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# EFFECTIVE COST ESTIMATION USING AGILE PROCESS

### UDIT KUMAR NATH<sup>1</sup>, ALOK KUMAR JAGADEV<sup>2</sup>, PRASANT KUMAR PATTNAIK<sup>3</sup> SANTOSH KUMAR SWAIN<sup>4</sup>

<sup>1</sup>Research Scholar, School of Computer Engineering, KIIT Deemed to be University, Bhubaneswar, Odisha, India

<sup>2</sup>Professor, School of Computer Engineering, KIIT Deemed to be University, Bhubaneswar, Odisha, India
<sup>3</sup>Professor, School of Computer Engineering, KIIT Deemed to be University, Bhubaneswar, Odisha, India
<sup>4</sup>Professor, School of Computer Engineering, KIIT Deemed to be University, Bhubaneswar, Odisha, India

E-mail: <sup>1</sup>uditnath@yahoo.com, <sup>2</sup>alok.jagadevfcs@kiit.ac.in, <sup>3</sup>patnaikprasantfcs@kiit.ac.in, <sup>4</sup>sswainfcs@kiit.ac.in

### ABSTRACT

Cost estimation of any product or project is the key factors to determine the overall budget and successful completion of project deliverables. There are many traditional methods available to estimate the efforts. But understanding the project features or requirements and apply correct methods in effective way is the key for any successful project. The above modern way of cost estimation techniques can reduce the overall development cost and improve the quality deliverables. This research paper elaborate more on available cost models, analyzes, and compare their results and proposed the effective models.

Keywords: Cost Estimation, Budget, Traditional Methods, Cost Estimation

### 1. INTRODUCTION

Cost estimation is the approximate cost quoted by service provider to ensure the jobs are complete within project scope and quality. It is key and vital for any product or project life cycle; this helps to achieve the project goal with the defined financial constraint. The above cost-estimation take front seat while calculating total budget estimation for complete project [1,2]. The project estimation mainly depends upon certain parameters, like cost, schedule, time, resources. The project estimation may impact, if any of the above parameters does not sync with defined planned. Producing accurate estimation is always desirable and most important for any successful project life cycle. The estimation is not only essential for winning new business, but it helps determining the project budget, required tasks schedule and how to manage the resources effectively for successful execution of project and inline generation of invoice to customer. However, as per history, business always underestimate the requirement that causes budget over-run, required additional efforts and resource to complete the scheduled tasks [3,5,6]. This usually erode project profit margin, loaded excess staff, missed milestone, deadline, and impact quality. Cost estimation usually done by breaking the project scope to manageable components and using the available information (past experience, similar type of jobs, industry expertise) to arrive the total budgeted cost. The above budgeted cost compares with actual cost at defined milestone to ensure cost are in lined with planned and may avoid any cost over-run. The previous data's show that about 20% of project fall in to cost overrun category. There is various reason like lack of clear visibility, requirement ambiguity, competitive market-trends, business pressure to win the bid process, the proposed estimation is less than actual estimation, which causes problems in latter stage of project execution. Hence forth, it's always advisable to propose logical, accurate cost to avoid any such situation [4,7]. There are many benefits associated with accurate cost like 'more accuracy in planning', 'maintain the profit margin', 'effective utilization of resources', 'maintain the bonding with client' and 'renewal of businesses. The above keys benefits may be achieved through effective cost model are elaborated in following section.

### 2. OBJECTIVE OF COST ESTIMATION

Manuscripts Objective of this module to save the cost by using cost effective processes. Cost is always impotent to ensure maintain the balance

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between estimated efforts and budgeted cost. Tools, technique used to control cost and maintain balance with budgeted cost and improve margin for some extends [4,6]. The objective of cost process model to measure cost of each of the activity, control the cost by using available tools, reduce the cost by resource optimization technique, all these above measures ascertain profit margin of project. Cost estimation helps in accuracy and effective project planning, by using these effective estimation methods help to manager and plan the project effectively. The next effective strategy to focus on 'improve margin', there are certain factor like un-known risks, inflection, poor capture scope may dent the organization margin [5,7]. Therefore, monitor the estimated cost and notify the stakeholder if there are un-known risks and try to mitigate & re-estimate the impacted area as change request helps to maintain the margin. The next core objective to utilize the available resource effectively, based on the modules or tasks level skill requirement, sometime, it needs to shuffle the resources, identify the gap and pull the resource from other account to ensure delivery milestone meet as per commitment. All these effective uses of resources are coming under effective resources management. The next key focus area is to build good relations with customer, cost estimation may help to maintain strong customer rapport, build long term relation while vendor take customer to confidence in respect to cost [6,8]. Repeat business by maintaining the goodwill is another area where cost play crucial role, timely project delivery help to create prospective customer and may expect repeat or new business by referral due to good reputation. The above key areas for cost estimation may achieve using cost estimation model, which is elaborated in following section.

