

Lean Implementation in the Gauteng Public Health Sector

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Abstract--The preponderance of the South African populace has no access to adequate health care. Consequently, the Government concluded a requirement subsist for a National Health Insurance (NHI) scheme analogous to the National Health Service (NHS) in the United Kingdom. The study was undertaken in Gauteng provincial hospitals in Johannesburg, South Africa. The attainment of the objective is conditional on execution of value added services. Hence, it is critical to augment quality and efficiency of effort whilst containing costs. A unique and capable methodology ascertained in health care establishments is Lean, an improvement attitude and an array of philosophies initiated by the Toyota Motor Company. The research exposed Lean as appropriate in multifaceted knowledge work environment comparable to assembly-line manufacturing. Executed decorously, Lean transmutes the manner organizations behave and initiate a voracious pursuit for improvement. The paper delineates Lean philosophies as deliberate, signifying the vital vibrancy of Lean. The fundamentals isolated were, postures on continuous improvement, value creation, and unity of purpose, reverence for employees, visual tracking, and malleable procedure. The rationale of the paper is the discussion and exposition for creating a procedure for evaluating and improving Gauteng provincial hospitals. The mechanisms encompass a structure or exemplar for gauging, assessing, analysing and improving the hospitals.

I. INTRODUCTION

Confronting the international economic fiasco which commenced at the end of 2008, organisations globally struggled to sustain their continued existence owing to a reduction in their revenue stream and it became a significant concern. An additional anxiety for stressed concerns is the allegiance of consumers appreciably motivated through the amount they are prepared to disburse for goods and services. Enterprises proficient in decreasing cost, honing quality and creating a formidable relationship amongst their consumers, emerged as significant competitors within current market conditions.

Healthcare, analogous to production in addition to other service segments, were confronted by means of international competitiveness vis-à-vis price in addition to quality. An additional impediment confronting organisations is an upsurge in demand associated with the dearth of existing revenues. Research implies the existing healthcare systems necessitate essential vagaries concerning safety and quality difficulties. Diverse programmes were initiated in refining existing hospital processes and systems through reducing gratuitous process replications, protracted waiting times as well as the intervals of patient consulting a physician [1, 9, 12 and 25].

Certain of the processes are simple to utilise whereas further processes are more complex in nature, necessitating particular competences and proficiency from the staff harnessing it. The procedures and instruments are essentially a method realising a resolution of a prevailing issue or issues. A suitable combination embracing the appropriate procedures and instruments is fundamental to the realisation of improvement endeavours. The effect will be that the consequence of the improvement endeavours will be guaranteed and augmented. A range of lean procedures and instruments were incorporated by professionals applying lean six-sigma, together with the six-sigma instrument suite [2, 10, 16 and 30].

Additionally, it supports the detection of root causes of variations in the output quality attributes. The consequent outcome would be realisation of the central intention of a six-sigma agenda, namely variation eradication. [2, 11 and 25]. The fulfilment experienced and quality treatment gained by a patient are crucial criterions gauging the achievement for a public hospital. Safeguarding the perpetual evolution and capability of the facility, it is obligatory for hospitals to accentuate quality and effectiveness of assistance dispensed incessantly. The principal trial concerning the overall treatment practice safeguarding enhanced quality of conduct and swifter service at low cost.

Healthcare facilities endure the cost of lost consumers and inactive employees as patient discontent intensifies. Inadequate fiscal sources, represented by taxpayer's monies, are utilised ineffectually. The essential character of hospital processes necessitates additional capacity is amassed within the processes to afford the vital suppleness of reaction resultant in reduction of waiting times encountered by patients. Public hospitals are confronted by an increased appeal for just in time (JIT) health services from their patients. [7 and 11]. Researchers sought diverse hypotheses to enhance and develop process effectiveness and efficacy.

The DMAIC representation is proficiently appropriate to operate as an overall structure for process enhancement whilst concurrently entrenching lean procedures and instruments throughout individual stages. Value stream mapping (VSM) facilitates the exposure and enumerating value and non-value added operations afore and following enhancement endeavours. The differentiation of value, patients to be categorised as independent consumers and doctors and nursing staff as interior consumers of healthcare services, are conferred. Independent consumer prerequisites might embrace concepts such as effortless admittance to healthcare facility, brief duration in the healthcare facility,

timely procedures, naught medical oversights and an efficient and judicious release [8, 12, 21 and 30].

