**Q1**

‘Standardization is the sum of inter conditional actions and measures the lead to rational unification of recurring solutions.’ It is a lean tool, which makes an industry or organization agree that all relevant parties must be held to ensure that all procedures associated with the quality of a commodity or performance of a service are performed within set limitations. It ensures that the final product has certain quality. Standardization looks in two types, the management standards and operating standards.

In an industry, it would be desirable that all procedures are the same for the same product. Generally, standardization ensures that certain goods or performances are produced in the same way via set guidelines. It guarantees greater efficiency and liquidity for a commodity. Labour would be trained by the same way, therefore the costs of training decreased. Using the same production line and machinery would decrease the cost of fixed assets. Standardization also frees up time for employees to focus on more efficient processes, such as build to order, so that manufacturing companies can focus on improving response time and thus efficiency. As the flow speed of the production line would increase, the liquidity would rise. Standardization also supports other cost reduction methods, such as customization.

For a manufacturing industry, through the purchasing lever theory, manufacturers would reduce their purchasing costs significantly. If the purchase of parts and products is standardized, the inventory cost will be reduced. Since common parts are only stored and supplied when needed, material expenditures, required material planning or ordering costs could be avoided. Administrative costs, such as purchasing, storage, picking and billing, will also fall. It costs less to purchase basic materials.

Theoretically, more standardization means less picking and manufacturing mistakes, thus firm will face few quality problems. It would also be easier for manufacturing companies to constantly improve their parts and processes due to standardization, thus the outcome will have better quality and cost less.

Although the flexibility would decrease due to the standardization, as there are more restrictions, with standardized components work centers could be changed quickly because there would be no need to put away and restock as many components with switching products. With the help of new technologies, the standardization would be better managed for manufacturers and cost would decrease further.

The improvement of standardization is just part of sort, stabilize, shine, standardize and sustain (5S). Sort defines items that are needed to stay and to be removed from the workplace. Stabilize defines the exact location of all items in the workplace. Shine means actions that keep everything clean, and they are always ready to use. Sustain aims at constantly using 5S method and seeks to take root in the concept of working culture. As the 5S are widely used and could be improved inseparably interconnected, the standardization would have multiple significant effect in manufacturing operations.

**Q2**

**The Introduction Stage**

The introduction phase refers to the stage in which new products are originally distributed and are able to purchase after product development stage. Market for this product is infant, and consumers pay little attention in this product. Firms spends a lot in distribution and promotion. The profit would be negative or low. More money is used to attract consumers and build the stock. The term of introduction would take a considerable amount of time, as sales for this stage grows slow.

For marketing strategy, it is desirable to aim at the innovators who would be able and ready to buy. The camera supplier would choose a launch strategy that is reliable with the planned product positioning. Normally the market is not ready for developments or modifications at introduction, and product would be in relatively basic version.

Due to asymmetric information, the competitiveness of this market would be currently low or even zero. There are few firms doing the same product, therefore the supplier could have some monopoly power, although actually few, as there would be few demands. Cost-plus pricing could be used to simply recover the costs incurred. The goal of advertising should be to build product awareness among photographers and early users. To entice the trial, heavy sales promotion would be desirable.

**The Maturity Stage**

The maturity stage is the stage in which the product’s sales growth slows down or even stopped as market saturates after peaking. It needs a careful selection of product life cycle strategies, because maturity suppose to stay as long as possible to gain profit. There are increasingly heterogeneous camera parts to sell, thus individual sales growth slows down.

The obsolete and useless products would already be abandoned before reaching maturity. This overcapacity results in greater competition between those survived products. Supplier could cut price, keep advertising, promote sales and increase product development and research to differentiate from other products, a drop in profit generally occurs.

Business aim would be maximizing profit while prevent losing the market share. The most successful products are always modified to meet the changing consumer needs, therefore supplier would still research and develope to find new unique selling points. It would also try to boost consumption by finding new consumers and new market sections.

Even if supplier succeed to become a real monopoly, the market would remain dangerous as lower qualitied firms have the ambition to take over. Government would come out legislation to prevent it from abusing the power.

**Q3**

Triple bottom line is an accounting structure with three parts: social, environmental and financial. Sometimes it also refers to the relationship between people, planet, and profits. According to the triple bottom line principle, the green supply chain is defined as a sustainable development supply chain with organized economic performance, social performance and environmental performance. Say if a firm aims at profit maximization only, ignoring the environment and people, it cannot represent full cost of the business. Financial is simply the measurement of financial profit, environmental would be the environmental responsibility, and social would be the social responsibility.

Not only the United Kingdom but the entire globe is now trying to work out an environmental, social and economic friendly method to overcome the common daily needs.

The disadvantage of the diesel train would be noisy, relatively expensive, heavy and carbon oxide emission. Economically, the diesel railcar would be expensive to operate than electro railcar. The cost of daily operation would therefore increase. Diesel engine would be much heavier but weaker than the electro engine, thus there would be more fuel needed to transfer per passenger, and that makes the transportation inefficient. The working area for diesel engine would be dirty and noisy compared with electro, therefore labor has low welfare, and might claim more wages, which rises the cost.

In the railway business, the social demand would be relatively inelastic as it is people’s daily necessity. Therefore, it would be hard to switch to other alternatives. As it is more expensive to operate, the ticket price might rise, thus social welfare decrease. The diesel engine would generate a much noisier sound which causes sound pollution to the nature and the city. The workers might be easily get ill by the working condition. The massive external externality of the rise in ticket price and noise would be irresponsible to the society.