### 3. VARIOUS AVAILABLE COST MODEL

Various available cost model is an existing process to calculate the total cost of project and use to maintain the profit margin at organization level. The above readily available cost estimation process may use based on project, customer, and business needs. Among these, cost and staff level estimation are widely used in recent market condition where cost level estimation is primarily depends on budgeted cost, which is overall cost of the scope calculated at the time of aggregate cost calculation. The next level estimation known as cost level estimation is the staff level cost, which depends upon tasks, modules, budget cost based on these factors project team needs to calculate the staffing required to suffice the customer needs and expectation. Based on project need, effects estimation may be segregated in to 4 levels, those are intuitive, parametric, analogy and analytical (refer to figure 1). The advantage of intuitive process model is quick, useful even without quantifiable amount of empirical data, usually cost estimation is more accurate using enormous empirical data. But the above process this criterion is not mandatory, and it is easy for comparison as well. The only disadvantage of this process mode is un-structured and difficult to document [6,8,10]. The 2nd level of cost estimation is 'parametric', focuses more on generating similar repeatable estimation, cost driver associated for above processes are clear and visible. This estimation is favorable for customer only disadvantage, it may require experience resource to calculate as team needs to understand the algorithm. The 3rd level estimation is 'analogy' level estimation, which may require lesser data and easy for modification and usages. There are some disadvantages like difficult to use in case of new project. The next level estimation known as 'analytical', that focuses mainly on cost driver. Customer and project team needs to select the correct data based on business or end-user requirement. The next section focuses on cost and staff level estimation, those are used in recent market trends.



Figure 1: Various available cost model [2-3,6,8,13-14,20]

### 4. COST ESTIMATION - PROCESS

Estimation is always tough and key factor for any successful delivery of project or product. It depends, where it is a phase delivery or complete delivery, but high-level estimation is must and required phase at initial phase of project life cycle. This concept is widely applicable to all most all the industry. High level estimation is process of finding the cost or approximate cost to plan further stage of development. There is different process, method is applied based on the features or complexity of the

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requirements to get the overall efforts estimate	[2- se	egregate cost among valid, invalid format and	drop
4,8]. Based on these high-level efforts, near	or th	nose invalid cost with proper reason. Once the	cost
relative cost is calculated with the contingency of	f 10 is	validated and ensure only valid feature	ures,
-20% of efforts variance. This budgeted cost	t is re	equirements are considered need to review t	hese
always revalidated against the actual efforts and c	cost es	stimations with independent party to get the des	sired
in every phase of project life cycle. This p	pre- ur	n-bias cost estimation. This final estimation n	eeds
validation of efforts, cost indicate whether	the to	be continuously monitored and updated a	long
project is in lined with customer expectation	or w	vith forecast on timely basis. Cost can be	sub-

moving way ahead of initial budget. Cost overrun can jeopardize the entire project; therefore, it is required to measure project progress, identify unknown risks, and take plan for mitigation at initial phase life cycle [9,11].

Cre	edibility factors for High level esti	mation
$=\bigcirc$	High level constraint, assumption, risks	5
$\Rightarrow$	Involve Peer and Independent review process	
=	Ensure to utilize relevant and quality data while estimation	
$\Rightarrow$	Ensure to consider appropriate standard and structural process	
$\Rightarrow$	Consider risks, unknown factors, uncertainty, change of environment	-3@7-
$\Rightarrow$	Identify and recognize the exclude cost with proper reason	15 BA
$= \bigcirc$	Ensure to include thorough and un-bias, independent review process	
$=\bigcirc$	Continuous review and update of forecast based on update	

