lean companies, KPI's characteristics have to be consistent with the lean culture and fit the lean concerns; To understand which are the relevant key performance indicators must focus on which are the pillars of lean culture; starting from value creation for the customer the deriving action that a company does in order to maximize this value is to eliminate waste, then implement flow production systems, are better able to meet customer demand by using pull systems instead of push one and pursue perfection. This reasoning stress out those relevant performances must focus on

Traditional key performance measures make people focusing on traditional goals, which tends on maximization of production by being more efficient, effort is put on maximization of production. These objectives are not relevant for lean enterprises, which have to put their effort on minimizing cost by improving quality and delivery time. In this sense lean accounting measures put effort on operational KPI's, which take into account the quality like the "*first time through*" index or the lead-time of production and delivery like the "*dock to dock*" index. Improvement effort are directed toward value creation for the customer in this sense and are aligned with the lean culture,

by only considering the financials relative to this operational improvement, there may be no evident improvement, given the fact that cost are relatively the same per piece, but quality and lead time improved.

Lean strategy setting works only if the performance and control framework is set in order to manage the lean key performances that lead the people toward the proposed strategy. Unox makes the best effort to link its strategy to performance measures, the company culture reflects this approach and the will to make the strategy communicated by it through relevant performance indexes is strategic matter itself.

4.1 Why Lean Accounting?

The concern is that traditional accounting are designed to support mass production and push systems, are complicated and usually too late; instead lean accounting provides a bundle of tools that helps practitioners to make better Lean decisions, eliminate wasteful transactions and identify the potential benefits of Lean improvement initiatives, it also link performance measurements to the drivers of value creation for the customer. This is made possible because Lean Accounting applies the principles of lean thinking (value, value stream, flow, pull, perfection). *“Traditional control systems are the right answer for the wrong question (Stenzel 2008)”*, because the purpose of these systems is to maximise productivity, instead on addressing the maximisation of value for the customer, that is more relevant on the long run.

During the Lean Society Forum 2015 at Cuoia, one of the main points addressed is to “rediscover” the value for the customer, to this extent, focusing on customer instead of productivity as a critical success factor is becoming fundamental. The aforementioned framework provides a comprehensive set of data to support control system in managing people toward the desired direction, and support planning process by giving readily available and relevant data. Some research shows that discontinuing the traditional practice of variance labour reporting leads to lower labour productivity that in the short term impact on financial performance of the firm, but is also shown that when changing measures for valuating the labour such as scrap rate and customer reject rate, savings on material cost are made and effective and perceived quality of the product and brand value of the firm improve, even not quantifiable, these improvements on the long run can enhance the financial performance (Banker et al. 2002).

Lean accounting also provides easy method to get relevant information always available in a timely manner, basic features of performance measures so are fulfilled following the lean thinking. This permits the lean company to communicate its projects, mission and strategy in “lean language”. The three basic features of a performance measurement control what is relevant for a lean company, communicate in “lean language” and focus on right improvement, by discovering right problems, the right kaizen activities are addressed.

Lean accounting provides also a comprehensive framework, in which are present a set of performance indicators that are not only the financial ones. This set provides a broad understanding of the operative situation of the value stream and lean improvements can be managed and valued in

a consistent manner. Relevance of tracking operational and capacity performance is highlighted when using this kind of framework.

The increasingly attention posed on performances different from the financial ones, raises attention of people on quality issues that have direct impact on financials. Through the use of operational performance indexes, attention is kept away from the cost reduction itself, but instead drives through quality of processes and defects elimination. People are driven toward perfection, to create the maximum value for the customer, which is the lean philosophy biggest aim.

In this sense the usage of Box score keeps track of the performance index from different perspective, which are not only impacting financials but also operational and capacity performances.

4.1.1 Lean Accounting for Hoshin Kanri

Value stream costing system allows the valuation of the projects by converting them into money values. It translates the process improvements into money and integrates hoshin with budgeting and financial management by giving adequate measures for the decision-making from a lean perspective despite traditional accounting systems that cannot translate lean decision into money because miss to translate the five lean principles. Value stream P&L shows then in an understandable way, the business process and the cost items. Empirical research support that a simplified and strategically aligned management accounting practice is found positively associated with value stream costing, so lean firms that applies lean thinking to their accounting functions by simplifying and strategically aligning their management accounting practices are more likely to see the value and need for value stream costing, and provide direct product cost information for the value streams, supporting better decision making, also is found that value stream costing is positively associated with visual management (Fullerton, Kennedy & Widener 2014). Fullerton's (2014) research also supports the effect of the VSC on operation and financial performance.

