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The Impact of Hidden Costs on Production and Operations

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Abstract

The paper is a conceptual research in hidden costs which are increasing important in the everchanging technology world. The worldwide manufacturing environment has evolved rapidly from only producing a narrow range of products to a wide range of customized products. While the world's attention is focused on the fight to increase productivity and develop new technologies to maintain manufacturing competitiveness, the change in this nature has called for a serious review of the existing cost management strategy and lead to intense focus on the less visible but every bit as critical to the cost incurred by the hidden factory of offline transactions. This paper identifies various elements and contributing factors of common hidden costs in production and associates the impact to the total product cost. Hidden costs cannot be eliminated completely but can be reduced. Hidden costs transform from one area to another and sometime they are essential parts of the manufacturing costs. This paper also discusses a case study on offshore outsourcing by using transactional cost analysis to reveal the additional hidden costs associated with the transaction where traditionally, people like to associate cost to physical units or activities, but not on the exchange of transaction. As the demand in hidden cost analysis increases, managers are aware that the existing cost system and direct allocation method is not capable to provide accurate cost information to help the cost reduction effort. Hence, classification of hidden costs and ability to transform them into visible cost becomes critical.

Keywords: hidden costs, production science.

I. INTRODUCTION

True cost and true price ensure a circular and inclusive economy that creates a visible value (Raynaud et al., 2016). Learning and recognition of hidden costs influence the organisation pricing decision and performance of the cost management (Nini & Zixian, 2014). Most of us probably have heard about the Titanic ship, the most modern, luxurious and complicated ship that was designed to be a marvel of modern safety technology and once; quoted as "unsinkable" by the press. But during her

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maiden voyage, the greatest maritime disaster in history began in a night of heroism, terror and tragedy where 1502 lives were lost. Captain Smith, captain on the ship was not able to detect the disastrous huge iceberg hidden underneath the sea and undermine the impact of the iceberg by looking only at the tip of the iceberg in an unusually calm and flat, "like glass" sea. Let's look back to the industry, isn't this history a good illustration of what is hidden cost in production and what will be the impact to the manufacturing competitiveness if managers do not take it seriously, or not aware about it.

While the world's attention is focused on the fight to increase productivity and develop new technologies, manufacturing managers today are quietly waging a different battle to conquer overhead costs. Larsen et al. (2013) identified that decision makers are more likely to make cost-estimation errors due to increasing configuration and complexity in offshore outsourcing. Miller and Vollmann (1985) indicate in their research that overhead costs rank behind only quality and getting new products out on schedule as a primary concern of manufacturing executives. Hidden costs are invisible costs associated to transactions that are carried out there by the people whose wages and salaries account for the total costs. But in the "hidden factory" where majority of manufacturing overhead costs accumulates, the real driving force comes from transactions, not physical products. Even in the offshore outsourcing, Qu and Brocklehurst (2003) argue that transaction costs are almost as significant as production costs. Hidden manufacturing overhead costs generally include equipment downtime, process setup time, rework, production scrap or waste whereas non hidden manufacturing overhead costs include labor turnover, absenteeism, mismatched compensation, managing corporate dishonesty, managing proprietary information, cost of quality, work injury.

Larsen et al. (2013) identified that decision makers are more likely to make cost-estimation errors due to increasing configuration and complexity in offshore outsourcing. Kaplan (1988) believe that most companies now recognize that their current cost system is only adequate to cover narrow range of products where cost of direct labor and materials can be easily traced back to the products, so distortion on using burden rate and direct labor allocation is minimal. But today where direct labor now represents a minor fraction of total cost and other overhead costs have exploded and grown significantly, the simplistic approach in categorizing and direct labor cost allocation is no longer providing accurate manufacturing information. Copper and Kaplan (1988) have developed an alternative costing method called Activity Based Costing (ABC) to respond to the deficiency of the conventional system and paint a right picture of the product cost.

1.1. Research Problem

Frick et al. (2013) analyzed that team work and performance linked pay on productivity, accidents and absence rates can create hidden cost manufacturing and do not necessarily increase worker productivity. As companies face up to the challenge of restoring manufacturing competitiveness, they usually turn their attention first to reducing the costs of the visible operations on the floor of the factories but neglecting less immediately visible but every bit as critical on overhead costs incurred by the "hidden factory" of off-line transactions. Managers had the perception that collecting such details on hidden cost does not pass a subjective cost benefits test because the costs are captured under others cost and will not be misstated in the final financial and tax statement, however the cost variance are likely to distort the major financial and

investment decision making in business world. Many companies now also recognize that their cost systems are inadequate for today manufacturing competition. System designed mainly to value inventory for financial and tax statements are not giving managers the accurate and timely information they need to promote operating efficiencies and measure accurate product costs. In short, the research problems are summarized as followings:

a) Lack of awareness and understanding of hidden production cost and generally transactional cost analysis.
b) Cost systems are inadequate to provide information to maintain manufacturing competitiveness.

1.2. Objectives of The Research

The objectives of the research are:

a) To identify factors and elements of hidden production cost that unattended but critical to maintain manufacturing competitiveness.
b) To provide in depth understanding and focus on transactions which generate hidden costs by using transactional cost analysis on offshore outsourcing.
c) To suggest on how to improve the current cost system to provide more meaningful information to the managers.

II. SURVEY OF LITERATURE

The survey of literature covers the basic understanding of direct and overhead manufacturing cost and classification of visible and invisible (hidden) cost that contributes to the total product cost. It also includes the elements, contributing factors and consequences of hidden cost in the production. The survey has been divides into a few categories such as hidden production cost elements and factors, transaction cost analysis and impact and cost management and system.