### Figure 2: Credibility factors Estimation [2-4, 6,8,10,14,18,20]

There are many research processes to predict the accurate estimation. But still, it is in dilemma how to get the desired estimation, as per customer expectation. Therefore, some of the researchers have come up with the concept of credibility factors. The above diagram (refer to figure 2) shows some of the factors can be used to get the approximate estimation. The first and foremost factor is to identify and try to draw the outline the high-level constraint, assumption, and risks of the project. These are the key indicators, which directly or indirectly impact the efforts estimation. Therefore, outlined those factors and informed to all the stakeholders [6-8,10]. The next step is to ensure to introduce peer review & independent review process. This will help to get a fair estimation of efforts and cost. This estimation needs to calculate with relevant and quality data. Ensure all these data used are relevant and valid for estimation. The next step to ensure use of standard, structural process to calculate the above estimation. Improper standard and process can impact the estimation and not help to get the desired output. Along with the process, ensure to consider all the known, unknown risks and environmental factors which can influence the estimation [7,9]. The next important step is to

divided into Cost and Staff level estimation. Following section emphasizes more in details on these types of estimation [12-13].

# 5. COST LEVEL ESTIMATION

Cost level Estimation may be categorized in different level based on the accuracy level and Organization benchmark. There is no mandate of accuracy, it entirely depends upon the phase of project life cycle where estimation carried out. Based on the historical data's, the accuracy level can be categorized in to 5 levels of estimation. Below is the high-level categorization of estimation levels [4-5].

Level 5 -Estimation (ROM) Rough order magnitude - Least accuracy level. This is lowest level of accuracy estimation process when the adequate data are not available, requirements are not crystal clear, customer has not finalized any requirement and very high level and initial phase of estimation. The risks factors, assumptions and constraint s are very high in this level of estimation. The above estimation is applicable for evaluation of screen, application for different existing projects and high or preliminary level concept of cost. Analogues, expert judgement, and parametric model plays vital roles in this estimation level [12-14].

Level 4 - Estimation: Accuracy level is lower but better than ROM, level 5. This type of estimation mainly focuses on planning level where the high-level project plan is defined by 1- 15%. Feasibility study, impact analysis are the prime focus areas of this estimation phase. Different type of feasibility study, like technical feasibility to understand whether the project is technically feasible, the project can be completed with available technology and expedite level. Performance feasibility, where it focuses the performance (functional, non- functional) feasibility.

Level 3 – Estimation: Accuracy level may be assumed as medium in this phase, the project requirement is well defined by 10-40%, This phase emphasizes more on monitor and control of budget as the defined featured are high level understood and can be planned to control the overrun budget by

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ISSN: 1992-8645 www applying different level of methods, like semi – detailed unit level of cost analysis.

Level 2 - Estimation: Accuracy level is higher in this type of estimation as project is defined by 30-70%. Cost control and bid process are the key focus areas of this phase, where team need to identify the areas like resources or staff, scope, work efforts, schedule, finances and achieve the defined milestones. Team need to continuously monitor these highly volatile areas and need to take necessary action on need basis to control the cost. In this phase, project is well-defined, resources expertise medium to expert level based on plan, any deviation in above phases, need to take immediate action. The above level of estimation may help in bidding process, where bidding may ask from 3rd party vendor, subcontractor to ensure milestone are achieved and defined quality is maintained [8,10].

Level 1- This is highest the accuracy level in this estimation process, as the defined project plan is matured by 70-100%. This focus areas are to verify the defined estimation, bidding process and may start negotiation based on the proposed proposal. The details level unit cost might require based on the proposed solution [15,17].

This above accuracy level is defined based on research on sample data's analysis of project firm. The estimation levels can be changed based on organization and nature of work, there is no mandate that all these percentage levels are same for all the Organization. The next widely used estimation process is staff level, which is elaborated in next section.

### 6. STAFF LEVEL ESTIMATION

Staff level estimation or staffing plan usually comes after high-level project or cost estimation is completed. This phase emphasizes mainly the staff required to complete each phase of project life cycle. The staff level estimation is defined by eminent researcher Putnam, which is the extension of Norden staffing theory and in alignment with Rayleigh theory of distribution curve in 19th century. As per Rayleigh distribution curve, in initial phase of project life cycle, it won't require high volume of staff. It usually starts with less number, i.e., in requirement phase, it requires very a smaller number of staff and as on project proceed to next level, i.e., execution or testing phase the required staff size is huge known as peak period and gradually it decreases, and very lesser number of staff required in post implementation phase [6,8,10]. The above staff level estimation can be calculated using researcher Rayleigh formula of efforts. The formula