Exploiting DMAIC as a tactic, the analysis of processes should expose the following enhancement prospects:

- a. Process variability decreasing, thus augmenting deployment and moderating waiting times
- b. Augmenting or initiating homogenous guiding all the way through the process, through the initiation of sequencing rules, commencing limitations on the quantity of work in process (WIP) through the utilisation of a Kanban and supplanting batch wise functions with a single piece flow control
- c. Augmenting capacity and exploitation of employees and machinery, guaranteeing a level workflow with tolerable waiting times as well as decreasing cost for staff and equipment
- d. The refinement of a process's consistency and safety through the alleviation of the prospects of failure and creating a process that are vigorous
- e. The diminution of throughput times and waiting times through the detection of logjams and repetitions in the process
- f. Appropriate decline of cycle times for every activity through the augmentation of labour practices and processes [13, 14, 24 and 25]

The subsistence of data disparities in the approach, executives must expedite efficient lean knowledge processes and activities in healthcare facilities may be a motive for malfunctions. Studies advocate that hospital executives and supervisors is ill-equipped to afford staff members with the education and proficiency essential to foster a lean ethos and mentality [17 and 26]. The paper advocates a lean six-sigma conversion exemplar which will be able to be embraced by the healthcare institutes presently being scrutinised consecutively to fulfil their service charter. The paper further characterises the preliminary exploration embarked on in specific Gauteng healthcare institutes.

The awareness that enhancement prospects arise after an analysis of the procedure being deliberated differentiates the method enhancement hypothesis from rival methodologies to healthcare enhancement. An extensive empirical foundation of presentations concerning process enhancement dealing with healthcare is accessible and were exploited. The emergent text available was exploited additionally to deliberate the practices and approaches for process enhancement accessible to the healthcare milieu 31, 32, 36 and 40].

II. BACKGROUND

Historically the public healthcare facilities in South Africa mainly catered for the populace that could not afford health insurance. With advent of the new dispensation in 1994 the healthcare facilities had to cater for a larger section of the populace. Healthcare also became free for those that could

not afford to pay the minimum charge that was levied in years gone by. Since 1994 South Africa became a destination for larger groups of refugees from other strife torn countries in Africa. The majority of the refugees is unemployed and utilise the public healthcare facilities.

The government decided to implement a national health insurance that would be universal to every person in South Africa. It includes the persons that do have health insurance to cover their medical expenses. The healthcare facilitates had to cope with the influx of patients without a real growth in the budgets allowed to operate the facilities. Employees at the facilities further exacerbated the situation with salary demands that were high and drained scarce resources even further. The Chief Executive Officers (CEO) at a healthcare facility were expected to manage the facility in a manner that would ensure that the budget is fully utilised.

The result were that CEO's would have to cut back on certain services offered which in turn resulted in long waiting lists for certain treatments. It is not unheard of for a patient at an oncology unit to wait a year to be seen by an oncologist. Other services are impacted as well. The patients waiting to consult a physician start to queue as early as five o' clock in the mornings to ensure they do consult with the physician. The healthcare facilities does not have a functional appointment system, instead it is first come first served. Most of these patients are elderly or woman with small babies and children. Further exacerbating the situation there is a shortage of medical staff in the healthcare facilities which is a result of the low salaries paid in comparison to those in private practice.

The medical staff members are overworked and cannot consult with the large numbers of patients queuing at the facilities. Processes in the public healthcare facilities are almost non-existent. Patient file is not computerised but paper based. It entails that a patient have to get their file from admissions and join the queue. Filing is not done regularly and it is common place that a patient would have an incomplete file by the time he or she join the queue. The result is that physicians have to piece together what has occurred in the treatment of the patient where the gaps in information exist. The lucky patient who did consult a physician and were prescribed medication has to join another queue to fill their prescriptions. The process of servicing the customers is ineffective too.

The aforementioned is a few of the problems faced by the management, physicians and patients on a daily basis. The CEO's of four of the largest healthcare facilities requested assistance from the researcher in solving some of the more pressing problems. One CEO attended a workshop where the concept of lean six-sigma was discussed. He believed it would be magic wand that would address every ill experienced in the facility he must manage.