2.1. Hidden Production Cost Elements and Factors - General Information

Betancourt et al. (2016) found that online channels can separate costs of production, distribution and consumption of all distribution services across space and time leading to minimisation of hidden costs which plays an essential role in the sustainability of online channels. Miller and Vollmann (1985) stated that as companies faced up to the challenges of restoring manufacturing competitiveness, traditionally they turn their attention first to reduce the costs of the visible operations on the floor of their plants and factories. Generally, they are three approaches to manage the cost more effectively, firstly is analyzing which transactions are necessary and improving the methods used to carry them out, secondly increasing the stability of operations and thirdly relying on automation and system integration. However, automation and system integration must be selectively applied and not to cause any adverse effect. This paper has provided details explanation on how explosive growth of overhead costs is impacting company manufacturing competitiveness and what approaches can be applied to reduce the "hidden factory costs". This article only focus on logistic, balancing, changes and quality transaction, but these few are incomplete to provide an explanation to the total hidden costs in production. The explanation is too simplistic.

Azzi et al. (2014) conducted a multi-case study to understand how the holding cost parameter is currently computed by industrial managers and how much the difference between manual and automated/automatic warehousing systems impacts the definition of inventory cost structure. They found evidence that the kind of storage system adopted inside the factory can impact on the holding cost rate computation and

permit to derive important considerations. Yamashina and Kubo (2002) stated that one of the major manufacturing problems today is to reduce cost and maintain competitive advantages. In the industry, there are many programs introduced such as total productive maintenance (TPM), total quality management (TQM) and just-in-time (JIT). However, these companies discover that these activities do not necessarily guarantee cost reduction but worst case, manufacturing cost rises with the introduction of such activities, since each activity is not necessarily promoted with the finding a connection between its loss reduction and possible cost reduction. "Manufacturing cost deployment" is a powerful tool to identify production losses to reduce costs.

This method will focus on investigating various production losses and classifying them into casual losses and resultant losses, looking for the relationship among the losses and finding connection between various kinds of loss reduction, clarifying if the know how on each loss reduction is available and if not obtaining it if not available and lastly estimating the cost of reducing or eliminating each identified loss and putting priority to the loss items for the total cost reduction. This article is academic orientated without empirical study. The approach is not practical and very time consuming; most of the companies will find it hard to implement.

SEAM (social economy approach management) 4 leaf clover suggests that the interaction of the structurism (left leaf) and the behaviorism (right leaf) of the 4-leaf clover – within a company creates six families of potentially unhealthy social performance areas within the seventh arena of social economic spectacles. SEAM is therefore more interdisciplinary and incorporates these into accounting (hidden cost) and economic (hidden revenue) aspect of performance to reveal the elements that are hidden in the normal balance sheet reports available for decision making. The seven arena are working condition themes (WCT) of how jobs are designed vary by context, working organization frame (WOF) of how ideologies or idea system in play, 3C'sD (communication, coordination and cooperation dialogs) of how hidden cost accumulate from miscommunication, poor coordination and road block to cooperation, time rhythms (TR) of life script rhythm control, training cast of character (TC), strategic plots (SP) and social-economic spectacles (SES). SEAM suggest that the common hidden costs associated in an organization are mismatched compensation, downtime, rework, waste, opportunity cost and risk and understanding of surface and subsurface cost lead to an understanding of the root of the accounting problem. There are indicators of hidden cost identified on absenteeism, work injuries, staff turnover, quality defects and lower direct productivity. This model is simplistic and probably enough to explain on small business.

Leslie (2003) cites that the total cost of owning and managing storage varies greatly from company to company. IT administrators must weigh a number of factors such as customer needs and business applications when designing and implementing storage environments. An IT department that understands the hidden costs of unmanaged storage will most likely end up with a lower storage TCO. Many enterprises are not well aware that the unmanaged storage and excess storage capacity carry hidden cost in term of resources, infrastructures and physical spaces for both operational and administrative aspects. The hidden costs are not the costs of acquisition, but IT management and client/application downtime associated with expansion and reconfiguration. A critical piece of storage infrastructure planning revolves around optimizing a company's storage resources. Companies that understand the composition and drivers for storage costs and spend money to carefully plan an optimal storage environment can avoid downtime and thereby save money over time.

2.2. Hidden Production Cost Elements and Factors - Human Behavior

Von Siemens (2013) showed that intention-based reciprocity can explain reduced worker performance as a hidden cost of control if individuals differ in their propensity for reciprocity and preferences are private information. Not being controlled might then be considered to be kind, because not everybody reciprocates not being controlled with high effort. Similarly, Hinds (2000) state that technological company relies on employees to protect proprietary information from the clutches of competitors. In the effort to protect the company intellectual properties, few employees consider the affect of such constraints on employees' creativity. It is believed that firstly employees are less creative when they do not have adequate autonomy, secondly when employees absorb new information, it becomes integrated into their existing mental models and maybe difficult to differentiate from their existing knowledge. Thirdly, requesting employees to suppress information may strain their cognitive resources. For cost perspective, the study outlined in the paper suggests that there maybe hidden cost associated with asking employees to protect proprietary information. Without knowing it, organization may experience less creativity and innovation when they designate information as proprietary and restrict employees' ability to share information. This study provides an insight of hidden cost from constraining innovation and creativity and this is not visibly shown in the balance sheet but is visibly notice on the high turn over as employees are less motivated to generate new ideas. Their self satisfaction need is not satisfied. This article does not provide solution to manage company proprietary information, this is important knowing that managing proprietary information in a highly intellectual company is happening everywhere.

Cialdini et al. (2004) identified organizational dishonesty as a major reason for hidden costs than has been understood so far. They found that unethical practices vis-à-vis organizational stakeholders have far-reaching, negative internal repercussions. Such practices are difficult to trace and identify via typical accounting method. This article offers a new perspective in translating dishonesty in business practice to increased costs and this come in time with the recent major corporation unethical business fiasco. The author emphasizes more on negative consequences in external dealing, as a matter of fact, internal compliance to the business ethnic is also critical.