E-ISSN: 1817-3195 www.jatit.org of Efforts = K-total area covered  $/t^2$  d t e  $-\frac{t^2}{2t^2}$ d, E stands for total efforts required, K stands for the total coverage area for staff estimation, the staff level efforts covered, td represent is the peak of total area covered. The above formula of Rayleigh depicted the curve of effort vs. time, it represents graphically how the efforts is usually start with minimum, gradually increases to maximum or peak, at build or coding phase where number of staff required is more then gradually decreases in testing and subsequent warranty support period. The above staff level estimation may use various available process estimation to calculate the efforts, those are bottomup, parametric, comparative, 3-point and expert judgement to estimate the efforts and based on customer needs team needs to estimate the cost of project (refer to figure 3). The details of above cost model elaborate in following section.



Figure 3: Staff level estimation [1-4, 6,10-12, 14-17,19-27]

### 7. TOOLS & TECHNIQUES-TRADITIONAL COST ESTIMATION

Tools and techniques used for cost estimation give more accuracy while calculate the budgeted cost for entire project. The usages of above tools and techniques may reduce manual effort and helps to achieve more accuracy level of estimation, which is key for any successful project completion [13, 21]. There is various readily available estimation technique may be used based on project, product business requirements [22-23]. Below table (refer to Table 1) elaborate the available methods their pros and cons for usages. Once team understand the usability and benefit of cost estimation, team may focus on cost driver for details level cost, which is elaborate in following section.



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Table	e 1: Tools & techniques	Traditional	Cost	Analog	This estimation	This	Though,
	Estimation [2-4, 19	-21,22-25]		ous	technique deals with	techniqu	the similar
Name	Descriptions	Pro	Cons	estimati	similar project or	e is	data is
Expert	This type of	This	There are	on	previous existing	relativel	available,
Judgme	estimation mainly	process	chances of		data. In this model,	y easy,	but need to
nt	used when	calculat	error due		usually team try to	as · · ·	take care
	experience in	es the	to their		find out the	similar	of current
	application, tools	estimate	emotional		similarity leatures	types of	scenarios
	resources available	digitally	judgement		and compare with	uala	husiness
	and they can	inrougn	frequent		current project [4-0].	evist and	need as
	based on their	compute r using	influence			team can	same
	expertise	modern	hy other			use this	functionali
	knowledge This	tools	and			as	ties may
	mainly deals with	techniqu	prejudices			referenc	behave
	the consultant	e gives	regardless			e [6-8].	different
	having depth,	advanta	of				environme
	specialization	ge of	knowledge				nt [10].
	knowledge on	less	and expert	Vendor	This type of	This	This model
	estimation of similar	error.	level [4].	Bid	technique is widely	helps to	is not
	fields of project or	But		Analysı	used to gather	choose	exhaustive
	application [12].	human		s	project details and	the	or
	Consultant can co-	interfere			different vendor	availabl	sive one
	constraint and	required			bids or proposal In	e vendor	Apart from
	effectively use the	to			some of the project.	and	this does
	variables to	ensure			project bids through	could	not
	calculate the cost.	accurac			proper proposal	bargain	consider
	which can give a	y of all			document (RFP)	based on	the
	valuable return as	the data			[10-12].	required	administra
	meaningful	and				featured	tion
	evidence [1-4].	availabl				[12].	expenses
		e					as well
		relevant		т			$\begin{bmatrix} I I \end{bmatrix}.$
		informat		lop-	in stort with	I his is	top down
		10n [2-		Estimati	identification of	for	approach
Delphi	This estimation	4 . As	It is	on _	scope of project and	initial	is usually
Method	process is very	subject	n 18 usually	Class 5	calculate the total	level of	not
Withild	interactive and	matter	time-	level	cost. After that.	estimati	accurate.
	forecast oriented	experts	consuming		based on total cost it	on.	Due to this
	confined with sets of	play	process, as		broken down to	After	it is
	experts. The above	vital	getting		manageable	this	advisable
	process deals with	role, the	consensus		component-based	prelimin	to connect
	questionnaires and	chance	of each		project contents and	ary	with
	expert needs to	of bias is	questions		attributes [12-14].	estimati	advance
	discuss the response	less in	and .			on	technique
	of each	this	response is			details,	the
	questionnaires and	case. As	difficult			s	hudgeting
	consensus [10.12]	are	Some of			estimati	and project
	consensus [10-12].	involves	the cases			on still	planning
		the	gets			need to	[13-15].
		estimati	consensus			be	
		on levels	with			carried	
		are very	wrong			out [4-	
		structure	estimation.			5].	
		d and		Bottom-	This technique deals	This	Developm
		metrices		up	with calculation of	techniqu	ent of
		oriented		Estimati	cost by identifying	e is very	WBS is
		[4-5].		on	and evaluating	effective	time