Within a short period of time he discussed the methodology with other CEO's. In this manner the researcher were contacted to discuss the implementation of lean six-sigma in the public healthcare facilities. The paper is the

result of the initial consultations with the CEO's and a tour of the identified facilities. The initial stage discussed in the paper was to sensitise the CEO and staff members to the inner working of the lean six-sigma approach and whether it could be applied to their institutions.

III. METHODOLOGY

Establishing reciprocally constructive research associations amongst the academic world and business concerns or health care operatives has been revealed as thought-provoking. Researchers isolated a communication disparity between them and organisations. Amongst business concerns a schism coexisted and was emphasised as the researcher's perspective and assessments in regard to staff members of organisations. The schism principally relates to the aims to be accomplished during the research projects. Generally, researchers and organisations founded their individual research domains, individual research areas of procedures and processes, individual customs of operations and transmitting findings [5, 6 and 13].

The features of action research have been acknowledged to be:

- a. The scholar and the staff members of the organisation acquire research capabilities related to data anthology, elucidation and understanding. Continuous training concerning research practises and procedures is embarked on by in cooperation to distinguishing the suitable methodology fitting the conditions
- b. Outcomes as a consequence of action research impact on the shared awareness of lean six-sigma and are imparted amongst appropriate participants to expand lean six-sigma processes
- c. Research questions are mutually defined by both parties
- d. Both parties share and shape their on-going, personal and critical reflections as an integral part of the research process
- e. Both parties collaborate in investigating solutions to industry based problems [18, 19, 28, 33 and 34]

In the preponderance of occasions a permutation of the approaches described is exploited by scholars. Furthermore, it is realistic to designate action research as a distinct, communal, proportional or layered approach. Grounded on the complex practice of action research, in the course of honest encounter together with organisations, scholars is capable of probing the lean six-sigma professional's communally created domains, customs, associations, communication and actions. Action research bequeaths the scholar with explanatory and essential appreciation of the societal and established character of fundamental procedures and lean six-sigma methods [35, 38 and 41].

Moreover, action research experiments proffer profound and enhanced enunciation conceptualisations than previously accessible. The methodology adjusts interactions amid elements and poses innovative notional frameworks to

appraise expansion and supplementary research into lean six-sigma. The test is to create clearer and progress to a lucid appreciation of what is happening in the often murky developments within the lean six-sigma approach. Added to the emphasis and latent categories of information action research findings engender, there is an exceptional feature to the method when action research is performed [19, 28, 33 and 34].

It will include all the important levels such as thinking, procedural and strategy. It proffers the greatest potential and viability foundation for cultivating lean six-sigma research commitment with the areas of procedures and processes. Conversely, scholars are permitted to unearth the innovative, the original and the unanticipated, incorporating the elements of understanding which were well researched and reputedly previously totally expanded. Moreover, action research criticizes and challenges conformist perception resulting in hitherto unanticipated tactical prospects can be unlocked for potential utilisation.

The action research convention is strongly positioned to transmute research outcomes into practical implications with which executives and other decision-makers can recognise and promptly grasp. Consequently, it will afford a stouter foundation for forthcoming execution of lean six-sigma projects. In conclusion, action research divulges the personal and societal realm influenced by the financial information that necessitates and could generate innovative practices of lean six-sigma execution. If executives select this course of action, it is conceivable to unearth information long forgotten or presumed already understood. Scholars and practitioners will be capable to challenge and modify processes and procedures to a grander magnitude than assumed hitherto conceivable [35, 38 and 41].

IV. LITERATURE REVIEW

A. Waste identification

The experience acquired following the application of lean philosophies at Toyota has profoundly influenced manufacturing enterprises in a broad spectrum of businesses. Throughout the preceding two decades, healthcare organisations appropriated operational enhancement instruments from the manufacturing enterprises lean six-sigma execution methodology. The dominant principle of the lean six-sigma methodology is to decrease or eliminate of waste in methods. Several researchers have characterized waste as any action not enhancing value to the patient experience. The deduction from the characterisation of waste would comprise actions patients will be reluctant to compensate the hospital for.