Prickett (2002) believes that the problem of labor turnover remain unresolved and over the years has taken on varied aspects and has attained a significant impact and which now calls for universal attention. Labor turnover is not only an industrial problem but it becomes a vast social threat. General separation has been classified as quits, discharges and lay-off and even these are not the same in nature, the cost associated to any form of separation is significant. The author believes that the causes of quits commonly given are wages, working conditions and perceived better opportunity, discharges are generally because of incompetency of one type or disciplinary reason due to insubordination, laziness and trouble making. Elements of costs associated to turnover are employment cost, training and instruction, waste due to unskillful operators, cost of decreased production and others like exit interview etc. The problem of labor turnover is a management responsibility; it resolves itself into two parts, one has to do internally with the improvement of working condition within organization and the others has to do with inter-industrial and social relations and is partly external. It is believed that the ideal of regular, continuous employment can be nearly realized if the problem is faced squarely by those who are in a position to promote its achievement. The costs of resources expansion and costs of labor turnover

is different and the differences are not being discussed sufficiently in this article. Many companies believe high turnover is equivalent to hiring more.

2.3. Hidden Production Cost Elements and Factors - Cost of Quality

Balafoutas et al. (2015) experimentally examine the impact of tax evasion attempts on the performance of credence goods markets and four that tax evasion attempts – independently of whether they are successful or not – lead to efficiency losses in the form of too low quality and less frequent trade.

He et al. (2016) quantified the hidden loss caused by quality deviations in manufacturing and uses it as a newly added constraint to optimise the burn-in time and systematically combine the fundamental loss of quality deviations in the optimisation of burn-in time, which supplements the commonly used optimality criteria, with the upstream loss of quality deviations in the form of manufacturing defects. Likewise, Venmans (2014) found that internal capital budgeting rules and studying of technical feasibility and profitability are relevant to understanding the barriers to the diffusion of energy efficiency measures.

Balafoutas et al. (2015) experimentally examine the impact of tax evasion attempts on the performance of credence goods markets and four that tax evasion attempts – independently of whether they are successful or not – lead to efficiency losses in the form of too low quality and less frequent trade. Moen (1998) reveals in his article that traditional approach of quality cost measurement is categorized into prevention, appraisal and failure (PAF-model) and mainly internally company focused and reactive by nature. Intangible and hidden cost of poor quality costs have been described as the most important one needed for management and can be accurately measured using the QFD (quality function deployment) matrix, intangible costs consists of customer dissatisfaction and loss of reputation cost. QFD matrix is not well recognized and accepted in the industry.

2.4. Hidden Production Cost Elements and Factors - Environmental Regulation

Wesseh and Lin (2015) found that while renewable energy may have inherent limitations such as seasonality of supply, low energy content and capacity factor issues, they still hold a significant amount of value which can only be detected when externalities are internalized, thus underscoring the need for external costs-related policies.

Satish et al. (2000) suggest that industry compliance with stringent environment regulation can significantly affect product costs in industries such as chemical, paper, steel and utilities. Brainerd and Menon (2014) explained in detail about the seasonal effects of water quality and the hidden costs of the green revolution to infant and child health leading to unhealthy conditions. Environmental regulations affect firms' costs in several ways which translates into visible and hidden costs, visible costs referred to costs such as installation and maintenance of pollution control equipment and pipe emission treatment, whereas hidden costs referred to costs incurred by imposing additional constraints on production technology or assembly process. Managers attempted to estimate and included all the environmental associated costs into the costing but find it difficult to isolate and measure the components. Managers had a perception that collecting such details does not pass a subjective cost benefit test because the costs are captured under other costs and will not be misstated, however the cost variance are likely to distort the major decision making such as pricing negotiation due to unclear cost categorization, product profitability analysis, plant shut down and major investment decision. Author does not provide plan or method to drive for

hidden costs avoidance or reduction, note that compliance cost is not able to be eliminated. Hence, sharing in reducing costs within the regulatory boundary is critical.

Morgenstern et al. (2001) cite that reported expenditures for environmental protection are often cited as assessment of the burden of current regulatory efforts and primarily based on information collected in the pollution abatement and control expenditure (PACE) survey conducted by the U.S. Bureau of the Census. However, the potential for both incidental savings and uncounted costs means that the actual burden could be either higher or lower than these reported values. Many previous analyses argue that reported environmental expenditures likely understate the true economic cost of environmental protection, however in contrast, the result of the article rule out any meaningful understatement on average and suggest, if anything, some degree of overstatement. Based on the analysis of four industries with high pollution expenditures, the authors estimate between $0.68 in uncounted saving and $0.14 in uncounted costs are associated with an incremental dollar of reported expenses.

2.5. Hidden Production Cost Elements and Factors - Downtime and Changes

Bell (2004) concluded that all assets in an industry are required to be within a certain limit of assets availability. The high prevalence of such ceiling covers the huge yet latent costs created by inadvertent downtime. Such costs account for 1-3% of revenue in heavy process industries. The cost of unplanned downtime can be categorized as lost of revenue where this is a typical result of demand exceeding supply, carrying excess capacity to address typical assets availability barriers and lastly disruption and recovery costs where cost associated with returning to normal business operations. With these three major elements of downtime being identified, a simple model can be developed to calculate the hidden cost based on amount of excess capacity available to recover lost revenue. Base on the examples provided in the article, the cost of unplanned downtime can be significant. However, if the availability ceiling can be broken, organization can achieve significant return. One proposed solution is to use predictive maintenance software which can identify emerging problems before they lead to unplanned downtime.

Brainerd and Menon (2014) explained in detail about the seasonal effects of fertilizers on water quality and the hidden costs of the Green Revolution to infant and child health leading to unhealthy conditions. Terwiesch and Yu (2001) suggest in their article that there is huge amount of hidden cost associated to process change in production ramp-up. Production ramp-up is the period of time during which a manufacturing process is scaled up from small laboratory-like environment to high volume manufacturing. During this scale up, the firm needs to overcome the numerous discrepancies between how the process is specified to operate as written in the recipe and how it actually operated at large volume. Most of the hidden cost come from area of changes where company need to further refine the current process recipe that lead to potential acquisition of new production equipment, upgrades of software and increase in automation as well as in the aspect of yield loss where carry major impact in process economic. Author fails to explain how copy exactly method can be applied across sites located at different geographical locations, different cultural value and background. The level of copy exactly is also not discussed in this article.