The integration of Box Score further make available the operational and capacity situation related to the financials, in our case study the resulting box score shown improvement in financial performances but some of the operational and capacity ones were impaired. The provision of a comprehensive box score makes available relevant and quick information.

Lean enterprise maximise profitability and improves operational performance indicators like quality cost and delivery ratio, by means of reduction of wastes and improving overall operating performance of the companywide processes.

From a strategic point of view it creates an improvement-oriented environment; Hoshin kanri provide the tools for creating such environment and lean accounting methods gives the right direction for improvement and research through the elimination of the seven wastes.

This is made possible by directing people measuring both financial and non-financial measures that are relevant from a Lean thinking perspective and different from the traditional measures, in fact it is relevant that performance measurements are understandable from all the people involved into the organization and readily available in order to assure timely information when needed. People better understand the right direction toward customer value creation when is communicated through lean performance measures.

Lean accounting tools quickly provide readable data to help decision-making. Some scholars also argue that consistency among strategy deployment and accounting practices is needed in order to being effective (Nicolaou 2003). Also the integrated usage of both hoshin kanri and lean accounting provides a complete framework for the lean enterprise in which internal communication is effective and deployed to all the stakeholders.

The effective usage of hoshin kanri is deployed with the usage of effective key performance indicators, which are complimentary to the communication process and agreement for setting the strategy; by combining communication and relevant performance indicators the communicating effect is more effective. People receive more relevant information in order to achieve the goal, on the other side, the elaboration of an effective key performance indicator may be difficult when the performances to be controlled are not standard and if only one index can be complete (Simons 2013).

4.2 Final remarks

Given the results shown in the company some hypotheses can be prepared for further research. Hoshin kanri provides a framework for setting and making possible the execution of a given strategy throughout the company but is not sufficient to work in proper way without the usage of integration of management accounting procedures that are aligned with the lean purpose. In fact the strategy deployment purpose of hoshin kanri is devoted to the organizational learning and continuous improvement, which are objectives rooted in lean culture.

Lean accounting provides a measure that shows the relevance of operational improvements and makes possible to assess these in a comprehensive way. Case study shown that hoshin kanri needs to be rooted into the company and communicated extensively but during early stage of adoption the communication of the strategy generated some confusion to employees so top management decided to avoid this extensive communication and communicate strategy through most relevant KPIs, the exercise is time consuming and the effort made to make a comprehensive framework which includes all the proposed documents is not considered valuable enough during this phase of urgencies. Like other lean plans, lot of effort must be used and time is required to collect expected results.

Resulting situation showed on Unox case is that hoshin kanri is a tool, which adapt to the company profile like an exoskeleton. In the specific case Unox does not use the same framework proposed in the literature but adapt to his company culture the structure, on this structure accounting measures and other KPIs are integrated to form a comprehensive framework that keeps track of the company purpose and the results to be achieved with the relevant instruments. Further research is needed in order to establish the relevance of integration of the two frameworks and effects on decision making.

The usage of some of the tools of the hoshin kanri framework is not sufficient to enable the company learning through the company, therefore A3-X used by itself is not valuable enough considering the time consumed to redact this document, but stays at the basis for prospective implementation of a more complete framework, in fact lean accounting measures on value stream profit and loss are added and results are linked to projects and relative KPI for the purpose. Also the redaction of Skills map and the extensive usage of it for evaluation and improvement purpose for personnel generate the awareness of discrepancies from the actual versus the perspective ability of employees.

Lean accounting tools and value stream mapping integrate with hoshin plans in the costing phase and redaction of KPIs since these are thought and created by taking into consideration what is relevant for lean principles. Value for the customer is considered in order to generate meaningful KPIs. We can assume that usage of lean accounting measures in a visual manner through a box score and a value stream profit and loss statement make management easier to look on comprehensive manner the on going situation from different meaningful perspectives. Final result of usage of lean accounting techniques are shown inside the A3-X bottom panel, the value stream profit and loss, which shows impacts on financials deriving from projects already set. Final numbers set in this panel are the ultimate link among hoshin kanri and lean accounting, which work together to get the result of having an integrated and comprehensive framework useful for decision-making and policy deployment.

Strategy built on the hoshin kanri framework is supported by numbers that are the translation of action in results, these numbers does not take into account only the financials, rather check whether or not the company is aligned with the value creation purpose, lean accounts put emphasis on what is relevant for the company in order to generate value. In this sense operational and capacity indexes are added to the financial ones. These indexes are also able to make people aware of what is relevant for the translation of the company's purpose into reality.

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