The motivation for this action is it does not significantly enhance the service demanded by the patient. The researcher had the opportunity to be involved with the four principal healthcare facilities in the Gauteng Health Department. The rationale was to acquire knowledge concerning existing processes and patient progress through said processes. The

researcher was capable to picture the processes and ascertaining the exploitation of processes by patients. Since the researcher was an impartial witness, the researcher was able to swiftly recognise the existing processes demonstrate the conventional eight wastes delineated by the lean six-sigma methodology. Table 1 exemplifies the wastes recognised by lean six-sigma as presently harnessed by the healthcare industry [1, 4, 8, 20, 22, 27, 29, 36 and 37].

Agility is an anticipated outcome of the lean six-sigma methodology. The two concepts should not be seen as one and the same. The principal emphasis of the lean philosophy is realising improved outcomes utilising fewer resources in guiding an organisation to be effective. Conversely, an agile organisation includes that it is capable reacting to precipitously transformation. A criterion for merging lean six-sigma processes, a business must appreciate the manner procedures and divisions in hierarchic businesses are assimilated. The structural splitting and amalgamation of roles advances the processes in three respects [8, 23, 32, 43 and 44]:

- a. A criterion for splitting is permitting augmented harmonisation and command of information in procedures. The splitting ought to occur within tasks and amongst tasks
- b. An explicit consequence subsequent to the splitting is augmented knowledge and augmented capability, from centring on fundamental capabilities
- c. Economics of scale will be utilised due to corporeal actions being disconnected from clerical actions for

instance scheduling. The result will be the corporeal actions will be merged

The lean six-sigma approach is a way of thinking in addition to a practice and systematized problem-solving approach. Quality, effectiveness and throughput is unceasingly expanded once management and employees collaborate on lean six-sigma projects. In exchange it is guaranteed the patient experience a quality service. The ensuing has been acknowledged as lean six-sigma values and terminologies:

- a. The unremitting enhancement characterised by a Kaizen event as well as the quest for perfection. The requirement of the worth anticipated by the consumer which is epitomised by the patient and the monetary value the consumer would be agreeable to reimburse the supplier for the service
- b. Eradicate waste or muda altogether which were recognised in the activity. Muda is characterised by wasteful actions not adding value to the patient as illustrated in figure 1. Extricate value stream for manufactured goods or service, delivering the value and interrogate every unproductive action
- c. Realise level, even, uniform and incessant workflow characterised by the values of heijunka. The values of heijunka guarantee the process has an incessant movement. Homogenise processes utilising best practice and permit processes to perform efficiently, releasing time which would permit employees to be inspired and pioneering

TABLE 1 – WASTES IDENTIFIED IN HEALTHCARE INSTITUTIONS

Waste	Description	Examples
Overproduction	Processing excessively	Voluminous documents set up afore influx of patients, demanding superfluous examinations, maintain backup appointments in the event of unanticipated emergency
Defects	The system creates: Oversights Slip-ups Modifications	Half-finished patient documentations, treatment slip-ups, readmittance consequential to a malfunction in release process, replicating examinations since erroneous data was presented
Inventory	Retaining abnormal volumes of inventory	Caches of expired medications, unavailability of wheelchairs (Stock-outs), patients not released on time, lengthy schedules
Overprocessing	Exceedingly convoluted processes	Patients replicate identical data at numerous junctures throughout separate phases
Transportation	Transport objects several times superfluously (squandering energy)	Numerous passing on of patients and their data amid several professional employees, employees crisscrossing the ward gathering charts, a common store for frequently consumed articles alternatively positioning it at point of consumption
Waiting	Employees or patients waiting	Awaiting: patients, theatres, examination outcomes, treatments, drugs, doctors to consult or release patients
Motion	Patients relocated pointlessly	Hither and thither relocation amongst assessment areas and waiting precinct, employees tracking misplaced articles and apparatus, needless employee motion tracking mislaid notes, absent essential apparatus in each assessment area
Unutilised people	Employees not utilised maximally	Trained employees complete clerical functions

- d. Design mistake impervious processes by harnessing the methodology of Poka-yoke. Initiate pull amongst each stage wherever incessant movement in the process is unattainable. Emphasise the requirement as stated by the patient to activate actions in reverse throughout the value chain.
- e. Inspire employees functioning within the processes to distinguish deficiencies and close down the procedure when deficiencies transpire characterised by the methodology of jidoka. Administer processes with respect to excellence guaranteeing non value adding actions is eradicated from the value chain. The consequence is the extent of the actions, extent of the time and material desirable attending to the patient is constantly decreased.