Venkatesh (2004) mention in his article that TPM (total productive maintenance) is a maintenance program which involves a newly defined concept of maintaining plant and equipment. TPM is an innovative Japanese concept where the origin of TPM can be traced back to 1951 when preventive maintenance was first introduced in Japan. The

goal of TPM program is to markedly increase production, at the same time, increasing employee mobile and job satisfaction. The 7 famous pillars of TPM are Autonomous Maintenance, Kaizen, planned maintenance, quality management, training, office TPM and Safety, Health and Environment. TPM brings maintenance into focus as a necessary and vitally important part of the business, it is no longer regards as a non-profit activity. Downtime for maintenance is scheduled as a part of the manufacturing say and in some cases, as an integral part of the manufacturing process and the goal is to hold emergency and unscheduled maintenance to a minimum. One of the important TPM pillar is Kaizen which pursue efficient equipment, operator and material and energy utilization, that is extremes of productivity and aims at achieving substantial effects through eliminating of 16 major losses in organization. The 16 major losses are categorized in losses that impede equipment efficiency, human work efficiency and effective use of production resources. It is believed that TPM can be adapted to work not only in industrial plants, but in construction, building maintenance and variety of industry.

This article only articulates the benefits of the program but short in providing information on implementation as well as timeline to implement. This paper is also not providing information on what are the criteria that organization must equip with prior implementation.

2.6. An Introduction to Cost Management and System

Kaplan (1988) stated that many companies are not aware that their company cost system are designed to value inventory for financial and tax statement and not providing managers the accurate and timely information they need to promote operating efficiencies and measure product costs. Generally, cost designers have failed to recognize that their systems need to address not only inventory valuation for financial and tax statements, but also allocating periodic production costs between good sold and goods in stocks as well as operational control in providing feedback to production on resources consumed (labor, materials, energy and overhead) during operational period. Inventory valuation systems divide labor, materials and factory overhead, most companies continue to use direct labor to allocate overhead even the direct labor maybe insignificant of total manufacturing cost.

Copper and Kaplan (1998) mention that managers in companies selling multiple products are making important decisions about pricing, product mix and process technology based on distorted cost information. In this article, the authors present an alternative approach, which refer as activity-based costing. The theory behind is to include virtually all of the company's activity exist to support the production and delivery of good services in the product costs. It is believed that an activity-based costing can paint a picture of product costs radically different from data generated by traditional system and these differences arise because of the system's more sophisticated approach to attributing factory overhead, corporate overhead, and others organizational resources, first to activities and then to the products that create demand for these indirect resources.

2.7. Transaction Cost Analysis and Impact

Qu and Brocklehurst (2003) use a transaction cost theory in this paper to conclude that transaction costs are almost as significant as production costs when it comes to offshore outsourcing. This paper outline an analysis of the role of transaction costs in supplier selection of offshore outsourcing between China and India. Transaction cost theory, which was pioneered by Coase (1937) and developed

principally by Williamson (1975) is based on assumption that human beings are utility maximizers and firms are profit maximizers. In pursuit of these objectives, agents are rational and sometimes display opportunistic behavior. All the literatures on transaction costs theory related to manufacturing rather than services and that services may be quite different. This paper explain the decision made to balance the saving made in production costs (because a supplier can provide the good/services more cheaply) against the transaction costs that result from outsourcing. These costs include operational costs (e.g. search costs) and contractual costs (e.g. the costs of writing, monitoring and enforcing a contract). There are two important factors for transaction cost, first is from the perspective of the transaction participants, transaction costs exist on both the buyers and seller sides. Second, the transaction cost can be divided into three types, type 1 is cost is compulsory cost, are those costs that both buyers and sellers have to pay, type 2 is complementary cost that only one side need to pay and type 3 which is win-win or lose-lose, costs that both buyers and sellers would either save or pay. This paper has demonstrated that transaction costs assume a much greater importance relative to production costs for offshore outsourcing as compared to onshore cousin. Yet, the difficulty remains that transaction costs are not as transparent as production and often term as invisible or hidden. This article does not provide hidden cost analysis on outsource management but more to initial sites selection phase.

Barthelemy (2003) mentions the seven deadly sins of outsourcing. In his research, he cited that while outsourcing is a powerful tool to cut cost, improve performance, and refocus on core business, outsourcing initiatives often fall short of management's expectations. Through his survey, author concluded that there are seven common mistakes or errors that most of the customers made. These are choice of incorrect vendors, wrong choice of activities to outsource, ineffective contract writing, underestimating personnel matters, lack of control of the outsourced activity and lack of awareness about the hidden costs associated with outsourcing and lack of an exit strategy. The hidden costs of outsourcing are an important topic for managers because they can challenge the rationale of outsourcing. It is suggested that while considering all the potential impact of the hidden costs, it may be worth the additional costs of hiring outside expert to manage the business. This author generalizes the hidden cost of outsourcing management and did not provide details explanation and quantify the magnitude in his article. Using transaction cost analysis is a good method to quantify the magnitude of the impact.

III. RESEARCH METHODOLOGY

This is based on conceptual research. This topic provides a basic understanding on the elements and factors of hidden cost in production, impacts and the effect analysis. The information and data of the research were gathered from many sources including journal articles from magazines, websites and other publications.

Insert Figure 1 here.