There are as stated environmental damage such as the carbon oxide pollution and the noise pollution. Global warming might be caused by the tail gas emission, and the noise pollution affects the health of humans and other organisms. They are undesirable and irresponsible to the environment.

According to the TBL accounting method, those stated irresponsible features are a huge cost for the business. Comparing with the better choice of an electro motored railcar, there are significant imperfections of the diesel engine. Therefore for a nation’s railway, it cannot be seen as a sustainable solution.

**Q4**

Poka-yoke means ‘mistake-proofing’. It prevents and defects avoidable mistakes from occurring.

**Poka-yoke Example**

A common example might be a magnet selector used to remove any metal from grains before packaging, so that it prevents the mistakes of accidentally drop or omission of metal parts that could cause low product quality because of the impurity or other likely failures during the process. During the production process, all raw grains would be transport and stir with a electro-magnet above the stream. The mission would be impossible to complete manually, because that would be overwhelmingly inefficient.

**Correct Type of Poka-yoke Application**

Poka-yoke could be solving proceeding, setup, operation and measurement errors, accidents, and missing or incorrect part, by contact method, fixed value method and the motion step method. The contact is based on sensing device detecting abnormal behaviors in shaping or dimensioning. For example, ‘steel pins on the fixture prevent incorrect parts from being assembled’.

Fixed value is used where repeat activities happens. Operators could track how often this activity has been performed. For example, ‘Light sensors determine if each crayon is present in each box, machines will stop if missing.’

The motion step is similar to fixed value in that the operator is responsible for multiple activities but instead the operator performs different activities, such as ‘a proximity switch opens after components are loaded in order.’

**Poka-yoke Approach in Manufacturing Environment**

In manufacturing environment, apart from reducing the production costs, there some other main purposes like avoiding waste, improve procession, increase product value and solve problems for consumer. They are part of the lean concept. Another part would be the Theory of Constrains.

According to the Theory of Constrains, ‘poka-yoke recognizes that there will be constraining factors that can slow down manufacturing and result in defective products.’ After the identification of constrains, manufacturer could use the existing resources to solve problems by adding the poka-yoke approach. This stops the constrains immediately and eliminating the chances of making mistake. The cost of making mistake, like stopping the production or facing prosecutions. This increases efficiency dramatically and thus benefits the manufacturer.

Some of the poka-yoke would be aimed at keeping the employees safe. There are warning signals, automatic cutoff switches that activated when misbehavior occurs. They are important because, in economic perspective, the cost of injured workers, includes the opportunity cost of being healthy and productive, the likely cost of industrial injuries scheme, and the cost of replacing the damages. Ethically and socially, the hurts which could be avoided would be undesirable and could be causing negative externality. In general, the effect of poka-yoke in manufactures are significantly important.

**Poka-yoke Approach in Consumer Application**

In daily consumer application, the basic use of poka-yoke approach would be to give warnings and prevent ageing and accidents. There would be parts that becoming unpredictably obsolete after a period of using the product. The warning function would be therefore used as a poka-yoke tool to notify the consumer where the mechanism went wrong. For example, the pressure gauge in car tire. This would again protect the customer from serious damage, accident, or changing of the entire product instead of only a component of it.

The cost of a warning system compared with the cost of an accident would be considerably negligible. For the economic perspective, the importance would be significant. The cost of negative externality to the society would be undesirable, therefore for the society, the poka-yoke tools are significant. The average cost of the tool per usage of the product would be considerably small, compared to that of an accident, so the opportunity cost of not having a warning tool would be way greater than having one. In conclusion the importance of poka-yoke for a consumer would be remarkable.

**References**

Mĺkva, M. and Prajová, V. (2016). Standardization – One of the Tools of Continuous Improvement. [online] ReseearchGate. Available at: Doi.10.1016/j.proeng.2016.06.674.

Business Automation Specialists. (2013). Using Standardization to Reduce Manufacturing Costs. [online] Available at: <https://bautomation.com/using-standardization-to-reduce-manufacturing-costs-benefits-of-standardization/>.

Bpminstitute.org. (n.d.). Standardization or Flexibility- Partners or Enemies? | BPMInstitute.org. [online] Available at: https://bpminstitute.org/resources/articles/standardization-or-flexibility-partners-or-enemies

Blog, W. (2011). 6 Ways for Manufacturers to Reduce the Cost of Production | Wholesale Blog - Blog for UK Wholesalers & Dropshippers. [online] 6 Ways for Manufacturers to Reduce the Cost of Production | Wholesale Blog - Blog for UK Wholesalers & Dropshippers. Available at: http://uk-wholesalesuppliers.blogspot.com/2011/05/6-ways-for-manufacturers-to-reduce-cost.html

Maximilian Claessens (2015). Product Life Cycle Strategies (PLC) and Characteristics - Managing each PLC Stage. [online] Marketing-Insider. Available at: https://marketing-insider.eu/product-life-cycle-strategies/.

Grout, John R. "Mistake-Proofing Production." Production and Inventory Management Journal 38, no. 3 (3rd Quarter 1997): 33–37.

Stewart, Douglas M., and John R. Grout. "The Human Side of Mistake-Proofing." Production and Operations Management 10, no. 4 (2001): 440–459.

Lucidchart. (2020). Overview of Poka-yoke in Lean Manufacturing. [online] Available at: https://www.lucidchart.com/blog/poka-yoke-in-lean-manufacturing.