AN ANALYSIS OF THE IMPLICATIONS OF RESOURCES MANAGEMENT ON BUILDING PROJECTS PERFORMANCE IN HARARE AND BULAWAYO

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Abstract

Construction, by virtue of its size, is a major consumer of resources. Fundamentally, resources provide the means with which project objectives are achieved. Therefore, sound project management should strive to ensure efficient utilization of labour, materials and plant. However, apart from the centrality of resources in ensuring accomplishment of project objectives, resources management remains a silent discipline of project management both in practice and theory. In this paper, qualitative and quantitative techniques are used to assess the collective effect of materials, plant and labour resources management on project cost and duration. Public and private sector projects in Harare and Bulawayo were randomly selected for the study. During the study, it was observed that on majority of the selected projects contractors had some form of resource management systems varying from informal to formal paper-based systems. However, the fact that none of the projects was within budget or time bound raises questions on their efficiency and effectiveness. This suggests that overreliance on the traditional paper-based and informal project resource management systems which cannot account for resource usage in real time is a major pitfall of the said systems. Further exacerbating the situation is a lack of genuine commitment to this cause by contractors. On the other hand, unavailability of skilled labour,

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shortage of materials on the local market, liquidity crunch and inflationary tendencies were identified as some of the constraints to implementing an effective site resources management system, while on a positive note, an effective resource management system will, among other benefits, enhance good business relations between contractor and client, ensure that projects are delivered on time and within cost. The study therefore recommends revision of existing legal contracting frameworks to explicitly deal with the ills of ineffective resources management and training of contractor site staff in site resources management practice.

Key words: Resource Management, Building Projects, Project Cost and Duration, Project Performance

1.0 INTRODUCTION

The construction industry accounts for a sizeable proportion of Gross Domestic Product in economies of developed and developing countries (Tse and Ganesan 1997, Crosthwaite 2000 cited by Wibowo, 2009) stimulating economic growth through backward and forward linkages. In Zimbabwe, the construction industry contributed 3% to GDP in 2007 (Saungweme 2011). However, due to the large size of construction products, the construction industry is a major consumer of construction resources. Each construction activity requires a certain amount of resources such as labour, materials, equipment, etc. to carry out assigned tasks. On the one hand, the resources that provide the means of accomplishing the work objectives are scarce in supply (Memon and Zin, 2010) yet on the other hand, clients want their projects completed in the minimum possible time and budget (Al-jibouri, 2002). Nwachukwu and Emoh (2011) observed that the execution of construction work often involves substantial funds, and the losses through failure or abandonment have crippling effects on capabilities of investors. Thus effective and efficient use of resources should ensure successful performance of construction projects in terms of cost, time and quality. Systematically managing these tradeoffs is critical to ensure successful project delivery since the three are inexorably intertwined, and an impact on one usually has ripple effect on the other two. Thus the functions of project management for construction generally include the maximization of efficient resource utilization through procurement of labour, materials and equipment according to the prescribed schedule and plan (http://pmbook.ce.cmu.edu). According to Kafka (2007) ineffective resources management leads to financial impairment, costly project delays, lost time and decreased productivity. On the other hand, excess resource idling can result in cost overruns, while low resource coverage or long lead-time in resource acquisition can delay the project schedule (Park, 2005). In a study on civil engineering projects, Kim et al (2009) concluded that the large amount of construction resources and their scattered location make it extremely difficult for project managers to effectively utilise them. It is under such situations that the need for managing resources in real- time becomes a necessity.

However, there are numerous cases of projects that have failed to achieve their intended objectives. In the United Arab Emirates, shortage of manpower, poor supervision and site management, shortage and breakdown of equipment among others contributed to construction delays (Enshassi, Mohamed and Abushaban, 2009). The losses resulting from such ineffectiveness in management of construction resources are overwhelming. The National Insurance Crime Bureau in America indicates that the construction industry loses more than $1billion annually from equipment and tool theft (Brett 2006). In Nigeria, Nwachukwu, Ibeawachi and Okoli (2010) noted that the rate at which construction projects fail or are abandoned is retrogressive. According to McManus (2009), less than 10% of all projects are delivered to their original cost estimate. The Trilex Group statistics in Romania indicate that 50% of the projects end with cost overrun and term of delivery, while 25% are a complete failure (Vrincut 2009). Zimbabwe has not been spared from this. Skills flight, shortage of materials, and liquidity crunch were the major drivers of construction failure in Zimbabwe in 2008 (Saungweme 2011). Notwithstanding that, even before the harsh macro-economic environment of 2008, projects have been affected by mismanagement, and misappropriation of resources among other factors. Joina Centre, a major commercial centre in Harare, had its budget revised several times and had a time overrun of 8 years (Business Herald 18 March 2010), while the Library building at the National University of Science and Technology in Bulawayo is behind schedule by approximately 12 years.