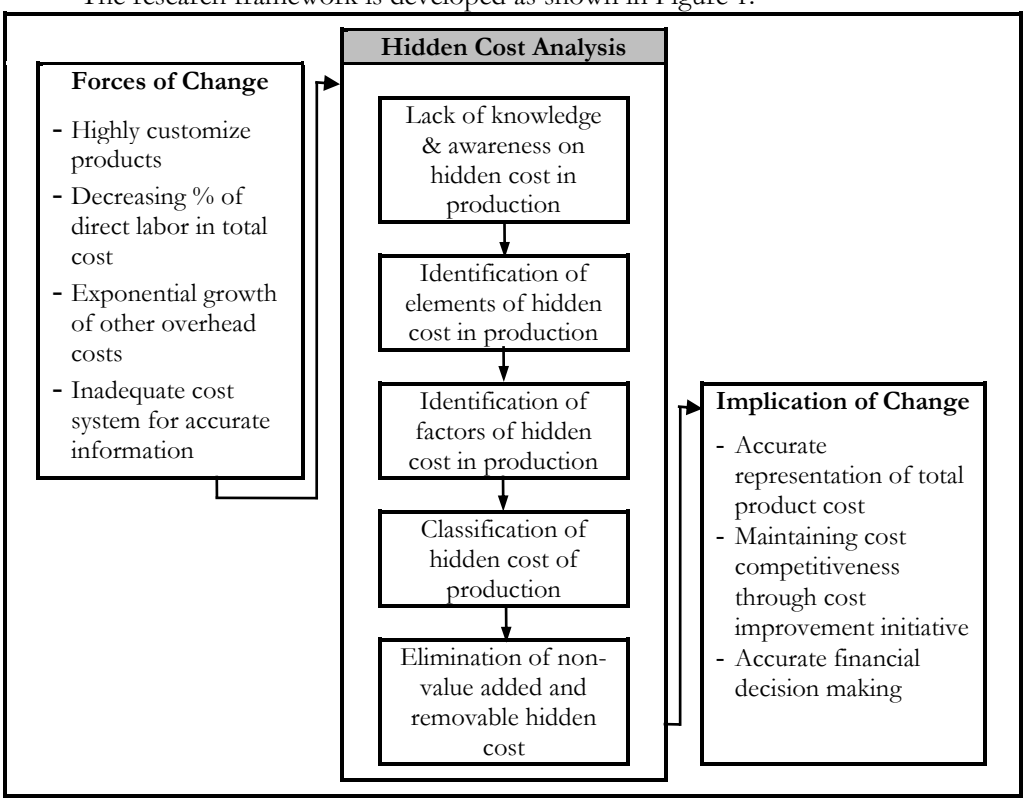
3.1. Discussion, Analysis and Finding

3.1.1. Factors and Elements of Hidden Cost in Production

Hidden costs or "invisible costs" are costs hidden in total product costs. It is undeniable that the world's attention is focused on the fight to reduce high manufacturing overhead costs. The indirect work now accounts for the lion's share of value added in most production based industries and in great dismay, most managers believe themselves to be poorly equipped to manage those costs. Hidden costs analysis become increasingly important as this portion of costs is often misstated and not

receiving the deserved attention. There is no clear definition of hidden costs in production; however hidden costs can be summarized as Figure 2 below.

The research framework is developed as shown in Figure 1:



Hidden costs can be summarized as Figure 2 below:

Factor	Element
Transaction	- Logistical - Balancing - Change - Quality - Vendor management
Conformance	- Conformance to environmental health regulation - Conformance to corporate policy of managing confidentiality
Social Process and Structure	- Labor turn over - Dishonesty - Communication - Rigid and bureaucratic management - Centralize decision making structure
Factory Shop Floor	- Costs of quality - Costs of rework/scrap/wastage - Cost of unplanned downtime - Cost of excessive IT storage

3.1.2. Transaction Cost Analysis - Significance

In economic and related discipline, a transaction cost is a cost incurred in making an economic exchange or transaction. Consider buying a product from the store; to purchase a product, your cost is not only the price of the product shown on the price tag itself, but also the energy and effort it requires to travel from your house and back, and the time waiting in the line, and the effort of the paying itself, and more if you spend time bargaining for the product; the costs above and beyond the cost of the product are the transaction cost. When we evaluate potential transaction rationally, it is important not to neglect transaction costs that proven significant.

In manufacturing sector, transaction cost is proven to be a significant part of the cost. Overhead costs do usually correlate with unit output, but does not mean that unit output "cause" overhead costs. Unit output drives direct labor and materials input on the actual shop floor that we all think of when we envision a factory. But, in the "hidden factory" where bulk of manufacturing overhead costs accumulates, the real driving force comes from transactions, not physical products (Miller & Vollmam, 1985). These transactions involve exchanges of material and/or information necessary to move production along but do not directly result in physical products. Therefore, it is important for managers to identify the basic types of transaction that are carried out there by the people whose wages and salaries account for the product cost.

In factory floor, basic types of transactions are logistical transactions, balancing transactions, quality transactions and change transactions:

a) **Logistical transactions**, which order, execute and confirm the movement of materials from one location to another location. These transactions are processed, tracked and analyzed by many of the indirect workers on the shop floor as well as by people in the receiving, expediting, shipping, data entry, data processing and accounting.
b) **Balancing transactions**, which ensure that suppliers of materials, labor and capacity are equal to the demand. The people involved in processing such transaction include purchasing, materials planning and production planning.
c) **Quality transactions**, which extend for beyond what we usually think of as quality control, indirect engineering and procurement to include the identification and communication of specifications, the certification that other transactions have taken place as they were supposed to, and the development and recording of relevant data.
d) Lastly **change transactions**, which update basic manufacturing information systems to accommodate changes in engineering design, schedules, routing, standards, material specifications and bills of material. Change transaction is often causing doing and undoing of the logistical, balancing and quality transactions and represents larger overhead cost in total.

3.1.3. Transaction Cost Analysis – Case Study on Outsourcing

Outsourcing is the process of subcontracting operations and support to an organization outside the company to replace the performance of the task with an organization's internal operations and it has become increasingly significant today. While it is viewed as a powerful tool to cut costs, improve performance and refocus on core business, management often overlook hidden costs that can seriously threaten the viability of outsourcing efforts. Zhonghua & Michael (2003) cite that the transaction costs are almost as significant as production cost when it comes to offshore outsourcing by using transaction cost analysis.