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separate   components   sum of all of t   get the desired   project   estin   in contrast with   down approad   15].	and while using them to d entire WBS nation, (work th Top- ch [13- down) structure , where tasks are usually breakdo wn to smaller manage able compon ent [13].	consuming and required expertise level. This will be difficult in re case of re complex project [14-16]. o to e e n ].		Contingency reserve – deal with project risks like schedule delay, technology bottleneck, staff overrun etc). Management risks consider all the unidentified risks [13-15].	ve measure of risks mitigati on. It indirectl y enhance s the quality of project estimati on by preventi ng cost, budget overrun [14]	project risks and mitigation [16].
ric to calculate Estimati parameter lik on budget, sched duration. method depends upo historical da statistical r with paramet 8].	te uses This e the techniqu e cost, e is very lule, or accurate This in mainly calculati on the on ta and provide relation d the single unit cost is accurate [8].	As u mentioned, ry this e technique uses ti historical data, it e usually ne suitable for high st degree of tasks repeatabili ty and difficult calculate the creative one [9].	Cost of Quality - Analysi s	This technique used to find out the budget required to meet the CoQ (project quality standard). This is combination of both cost of good quality (failure and appraisal activities like review) + cost of poor quality (cost incurred due to waste, re-design, re- work + expenses might occur due to quality failure, i.e., customer complaint,	This estimati on process like reserve analysis helps to tackle the project risks [16-17].	This is mainly risk preventive attributes to mitigate project risk. This technique cannot consider as comprehen sive project budget [18].
Estimati on -3- point technique d upon the prob 3 points esti (Optimistic, Pessimistic & guess) mod calculate. know as (Program Evaluation technique) calculate schedule Optimistic (4×Most Lik Pessimistic) = 12].	mation This epends estimati able of on mation process is very & Best detailed rather Jsually than PERT single point review estimati the generall y more + accurate ely) + [11].	i Due to 3 points of estimation, it is time consuming process [12-14].	8. TOO EST Tools & t for their is ares is to p the time estimation of their p factors a deliverabl elaborated	ES – AGII estimation. Ip to delive iccurate ar file emphas re all the may in dely used (refer to T	LE COST is known The focus ery team at nd correct sizes some exteranal npact the tools are able 2).	
Reserve This esti Analysi technique dea s uncertainty known Primary it types of bac	mation Reserve analysis (un- can be risks). consider has 2 ed as ck up. preventi	e It does not s calculate project er direct cost as rather ti cover				



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Table 2: Tools & techniques Traditional Cost     Estimation [2,4, 19, 21, 22, 25]			proce	items. This technique of	better	relevant	
Nam e	Descriptions	<b>Pro</b>	Cons		of bucket help to segregate and help in	other agile	or medium
Planni ng Poker	This is agile estimation process makes use of user story and choose the card based on their assumption. The fibonacci series plays a crucial role by assigning the story point to the user story. Consensus among the team is must if there is difference in assigning story point	This agile estimati on process best suit for small to medium project where the tasks	This estimatio n process has certain limitatio n for big, large project team [22].	Affini	This estimation is	estimati on process. But this may provide accurate data for large product [12-13].	size project [12]. This is
	[18-19].	levels are well defined [18].		ty Group ing	relatively quick easy for estimation. The above approach is useful at initial stage of product life cycle where user	estimati on process useful for small	tool is difficult to use and mange
T- Shirt Sizes estim ation	This approach uses the relative sizes of T shirt extra small (XS), Small(S), Medium (M), Large (L), Extra Large (XL) to define the story point. The above innovative approach	This is an informal process and adopted by various	Defined a relative size may varies from person to person and		story is not clearly defined, need more clarification [10-12].	or medium size of product life cycle [18-19].	for complex large project [19-20].
	helps to give a quick and rough estimation of any project and latter it may convert it into number to ger the estimation [12- 14].	item to calculat e their estimati on [18].	might create confusio n [10- 12].	9. COST DRIVER Cost driver is key while calculatin cost, it defined the direct and indirect co with product. The cost driver is mainly of multiple factors apart from actual			e project sociated ndent on . While
Dot Votin g	Agile product back log is good for defined product, but sometimes it is difficult to prioritize the items and this relative ranking process of dot voting is a great help. The above	This tool helps as a decision maker for some of the uses	This approach is difficult for large product, as it may create	- considering any product there are certain factors to decide the cost of the product, like variable cost, a activity-based cost. There may be variable cost associated with the cost, it may fluctuate the actu cost of the product. The following section elabora various cost driver method associated with produ- delivery.			cost, and ble cost ne actual aborates product
	lowest and highest prioritize items to specify the focus area [18-20].	story of prioritiz e items. But this is good for small, medium size product [13].	n [12- 14].	9.1 Star Star where the consider This star actual c interval cost is a consider cost nee	and and Cost Accounting and and cost accounting the pre-defined manufact red at the initial phase of indard baseline cost usual ost and variance is calc to gauge the product per- lways pre-determined, we red like minimum margin ds to measure frequently the continuous analysis	(SCA) is ure cost is product li lly measure culated in formance. S where all th , profit man maintain t	the cost a lready fe cycle. e against frequent Standard e cost is rgin, this he profit
Bucke t Estim ation	This estimation approach is useful for large backlog item where it is difficult to estimate various priority	This estimati on approac h is	This estimatio n approach is not	the proo standard factors,	ment to constantly monit duct and production pr l cost variance is depen i.e., material or software	or the effic rocess. Th dent upon variance,	e above various labor or