Due to the requirement placed on processes the movement of commodities, epitomised by the patients in healthcare, is anticipated to be executed through a homogenous approach displaying elevated levels of effectiveness from a lean six-sigma system. Consequently, newly enhanced processes are adaptable in sustaining diverse prerequisites and fluctuating circumstances. The processes symbolise sections of a conundrum and is resolved with distinctive protocols.

Resolving the difficulties is reliant on the amount of processes to be coalesced and the manner it will be attained. The prerequisite for lean six-sigma process stratagems is to be coalesced in distinctive manners to support the strategy for processes aimed at the vital yield emphasis [24, 29, 45 and 46].

In the healthcare industry the foremost function of lean six-sigma supervisors are the resolution of the predicament explained earlier by generating an evocative single-mindedness and well-defined ambition. It frequently transpires in the course of identifying vital lean six-sigma problems; it is affected by social factors. Frequently an organisation rigorously dedicated to provide enhancements, is loath to experience further problems demanding to be resolved. Subsequently, precious chances to transform processes are wasted and persist with malfunctioning processes, impeding the proficiency of the organisation and bring about excessive costs. Equally, if the philosophy is resolute on delivery and effectiveness, more unequivocal intercessions may well be essential to inspire transformation in the environment and conduct of staff members. Figure 1 illustrates the preliminary prerequisites for challenge differentiation [7, 12, 17, 39, 47 and 48].

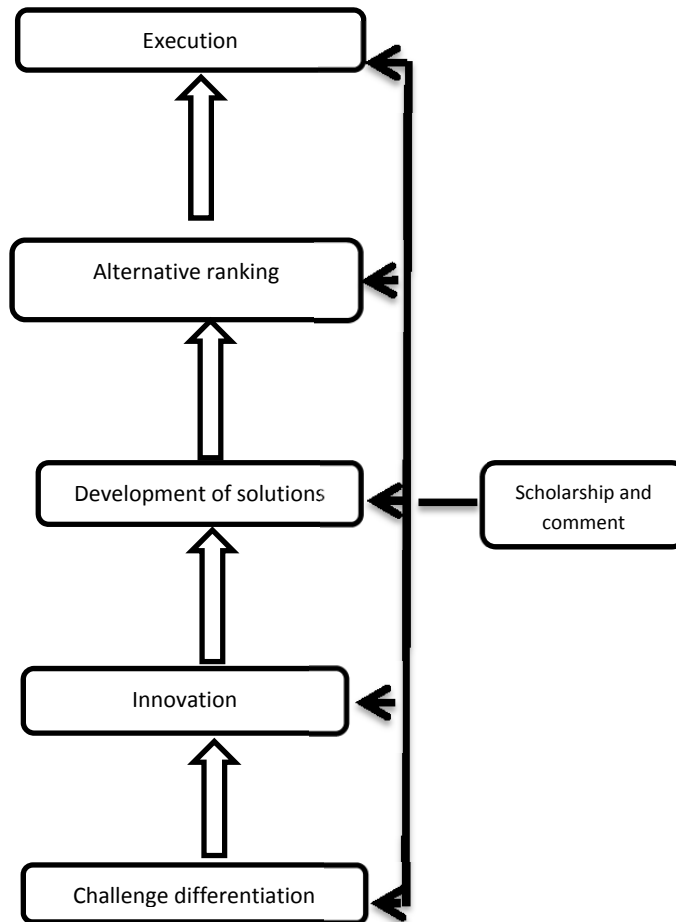


Figure 1 - Preliminary prerequisites for challenge differentiation

B. Root cause analysis exploiting observations

1) Lean exploitation of observations

Execution employees should pose the question “why” 5 times throughout the uncovering of root causes. Root causes for any question are recognised through multifaceted observations. The Toyota Motor Company habitually exploits Genchi Genbutsu in isolating root causes. A verbatim translation of the phrase to English signifies that employees should call on workplaces to wholly comprehend the circumstances. Genchi translates as real locality and Genbutsu denotes fabrication or objects. A Union of the two terms signifies to go and see in person, appreciate and comprehend an authentic state of affairs. The phrase Gemba is exploited to isolate root causes why methods generate waste.