Transaction cost economics (TCE) suggests that two main types of outsourcing hidden costs:

a) Outsourcing vendor search and contracting costs. Search costs are the cost of gathering information to identify and assess suitable vendors. Contracting costs are the costs of negotiating and writing the outsourcing contract; both occur before the outsourcing operation actually takes place. From the perspective of the transaction participants, transaction costs exist on both the buyers and sellers sides.
b) Outsource vendor management costs. These costs can be divided into three types:
   (1) Type 1 costs, which are termed compulsory costs, are those costs that both buyers and sellers have to pay, for example communication labor costs for both sides, decision costs for buyers and special skill/knowledge-building costs for sellers
   (2) Type 2 costs, which are termed complementary costs, are those costs that one side pays and the other side saves, for example searching costs; if sellers pay for marketing and information publishing costs, its buyers will save their search costs.
   (3) Type 3 costs, which are termed as win-win or lose-lose costs, are those costs that both buyers and sellers would either pay or save, for example negotiating and monitoring costs. If the buyers and sellers trust each other both sides will save money, this is win-win. On the other hand, if buyers and sellers suspect each other then both sides need to pay more negotiating and monitoring costs. This is lose-lose.

The framework of the transaction costs involved in offshore outsourcing is shown as Figure 3 below:

Type of Cost	Outsourcer Side	Vendor Side
Compulsory	- Decision process - Integration and re-engineering - Contract writing - Communication	- Proving its delivery capacity - Proving delivery quality - Contract writing - Communication
Complementary	- Information searching - Communication - Transportation	- Marketing/Awareness - Reputation building - On site presence - Transportation
Win-Win or Lose-Lose	- Suspecting - Monitoring - Contracting - Regulating	- Proving - Responding to monitoring - Contracting - Government support

This case study has demonstrated that transaction costs assume a much greater importance relative to production costs for offshore outsourcing. Several outsourcing organizations are quite sure about the cost saving benefits of outsourcing. However, they are not always aware of the accompanying latent costs that can derail the outsourcing activity as a whole. Hidden cost exists even in outsourcing environment and this hidden cost management will remain as competitive advantages in future where everyone outsources their business. Whoever can perform better in controlling transaction cost and reduce hidden cost will achieve cost competitiveness.

3.1.4. Hidden Cost of Conformance

Many managers are not aware that conformance to stringent environmental regulations or corporate policies can significantly affect products costs in the industry.

3.1.4.1. Environmental Regulation

It is estimated that environmental protection expenditures comprise roughly 2% of GDP are often cited as assessment of the burden of currency regulatory efforts and a standard against which the associated benefits are measured (Morgenstern et al., 2001). However, little is known about how well these largely self-reported expenditures reflected the total cost increase that is associated with regulation. Environmental regulations affect firm costs in several ways. Typical accounting system easily identify, and hence separately capture and accumulates "visible" cost of environmental compliance, such as installation and maintenance of pollution-control equipment and end of pipe emission treatment costs. Most accounting system accumulates visible costs into environmental cost pools, separate from other overhead cost pools.

The total current costs are sum of visible costs and hidden costs. Hidden costs are those costs imposed on additional constraint on factory production technology. For example, the requirement in implementing lead free electronic product to the market has significantly increase cost of compliance from R & D, production, marketing etc. Accounting systems often fail to identify separately the incremental costs of such changes, and instead include them in the others cost pools. Regulation can also lead to external costs to society for which firms are currently not accountable, but which may become material in the long run, such as contingent environmental liabilities for toxic release etc. Environmental regulations can also increase general and administrative costs. For example, legal staff may be involved in regulatory activities such as applying permits, license and so on.

3.1.4.2. Protecting Proprietary Information

Another common area of conformance is protecting proprietary information in high tech company. Companies in the information industry often rely on employees to protect proprietary information from the clutches of competitors. In exhorting employees to protect proprietary information, employees consider the effect of such constraint on employees' creativity. There are several reasons to believe that employees may be less creative when asked to protect proprietary information. First, employees less creative when they do not have adequate autonomy especially intellectual group; employees are less motivated as they are not able to use some of the information that they hold. Second, when people absorb new information, it becomes integrated into their existing mental models and may be difficult to differentiate from their existing knowledge, hence employees are constraint and not able to make the most of the mind. Third, asking people to suppress information may strain their cognitive resources. The study by Hinds (2000) confirm the hypothesis that protecting proprietary information can inhibit idea generation and overall creativity and suggests that there may be hidden cost associated with asking employees to protect proprietary information. Without knowing it, organization may experience less creativity and innovation when they designate information as proprietary and restrict employees' ability to share information. Organization may want to consider these potential costs when assigning a value protecting proprietary information.

One common mistake that company always make is to overspend in the name of conformance. The cost structure is not carefully reviewed and status quo is not challenged and no innovation as no one would like to step up and taken accountability for any potential incident happens.

3.1.5. Hidden Cost of Social Process and Structure

There is a strong interconnection on social process and structure of an organization and there is a mutual casual relation between the structure/processes and

its embedded behavior and associated hidden cost. The common human behaviors affecting the costs are high labor turn over, employee dishonesty and poor communication. Meanwhile, the common structural problems organizations encountered are physical and organizational structure.

3.1.5.1. Labor Turnover

The problem of labor turnover remained unsolved. This problem is not new, but over the years has taken various aspects and has attained a significant impact which calls for universal serious attention. High turnover can be attributed to three main categories. They are resignations, discharges and lay-offs. The most common cause given for resignations are wages, working conditions and better opportunity elsewhere. Discharges are generally because of in competency of one type or other disciplinary reasons like insubordination, trouble making and laziness. Lay-offs are due to changes to manufacturing and business fluctuation conditions. Quits being the most prominent cause of turnover, with lay-off second and discharges last. Elements of costs must not only look upon as belonging not only to the period of accession but as extending over the training period. The costs of turnover, in any event, apply to replacements, and are costs necessary to bring the new employee up to the efficiency of the one whose place he is taking. The common costs are employments cost, interaction and training, breakage and waste, costs of decreased production and other costs like exit interview etc. Expanding the workforces incurred only employment costs but no turnover costs. The problem of labor turn over and associated hidden costs must not be undermined.