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efforts variance and overhead variance [15]. The	mechanism. The basic principle of above cost driver
next cost driver (CD) is activity-based cost	[8,17] is focus on root-cause analysis and their
accounting elaborate in following section.	responses. The process of causality emphasizes on

### 9.2 Activity Based Accounting

Activity based accounting cost is a part of cost driver to computing cost that linked or associated with every defined product in an organization that consumed by number of resources. This cost driver plays important role while taking decision by management for any such new investment or part of bidding process in customer-based activity, it calculates the exact cost of the activity-based product and cause of cost. Activity based accounting depicted the real values or cost of the product that helps to determine while go for bidding process or sales the unit. The above activity-based cost driver helps to understand the profitability of each customer, due to resource constraint, team may decide to proceed with any such investment based on organization defined profit margin and elimination criteria [7, 8]. This may help customer to eliminate the less profit margin investment or associated thing. The primary challenges of activity-based cost (ABC) are allocation of fixed cost converted to variable cost and in such scenarios, it might be difficult to calculate the exact cost, if the total cost is higher in given time-period, profit usually less and may be eliminated for any such investment. The above costdriver always plays a key role while taking decision for any investment or vendor-bidding process. Resource consumption or staff required for in any of the process or investment is another important costdriver help customer to take decision based on the analysis is elaborate in next section.

### 9.3 Resource Consumption Accounting

Resource consumption accounting (RCA) is the latest process of management accounting that focuses more on generating reliable and trust-worthy information that reduce the overall cos of project and maximizes the revenue by enhance business productive capability to meet the business objective in highly business competitive market [17]. This cost driver act as a catalyst for vendor-bid analysis, it generally creates an integrated economic process of operation to breakdown the resources capability to productive, non-productive, and idle capacity resource, which help to define the accurate cost. The above concept was introduced to understand the overall cost and cost-flow, which is crucial and important for any system of management accounting (refer to figure 4). The effective utilization of RCA generally enhances and leverage the technologies by extensive use of analytical method and reporting

mechanism. The basic principle of above cost driver [8,17] is focus on root-cause analysis and their responses. The process of causality emphasizes on cause-and-effect relations of resource movement using value chain. The overall cost of the product or project depend upon their core assets, i.e., resource and effective utilization to maximize the output. The next core principle of RCA focuses on responsiveness that compliance align with above resource causality and focus on higher throughput elaborated in following section.







Throughput or productivity accounting is based on management accounting approach, where focuses more on identifying project-constraints and approach to overcome these bottlenecks. This throughput accounting (TA) principle try to find out project constraints, analyzes the root cause, suggest the best possible approach to overcome these constraints and increases resources productivity. The above cost driver increase throughput, velocity is always critical for successful completion of project [18, 21]. The above throughput is usually based on theory of constraints (TOC), it is the business process that reduce operating cost and increase profit. This is a simplified accounting based on above TOC process that involved 5 steps (refer to figure 5). Those are identification of constraint, creation of plan to exploit constraint, focus more on constraint for elevation, try to subordinate nonconstraint and finally repeat the above process till achieved the target. The next section focuses the critical cost-driver which helps in cost volume profit analysis.