Translating the phrase to English it is elucidated as workstation. It indicates employees are required to ascertain the circumstances for themselves afore considering the problems implicated by another person. Individual is accountable for their contribution involvement in root cause analysis and problem recognition. In research it is postulated that observations contribute to multifaceted comprehension of procedures with a consequence of a value-adding appreciation of the approach and facilitates lucid decision-making [1, 2, 3, 10 and 15].

2) Exploitation of observations in the framework of lean six-sigma

Observations in lean six-sigma oblige a process examiner to scrutinise a procedure or actions of humans and/or machinery. The examiner catalogues the observations for ensuing decisive examination. The examination is exploited to accomplish an evocative and rational inference on certain evidence, having the capacity to instigate variation in activity results. The objective is to distinguish the activities, features, human and design. Additionally, it can be exploited in instances for instance procedure limitations, impacting on the modification of the result. It may well signify non value adding actions (muda) as perceived from the patient's standpoint. In in the locales of enhancement projects, in addition to impartial observation devoid of prerequisites, the goal is the discovery of reasons for manifestation in the general performance of the procedure.

The comparison is undertaken of what should transpire in the archetypical state. A prerequisite in attaining the two goals mentioned previously, the observation procedures for lean six-sigma ought to encompass observing the actions being performed. The proviso is observations must be exploited solely in classifying waste and the source of waste in the lean six-sigma perspective. Consequently, it classifies every conceivable aspect or malefactor initiating inconsistency in the traits of the output. It is essential for the extent of the observations to be expanded to embrace the following [7, 9 and 29]:

- Isolating if the procedure diverges subsequent to dynamics mediating or tempering the performance of the procedure being examined
- Isolating inadequacies in actions initiated as a result of diverse operations, machinists or equipment or together, of a procedure during an interval

The lean six-sigma methodology encourages outcomes must be founded on facts. Hence, the conclusion is considered indications to the roots of inefficient activities transpiring in the method [7, 9 and 29].

3) Procedures for observations in a lean six-sigma execution

Observations are commonly embarked on for the duration of the measure stage in the lean six-sigma execution. It transpires once a rudimentary grasp of the procedure as quantified in the define stage has been acquired. The ensuing can be exemplified as guiding principles:

a. Designing and formulation

Exploiting a VSM the execution specialist must achieve an elementary comprehension vis-à-vis the procedure and action duration being explored. A comprehensive investigation must be embarked on incorporating the diverse operations, actions performed by humans, collaborations and boundaries, procedure positioning, departmental design, material and knowledge movement. It is prudent to embark on a minor, amorphous trial observation afore endeavouring to execute an entire programme of observations. In doing it will support:

- Unearthing diverse variables or dynamics discounted at some stage in the define stage
- Discovering the period particular instabilities emanates and influencing observations
- Isolate distinct interfaces integral to the procedure

The prerequisites for the observations are determined founded on the intricacy of the procedure. The execution specialist must be thoroughly knowledgeable regarding the practises and outline to be expanded [25, 29, 32 and 39].

b. Observation development

Abundant approaches exist by which observations can be embarked on. It can commence through a human observer or by a particular process of electronic filming apparatus. The preceding category of observation is exploited if the physical observation by humans is problematic. The primary category is described as direct observations and the subsequent category as indirect observations. An amalgamation of direct and indirect is a suitable way to undertake observations in specific conditions. The rational is if activities were overlooked by the execution specialist, the recording apparatus will document the action. It is possible certain procedural actions is embarked on concurrently or may well be interdependent. Hence, the execution specialist observes

what is superficial discernible only. Query meetings inclusive of the procedure employees following the observation action can expand the result of the observations in the examples as depicted [46].

c. Investigating the observation evidence and scrutiny

It is prudent for scrutiny to commence as soon as the observation is concluded. The reason is certain of the scrutinised elements were not captured. It can be described as a result it simply exists in the cognizance of the execution specialist. It transpires if the scrutinised procedure is overly multifarious to capture manually. The scrutiny must be accomplished afore the recollection fades away. The execution panel deliberates on the execution impartially utilising brainstorming consultations. The evidence assembled by observation group know-how and customary academic experience to categorise evidences on conceivable and probable origins of deviations. It is verified and strategies are primed for quantitative information compilation for auxiliary consideration. If further amplification is necessitated, additional observations must be effected to corroborate and authenticate the initial conclusions [25 and 29].