3.1.5.2. Organizational Dishonesty

Balafoutas et al. (2015) highlighted the efficiency losses evasion in the form of too low quality and less frequent trade, low marketing performance and additional costs to hide or uncover taxable transactions. All were due to tax evasion practices. Lackadaisical corporate governance practices have far-reaching harmful effect on the functioning of organisations than is usually acknowledged. The resulting damage can easily outweigh the short-term gains. Just look at what happen to recent business fiasco in US; Enron, Worldcom, Arther Anderson etc. Companies that deploy dishonest tactics typically do so as a means of increasing their short-term profits, and in that regard they might succeed. But, the misconduct is likely to fuel a set of social psychological processes with the potential for ruinous fiscal outcomes that can easily outweigh any short-term gains. In other words, organizations that behave unethically will find themselves heading down a slippery and dangerous fiscal path.

The second malignancy of dishonesty is mismatch between values of employees and organization. Employees with honest values tend to be unhappy in organisations that promote dishonest and unethical practices. They are understand constant stress due to the conflicting ethical values. It results in huge costs such as absenteeism, attrition, ill health, decreased job satisfaction and other effects. Honesty and ethics have to be demonstrated from the top, with senior executives setting the role model.

3.1.5.3. Structure

Organizational structures form a closed hierarchy to a networking organization. It is obvious that different structures promote or reduce operational efficiency. The most notorious structure practice in organization is bureaucratic system which is characterized by clearly defined hierarchy, manage from details rules and regulations and promote centralized decision making. The bureaucratic system often lead to attitude of bureaucratic to stick to the letter of the rules and procedures ignoring the spirit behind then or the purpose they are meant to serve and create social dysfunctions. The rigidity called "red tape" has often led to organizational efficiency.

The structure also often promotes or reduces rivalry. In a relatively hostile working environment, imagine the costs incurred due to miscommunication and poor coordination.

3.1.6. Hidden Cost of Factory Shop Floor

Most of the attention on the shop floor are mostly on reducing the costs of the visible operation on the floors of their plants and factories; mostly on the direct materials and direct labor costs, but the reality is all these importance – have long represented a decreasing percentage of the total value added by manufacturing. Cutting the explosive growth of overhead costs requires mastery of more than just what happens on the manufacturing lines. The most common hidden overhead costs are cost of quality, process changes, unplanned downtime, computerization and automation etc.

3.1.6.1. Cost of Quality

Moen (1998), recommended the necessity of a novel method to measure cost of quality as it was necessitated by the problems in studying and reporting the effects of quality enhancement efforts in a few Norwegian companies.

The cost of quality is the difference between the actual operating costs and what the operating costs would be if there were no failures in its systems and no mistakes by its staff (Bland et al, 1998). In other words, the costs of quality are "those costs that are incurred to prevent a shortfall in quality and a failure to meet customer requirements, as well as costs incurred when quality do in fact fail to meet customer requirements". Unwillingness of senior management to provide long term support was mainly due to their inability to estimate the benefits to the financial health of the organization as well as improvements in customer satisfaction and loyalty. In general, customers needs are not adequately addressed because the current paradigm in today organization.

Quality management has been increasingly significant; however many companies are still unaware of the negative consequences that coming along. The above mentioned hidden cost analysis is rather enlightening.

3.1.6.2. Process Change in Production Ramp Up

Production ramp up is the period of time during which a manufacturing process is scaled up from a small laboratory-like environment to high volume production. During this scale up, the firm needs to overcome the numerous discrepancies between how the process is specified to operate as written in the process recipe and how it actually is operated at large volume. The reduction of these discrepancies; a process that we will refer to as learning, will lead to improved production yield and higher outputs. This inter-temporal trade-off between learning to implement the current process recipe and the change of the process recipe itself in form of a dynamic optimization problem. An optimal policy of learning and process change which balance the long-term benefits of recipe modifications with the direct costs of change as well as the disruptive effect on knowledge accumulation is being derived. But, even if the modification come to zero financial cost, it can be desirable to delay their implementation because of "hidden costs of process change". The hidden costs appear in the forms of fluctuation in the product yield and outputs, resources to achieve a stable manufacturing boundary, learning curve and waste management etc. Industry practice of "COPY EXACTLY" is preferred for instant production ramp.

3.1.6.3. Planned Downtime

Total productive maintenance (TPM) is an innovative Japanese concept which introduces a total new maintenance concept. According to TPM concept, the greatest impact of equipment downtime is revenue loss due to low equipment utilization. The typical strategy to address this issue is to carry excess capacity; this will entail building a

plant slightly larger than necessary or carrying spare equipment to support the capacity. Another aspect is recovery costs associated with returning to normal operation. This could include overtime for emergency repair, spare parts, loss of product due to off-quality operation. Both solutions carry additional hidden costs.

Industry studies show that large complex assets typically achieve 85%-95% available and the non-availability is split evenly between planned and unplanned downtime. Planned downtime is a schedule maintenance where we evolved efforts from a reactive to a proactive method and use trained maintenance staff to perform planned maintenance. Unplanned downtime is breakdown and resulting in loss of capacity. TPM brings maintenance into focus as a necessary and vitally important part of the business. It is no longer regarded as a non-profit activity. Downtime or maintenance is scheduled as a part of the manufacturing day and, in some case, as an integral part of the manufacturing process.

3.1.6.4. Automation and Computerization

One of the most frequently discussed ways to reduce the overhead costs associated with the hidden cost is automation. Robots can have a role in sophisticated materials control systems that automate logistical transactions, lasers can read bar code and eliminate the need for data entry operators to record movement transactions manually; computer-aided-inspection (AOI) can help to reduce the costs of processing quality transactions.