Therefore, the main problem observed by this research is that irrespective of advances made by the construction industry to craft construction resource management systems, construction projects are hardly completed on time and within budget. Whereas several theories have been put forward to explain such phenomena; however, there is no immediate evidence from literature of discussions on the effect of integrated resources management on project performance. Resource related studies have focused much attention on developing models for resource scheduling, yet on the other hand Karra and Nasr (1986) argued that resource planning and management is one of the most important ingredients for competitiveness and profitability in the construction industry. This paper explores construction resource management practice on building projects in Harare and Bulawayo, and provides an analysis of the impact of such practice on project duration and cost. Specifically, the research sought to determine the methods employed to manage resources on building projects and their effect on project performance. Benefits and challenges to resources management were also considered.

2.0 RESOURCES MANAGEMENT

Project resource management aims at planning, scheduling, procurement and control of workers, materials and equipment required for the completion of the project, economically and effectively (Sears, Clough and Sears, 2008). According to Dharwadker (1989) management in general has come to imply a disciplined approach to the use of available resources. In other words, when managing construction projects, the manager is essentially managing the procurement, deployment and supervision of resources in a manner that would ensure achievement of project objectives. Kafka (2007) defines construction resources management (CRM) as a concept of overseeing and strategically managing every physical asset, from consumables to tools and equipment in every company department, for the advancement of the company. However, Dharwadker (1989) indicated that the efficiency of management depends on how well the available resources are utilized and how well the best possible results are achieved. Resources are the key inputs to construction projects. These include labour, plant, equipment and materials (BSi 2006). Kim et al (2005) argued that efficient resources management is a prerequisite for project success. Concurring with Kim et al (2005), Melton (2008) argues that any external resource needs to be robustly managed in order to ensure that the required level of performance is achieved. On the other hand, Killinc and Sen (n.d.) admit that efficient and effective use of resources can often make or break a project. Therefore to achieve project objectives, Kerzner (2004) argued that the project manager must control company resources within time, cost and performance. In fact, the functions of project management in construction generally include the maximization of efficient resource utilization through procurement of labour, materials and equipment according to the prescribed schedule and plan (http://pmbook.ce.cmu.edu). Several strategies have been put in place by construction firms to optimize the use of resources. Computer packages and software have also been developed to deal with the problem of limited-resource management. However, over investment in computer packages and modelling takes away the human element in managing projects. Whilst computer programmes provide the most efficient method of preparing construction schedule (Khattab and Soyland, 1998), the complex nature of construction activities and the scattered nature of resources on construction sites make resources management a complex function that cannot be left to computers and models.

It is also important to note that project resources management is not an event; it is a process involving inputs, processes and outputs operating within a resource management framework. Thus planning, coordinating, and control of activities are the main management functions. These functions squarely apply to resources management. According to Reiss (1992), there are four major stages when dealing with resources management. These stages are resource definition, resource allocation, resource aggregation and resource leveling. Resource planning assists to understand the type and quantity of resources needed for the project. Against this background, the BSi (2006) postulates that resource planning should precede resource management to make management feasible.

2.1 Construction Resources Management Systems

Construction resource management systems differ in extent from one organisation to another. However, the whole essence of having a system is to enhance resource management in the organisation. Construction resource management systems vary from those with very basic capabilities to highly sophisticated enterprise-level programs. These systems can be categorized as manual and computerized software systems. Advanced computer software offer enterprise-wide, fully integrated functionality that not only manages complete inventories of tools, equipment, materials, and consumables, but also provide visibility of these inventories throughout an entire organization (Kafka, 2007). The effectiveness of the system depends upon its ability to collect data in real time. The use of web-based technology capable of transmitting information through cell phones and personal digital assistants (PDAs) has significantly assisted this process. In some advanced systems, global positioning systems (GPS) and radio frequency identification (RFID) technologies are employed to monitor resources usage through 'connecting' the construction site and head office in real time. Whilst computer software is gaining affection with developed communities, the paper-based system of resource management is still prevalent in most developing countries. Forster (1989) details a multiplicity of paper based forms of managing site resources. Whilst these systems are economic, they suffer from the lag time between the time the resource is used and the time when the information will be registered with the management system

According to Svidt and Christiansson (2006) the paper-based system is time consuming in transferring information on working tasks, material use and equipment use from the individual worker at the construction site to the administration for economic follow-up, invoicing customers and paying wages to workers. To reduce such problems, some construction companies have turned to integrated, online software solutions that streamline everything from estimating and bidding to tracking job costs in the field, managing resources and maintaining equipment. Bell and Stukhart (1987) noted that some construction contractors have developed integrated, or "total concept," materials management systems (MMS) that combine and integrate the takeoff, vendor evaluation, purchasing, expediting, warehousing, and distribution functions. However, the choice of a resource management system should be based on the capability to strike a balance between economic considerations and the expected benefits from investing in such a system. In either way, the most effective construction resource management systems are designed to grow with a company, providing the right level of functionality now and for the future (Kafka, 2007).