C. Define, measure, analyse, improve and control (DMAIC) methodology

The lean six-sigma DMAIC procedure is classified as a broad-spectrum approach. In its basic format, DMAIC was utilised to moderate disparity in production processes. It originated in the fundamental classifications of DMAIC into detailed steps. Of late, the technique is utilised for all-purpose procedures including quality enhancement, effectiveness enhancement and expenditure cutback. It advanced past the applicability to the production industry and embraces healthcare and the service industry too. Four problem-solving concepts come to pass and developed for utilisation namely [13, 14, 42 and 46]:

- a. Personnel issues – The issues is extremely idiosyncratic and hinge on individual morals and acuties, consultations and resolution of questions recognised as significant fundamentals of problem-solving
- b. Characterisation issues – The issues is forced into a model representing a algebraic question where an answer is arose from developing and augmenting associations amongst variables
- c. Scholarly exploration issues – Problem-solving as a scholarly pursuit, underscoring experiential datum outcomes to ascertain the actual questions
- d. Specification issues– The objective is explicit, similar the problem investigation procedure and it pursues a step-by-step process

The DMAIC approach of lean six-sigma, embracing 5 distinct stages, is an approach appropriate to distinguish probable problem levels for enhancement. They are:

1) Define

The questions to be concentrated on and extent should be delineated, so to the objective of the inquiry to be established. A panel from each functional area must be constituted in the define stage. The establishment of a contract is essential in the define stage for an enhancement project. The contract should incorporate crucial elements for instance the features critical to quality (CTQ), voice of the customer (VOC) and voice of the business (VOB). It is crucial to restrict the extent of the investigation embarked upon. Restricting the extent permit panel delegates to efficiently deliberate on an individual section of the process and exclude sliding on the original extent of the project.

Extent slide infers the investigation is contravening the approved extent concerning the questions delineated during start-up of the investigation. Ideally the panel must comprise of delegates including medical practitioners, residents, nurses, administrative staff and managers functioning within the institution. Hence, the panel would comprise every party involved in the hospital. It is a precondition for a union delegate to be integrated to denote inclusivity. It is dictated to acquire the commitment to solutions from general labour. The aforementioned is categorised as the core interested parties of the hospital.

Preferably, patient support alliances need representation on the panel too. The alliances act for the outside interested parties of the hospital. The enlistment of the patient alliances is wholly unintentional. The membership to the panel is involuntary for the core interested parties[13, 14, 42 and 46].

2) Measure

Measurement is a vital objective of the DMAIC method. The panel is obliged to exploit direct observations to appraise the actions encompassing the practices within the hospital. The duration of every action encompassing a procedure has to be documented. The procedure is activated by compiling a value stream map (VSM) ascertaining patient movement from the onset up until patient departs the activity. In compiling the VSM it is vital to identify every independent and dependent variable influencing the value chain.

It is essential that the employee and patient monitored be appraised vis-à-vis the objectives of the research. The protection of the identities of everyone participating in the study is vital. The studies embark on have to be inconspicuous and recognise doctor-patient confidentiality. The commendation is for patients and service suppliers not to be openly studied. It is advocated the practitioner remain beyond the examination area and utilise the duration the patient spent with the physician or professional as the recorded time. It contributes to the regard and the confidentiality of the patient and not encroaches on patient-doctor discretion [13, 14, 42 and 46].

3) Analyse

Analyse is activated by ascertaining the existing proficiency of the procedure being explored. Reference point

proficiency ought to be computed. The lower bound for the reference point is expressed as 0 (zero) and the upper bound expressed as 60 minutes. Non value adding time is computed too. It is expressed as times not truthfully adding to the actions undertaken in the procedure. The non-value adding actions are calculated from the patient's point of view. It ought to be affirmed not every non-value adding actions classified might be non-value adding actions. Specific non-value adding actions may well be essential for hospital processes and should be considered as such.

4) Improve

The waste investigation embarked on and the subsequent VSM have to be the underpinning information in creating probable enhancement resolutions. The improve stage is launched by ascertaining matters the execution panel is capable rectifying instantaneously through no or minor capital outlay and infinitesimal labour. The topics are ascertained through the investigation of movement associated concerns. Secondly, the subsequent endeavour ought to deliberate on method. The VSM is to be exploited resolving the movement concerns itemised hitherto. Resolutions are expounded on the foundation of the 3 foremost lean six-sigma values namely, smooth, continuous one-piece flow where lots is eradicated and eradication of every category of waste is achieved. It should be to the degree where execution of homogenised labour could be achieved. One-piece movement of pieces is the definitive objective of lean six-sigma, where one piece is treated at a time. Hence, it is perfectly suitable for application in hospitals.