Perhaps the most important means of automating transactions is using computer systems that are so well integrated that data need only be entered once. In virtually every large company, however there is still a massive redundancy of transactions due to the existence of subsystems that cannot "talk" or "communicate" to one another. These problems exist both within manufacturing and between manufacturing and other functions. Integrated systems offer more than efficiency; they can also improve accuracy. However, redundant transaction processing and record is not cost effective and carrying hidden costs of excessive storage capacity and IT resources.

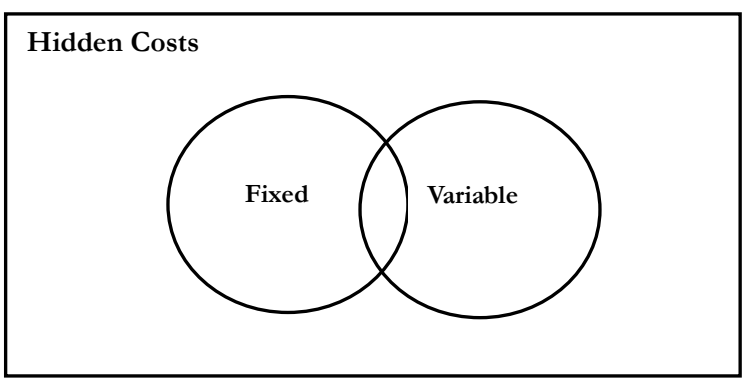
3.1.7. Classification and Behavior of Hidden Costs

Base on the research, it is suggested that hidden costs exists in all aspects and cannot be eliminated completely; like any form on energy conservation principle in physic, hidden costs transforms from one form to another form.

Hidden costs can be classified as:

a) **Fixed** - essential and indispensable due to multiple factors and hard to be eliminated.
b) **Variable** - costs that can be eliminated or replaced completely.

The relationship is illustrated in following Figure 4:



Fixed hidden costs are essential and indispensable; mostly refer to costs required due to policies and regulatory conformance. For instances, environmental capital investment and conformance to managing proprietary information belong to this category. Meanwhile, variable hidden costs are mostly inhered; this is the category that we will be able to invest effort in reducing or eliminating the hidden costs. According to the conservation principle, elimination is actually a transformation to another form and the significant part of it is the ability to transform to visible cost and provides an accurate representation of the actual costs structure. Most companies are taking serious attention in managing only direct material and labor as there are highly visible and easily identified. If we can classify the hidden costs and transform into visible costs, then we can take necessary efforts to battle this category of cost.

IV. RECOMMENDATIONS AND LIMITATIONS

4.1. Recommendations

The immediate challenge of hidden costs analysis and management is inadequacy of existing cost system. System designed mainly to value inventory for financial and tax statements to satisfy the board of director, shareholders and regulatory bodies. However, insufficient of accurate and timely management accounting information that the managers need to promote operating efficiencies and costs is not well recognized and adequately dealt with.

Betancourt et al. (2016) found that online channels can separate costs of production, distribution and consumption of all distribution services across space and time leading to minimization of hidden costs which plays an essential role in the sustainability of online channels. Activity based costing (ABC) provides a new costing approach to focus on activities as the fundamental cost objects. The costs of those activities become building blocks for compiling the indirect costs of products, services, and customers. ABC system makes more effort to allocate indirect costs to the products, services, or customers that caused those costs by separately estimating the indirect costs of each activities and then allocating those indirect costs based on what caused them. Each activity's indirect cost has its own and unique cost driver. Activities require more transaction are allocated more costs. Activity based costing is designed to provide more accurate information about production and support activities and products costs so that management can focus its attention on the products and processes with the most leverage for increasing profit. It helps managers to make better decision and encourages continual operating improvements. ABC is recommended in companies where producing wide range of products, highly complicated and customized and cost of overhead is high. By redefining the overhead cost structure into granular resolution, opportunity to identify, classify and transform the hidden costs to visible cost is high.

In our opinion, the future of digital world depicts astonishing growth. Knowledge economy is not going to expanded; but it is going to be exploded. In the context of disruptive technology, the way of doing business in manufacturing and services will be radically changing giving enormous room for the emergence of more hidden costs in the form of automation and robotics. Predictive and preventive measures are to be taken to curtail the presence of hidden cost by managing in an effective manner.

4.2. Limitations

Hidden cost analysis and management has not been getting the attention and focus that it deserved in today manufacturing environment. Most managers turn their

effort in reducing the highly visible costs but fail to understand the negative chain effect of hidden costs in the total product costs. The existing costing system has not able to provide accurate and impartial information to the managers. Companies are less interested as well as not knowledgeable on how to deal with the increasing significance of hidden costs. Very minimal empirical study on the elements of the hidden costs especially quantitative relationships of the hidden costs to the product costs. Managers can only learn the qualitative and behavior of the hidden costs.

Secondly, things broke down when it came to translating into action. Often, companies were looking for quick fix and neglected to follow an ABC initiative through to the end. Managers were reluctant to make efforts for collecting, analyzing and implementing fix as the effort is intense. Time is short and most companies cannot afford to take full advantages of the potential benefit of the hidden cost analysis.

V. CONCLUSIONS

Overhead costs grow explosively over the years in manufacturing environment where products range is wide, portfolio is highly customized and complex. This renewed trend calls for cutting the explosive growth of overhead costs requires mastery of more than just focus on reducing the costs of visible operation on the floor; less immediately visible but every bit as critical to the improvement of the overhead costs are the hidden costs. Managers today need to equip with good knowledge in managing the overhead elements especially identifying the "invisible or hidden" costs to maintain competitiveness. Without good understanding and knowledge of hidden costs factors and elements; the companies exposure to distorted costing information and high risk decision making. The story of world largest maritime disaster; Titanic will repeat in the same nature. Managers will be making distorted decision and redirect resources to the wrong aspects if they are not aware the impact and magnitude of the hidden costs; like the size of the ice-berg underneath the sea. Hence, the ability to focus in identifying the hidden costs, transforming to visible and implement plans to reduce the associated costs become a key to success in today.

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