2.2 Project Performance

According to Enshassi, Mohamed and Abushaban (2009) project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions or groups such as time, cost, quality, client satisfaction, health and safety. However, time, cost and quality are the predominant factors. Pheng and Chung (2006) as cited by Enshassi, Mohamed and Abushaban (2009) identified two common sets of indicators in evaluating project performance. Most of the parties to the project will be interested in completion time, but the attitude to cost will vary. The client will be keen to keep the total cost to a minimum, but the contractor/supplier will wish to maximise the profit margin between the actual cost of work and the price paid by the client (Woodward, 1997). A project is termed successful when it satisfies project objectives. These, however, commonly involve multiple dimensions or criteria (for example, the time/cost/performance triad), and many 'average' projects, though not usually considered failures, do not satisfy objectives in all dimensions (Nicholas, 1990). Concurring with Nicholas, Passenheim (2009) noted that the three important factors for the success of a project are the meeting or exceeding of the expectations of the customer and or the management in terms of cost (budget), time (schedule) and performance (scope). On the other hand Nkachukwu and Emoh, (2011) noted that project failure does not mean that the project may not have been physically completed but the question is when is the completion, is there any time or cost overrun, is the quality specified standard achieved? Examples of unavoidable causes of failure are failures caused by weather or labour problems, intractable technical difficulties, or other forces neither foreseeable nor controllable. Surprisingly, none of these are the cause of a great number of project failures. Nicholas (1990) argued that the root cause of many project failures is not intractable technical problems, nor uncontrollable forces, nor the user, but imply bad project management. This kind of failure is the output of a defective project management system – organisations, practices, or procedures.

However, the variety and great number of existing resources, both human and material; the diversity of tasks which each working unity is able to execute; the performance of each working unit; the involved costs; the spatial distribution of all resources over the different places leading to the need of transportation from one place to another complicates management of resources (Olivera, Fonseca and Steiger-Garcao, n.d). On the other hand, Sears, Clough and Sears (2008) noted that the supply and availability of resources seldom can be taken for granted because of seasonal shortages, labour disputes, equipment breakdown, competing demands, delayed deliveries, and a host of associated uncertainties. Projects are challenged by inadequate supply of resources at the beginning of the project, fighting for control of resources between functional managers and project manager. In Zimbabwe, Saungweme (2011) noted that unprecedented high levels of government debt coupled with zero external financial handouts spared not the public sector projects most of which were abandoned. Liquidity challenges to recapitalize and adopt state of the art technology have translated into minimum sector output and service exports

3.0 METHODOLOGY

The methodology for this research is discussed under research design and data collection methods.

3.1 Research Design

The research took an exploratory approach based on selected case-study projects in Harare and Bulawayo. Harare is the capital city of Zimbabwe and Bulawayo is the second largest city. These two cities have more construction activities when compared to other towns and cities in Zimbabwe (Saungweme, 2011). Whilst the research is skewed towards qualitative assessments of issues, quantitative assessments on project duration and cost performance of the projects was also done. Eight building sites with running projects were purposively selected to be included in this study. Medium to large scale building projects on the Construction Industry Federation of Zimbabwe (CIFOZ) rating scale were included in the study. According to CIFOZ grading, a medium project has a contract value of USD250, 000 – USD 3,500,000, whilst a large project has a value of at least USD3,500,00 and above. The magnitude of these projects allows for concomitant use of labour, plant and materials, thus providing the basis upon which the assessment will be based. Details of the selected projects are provided on Table 1.

Table 1: Study Projects

Project	Project Type	Location	Duration (months)	Budget (US$)
A	Students Residence	Bulawayo	8	1,153,000
B	Multipurpose Hall	Bulawayo	9	6,500,000
C	Rehabilitation Clinic	Bulawayo	8	450,000
D	Suburban Shopping	Bulawayo	12	4,500,000

	Mall			
E	Technical Education Block	Harare	8	2,900,000
F	Suburban Office Block	Harare	3	650,000
G[+]	CBD Shopping Mall	Harare	10	1,200,000
H	Government Office Block	Harare	8	4,600,000