[1-4, 6,10-12, 14-17,19-27]

### 9.5 Cost Volume Profit Analysis

Cost volume profit analysis is a useful technique generally used to calculate the inter-relationship and helps customer to think on their decision on cost volume and profit. It projects the net impact and effect that fluctuate cost, price, and volume on profit. The lower will be the unit of cost of production while the output volume is higher and vice-versa, as the fixed over-head cost may not impact the overall cost due to volume change [21-22]. The profit calculation for cost volume profit (CVP) analysis influence by certain factor, like input cost of material, volume of units, size of manufacturing unit and production efficiency. The above principle is applicable to all the industry, i.e., software, manufacturing etc. This CVP analysis mainly divided in to four key components (refer to figure 6). Those are contribution margin (CM) analysis, and the above component is calculated by contribution per unit divide by selling price. The next component emphasizes on breakeven point (BEP) analysis, this is calculated based on fixed cost divide by contribution per unit cost. The 3rd useful component is target point analysis (TP). The above target price (TP) is calculated based on fixed cost, plus required profit divide by contribution per unit cost. Finally, the 4th important component is margin of safety (MOS) analysis that depends upon the budgeted sale of production unit and break-even point (BEP) for production cost [26]. All the above throughput accounting somehow depends upon the economic value of production unit, which is elaborated in next section.



Figure 6: Cost volume profit analysis [12,14-17,19-27]

### 9.6 Economic Value Added

Economic value added (EVA) is important cost drive that focus on comparing the rate of return (ROR) on investment amount of capital. The is an important cost metrics used as residual technique, primarily measure the expected return generated over and above investor expected rate of return. This metrices serve as a checkpoint indicator and profitability of those undertaken projects. The above cost driver process generates values, wealth for investors [9-10]. The EVA is calculated based on given formulae for Economic value added (EVA) = NOPAT - (WACC × capital invested), where NOPAT stand for net operating profits after tax, WACC = Weighted average cost of capital (WACC) and Capital invested = Equity + long-term debt at beginning of the period. The above financial charge for project represents using formula (WACC × capital invested) [18-19]. The above cost driver helps customer to achieve their objective by giving a comparison dashboard and understand consolidate profit and future projection, this accurate projection give confidence to shareholder. All these above cost drivers are frequently used by agile process to utilize the resources and optimize the profit. Following section elaborate in detailed about the role and usages of cost driver using agile processes.

### 9.7 Role of Cost Driver in Agile Process

Role of cost driver in agile process is key for any cost estimation. The cost drivers play important role to estimate tasks-level, activity-level, unit-level detailed and comprehensive way to estimate the cost of product. The above cost driver (refer to figure 7) helps management by providing various option to calculate the estimation based on project [10, 20], business, and customer need. The effective use of cost driver in agile process changed the operating model, where focuses more on customer priority items, whereas earlier majority of project delivery stuck due to adoption of new business and

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ISSN: 1992-8645 www.jatit.org transformation of culture. Apart from this, agile way of process execution adds value delivery, help customer to eliminate barrier, move the phasedelivery faster, encourage faster decision making and in-time product release to market. The new way of being agile changed the life of product lifecycle by adopting of new cultural changes, this helps to increase the throughputs, speed to market and quality delivery using values delivery. The cost driver (refer figure 5.7) emphasizes in given diagram (SCA, ABC, CVP, EVA, RCA) are real turning point for all the aspect of product delivery.



[1-4, 6, 10-12, 14-17, 19-27]

### **10. SUMMARY**

This summary of this section defined the cost association with product lifecycle and how to maintain the profit, meet market and customer expectation. It emphasizes agile process through values delivery, which helps to identify different cost factors like standard based, activity based, cost volume profit based, economic values added, resource consumption. The above cost driver act as a catalyst that may be used in agile process to identify cost factors associated with the deliverables and try to maintain the profit margin by exceeding customer and market expectation and beat the cost. Cost and cost driver play major role in overall successful of project, any deviation in above scenarios may impact the overall margin Therefore, project management is always kept close watch on cost, any un-foreseen direct or indirect cost may spoil the market and investor mood.

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