5) Control

Metrics needs to be created supporting enhancements attained during the improve stage. Guaranteeing lean six-sigma philosophies is embedded in organisational culture; executives must establish an organisational culture which is amenable to the lean six-sigma philosophy. A crucial component to be incorporates is the prominence of comprehension of value added and non-value added time and the bearing it has on the care patients experience within the hospital. The significance of the governance purpose cannot be overstated. It is crucial to sustain returns achieved when managing the lean six-sigma approach; however, enhancements necessitated incessant scrutinising and enhancing [8, 12, 20, 21, 24, 30, 31, 40, 47 and 48].

V. RESULTS AND CONCLUSIONS

The paper elucidates the hypothesis of observation being exploited as an instrument to identify waste. Subsequently the manner it could be utilised successfully in a lean six-sigma execution. The investigation exploited understanding from action research and the lean six-sigma approach. Founded on actual cases the paper investigated the manner in which observations play a role in realising the matching aims of enhancing procedure effectiveness and diminish procedure

inconsistency if executed in a hospital milieu Even though observations as an instrument exhibit evident restrictions, the case study exemplifies the reality that observations prompts an awareness of problem solving in a state hospital.

It exemplifies the reality lean six-sigma will certainly not be an instant resolution for protracted system topics. The case in point of the hospitals scrutinized where the problems were present in excess of 15 years. The investigation implies it is judicious for a candid, comprehensive deliberation inside the state hospitals vis-à-vis the problems confronting them. The debate must afford leadership concerning the function and prospect of lean six-sigma as a prospective enhancement instrument. Hospitals should deliberate on the mode in which lean six-sigma can be developed to be function of everyday existence in the hospitals.

Being information focused tactic lean six-sigma functions as a practical instrument in dealing with procedure unsteadiness experienced in the hospitals. Albeit the mechanisms and techniques are simple to be taught the motivation for transformation and the philosophy of continuous improvement essential in acceptance of the philosophy can be arduous to infuse. The researcher encountered the aversion to transformation personally. The rank and file in the hospitals experienced the enhancement activities as invasive. The universal judgment was one of no significance for the employees individually and would not believe in the methodology.

The union capitalised on the disinclination from staff members as a line of reasoning the enhancement would inexorably result in loos of employment. Hospitals must persevere in the revolution and hospital personnel has to recognize the capability to incessantly expand and an established technique achieving this goal will be vital for hospitals to care for the perpetually escalating patient burden. Lean six-sigma recommend VSM of procedures as an authoritative instrument to distinguish problem areas. The approach additionally postulates lean six-sigma activities must structure the endeavours aims in quantifiable metrics known as critical to quality (CTQ).

The approach consigns quality, deficiency and inconsistency, the time-honoured crucial purpose of lean six-sigma, in a lucid classification of value. The DMAIC methodology is germane to empirical questions ranging from reasoned to semi-structured questions. It is inappropriate for ill-defined questions or state of chaos as a result of skewed problems. DMAIC is appropriate for significantly wide-ranging problem solving operations entailing all the mechanisms of question classification, analysis and construction of solutions. The suitability of the approach diminishes for problem tasks of a lesser range. Lean six-sigma is a broad based technique.

The approach has a celebrated strength in utilising well thought-out techniques. If the argument is taken from the viewpoint of problem solving, the DMAIC approach performs as a problem definition method. It is particularly beneficial in the Gauteng public hospitals. Members of the

executive and medical staff must grasp the problems confronting them. It dissects a problem solving operation into a succession of broadly defined sub operations. It is epitomized by the Define, Measure, Analysis, Improve and Control phases. Meticulous description classification of the sub operations into exact metrics is a definite benefit. The paper emphasize the fact if hospitals embrace the lean six-sigma approach and the DMAIC problem solving methodology participants in the project must be conscious of the description and likely boundaries of the approaches. It is noteworthy from a problem solving standpoint. The paper endeavours to compose and present a lucid awareness of the approaches for novice execution parties in the hospitals.

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