[+] *Labour only contract*

3.2 Data Collection Methods

Secondary data was collected from published journal articles, textbooks and the Internet whilst primary data was collected using questionnaires, interviews, site observations and project records/files. Project records provided information on the trend of resource utilization on a project. Planned resource utilization was compared with actual utilization. Questionnaires and interviews were used to elicit opinions of consultants, contractors and clients on the effects of resource management strategies on construction project performance and, benefits and challenges of effective resources management. According to Naoum (1998) questionnaires have been widely used for descriptive and analytical surveys in order to find out facts, opinions and views. They enhance confidentially, supports internal and external validity, facilitates analysis, and saves resources (Haddad, 2006). Questionnaires were self-administered to contractors. This approach is well suited to case study data collection and particularly for exploratory research like this one because it allows expansive discussions which illuminate factors of importance (Yin 2003; Oppenheim1992 cited by Conboy n.d.). On each project, respondents were selected on the basis of their contribution to resources management on the project. These included contractors, clients and consultants (quantity surveyors, architects, civil/structural engineers and project managers). Interviews were conducted with clients and project managers. The research therefore sought cross-sectional opinion from the respondents regarding their experiences with construction resources management, how resources are managed on construction projects, benefits of and challenges to resources management.

Apart from the questionnaire and interviews, the researchers also went on sites and spend time monitoring site resources management practice. This included but not limited to analysis of workflow arrangements, material storage and disbursement, equipment movement, and labour practices. Photographs were also taken on sites to illustrate resource distribution/arrangement on project sites. Cumulatively, the findings from questionnaires, interviews, project records and site observations were collated, analysed and inferences were made from these findings. SPSS was used to analyse data from questionnaires whilst MS Excel was used to analyse quantitative data from project files on resource utilization. Data from interviews and observations was analysed qualitatively.

4.0 RESULTS PRESENTATION AND ANALYSIS

The results of the research are presented in this section under distinctive sub-headings.

4.1 Profile of Respondents

The respondents were drawn from contractors, clients and consultants (project managers, quantity surveyors, architects and engineers). A 78.8% response rate was achieved. Overall 76.8% of the respondents (excluding clients) had more than 5 years work experience in the construction industry. The research, therefore, benefited from the multi-disciplinary nature of respondents and their considerable work experience to explore the concept under study in detail.

4.2 Managing Resources on Building Projects

Contractors, clients and consultants acknowledged the importance of resources management on building projects. On these projects, contractors play a leading role in resource management. The other parties have indirect roles. On government projects the Ministry of Public Works is the projects manager and on private projects, clients employ a consulting project manager (who can be an Architect, Quantity Surveyor or Engineer) for safegurading their interest in the project. In Zimbabwe, the project manager's role has traditionally been assumed by Architects, Quantity Surveyors or Civil Engineers. The consultant Project Manager sets cost, time, and quality parameters of the project and ensures that the contractor adhere to these through supervison of works and invoking relevent contractual clauses against the contractor should the contractor fail to meet the agreed parameters. Resources management takes place on-site and off-site. Off-site resource management is skewed towards policy formulation while on-site resource management is inclined to translation of policy into practice. This is top-down system of resources management organized along functional lines. From the selected projects, 62.5% of the contractors had some form of policy or system that could be equated to a resources management system while 37.5% had neither a clear policy nor system for resources management. In the later instance, resource management is dependent on supervisor's experience or on trial and error. In the former, 37% of those tasked with overseeing site resources management are site managers or project managers respectively. Details are shown on Figure 1 below. These findings concur with the arguments by Forster (1996) that the site manager is responsible for translation of company policy on site. However, with the growing importance of the role the project manager on construction, contractors are also employing project managers to manage their projects.

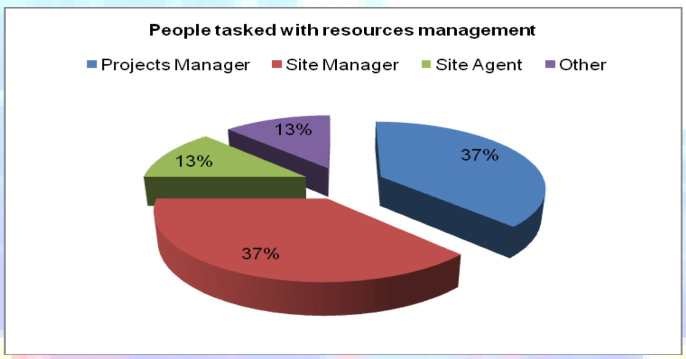

Figure 1: Site Resource Managers in contracting organizations

4.3 Construction Site Resource Management Practice

Policies generated at contractor's head office guide the manner in which resources are managed on construction sites while client's representative(s) on site crosschecks the activities of the contractor. Several measures are put in place to ensure effective and efficient use of available resources. Material storage sheds were provided on 75% of the sites while 87.5% of the sites were bounded by a perimeter fence/wall, and 75% of the sites employ security guards. In addition, resource registers (clock-in registers, material stock registers and plant registers) are some of measures put in place of for monitoring resource movement and utilization on the project. Figure 2 shows some of the measures put in place by contractors to manage resources project sites. In addition, the site manager or project manager (working with gang leaders and foremen) provide the necessary supervisory role.

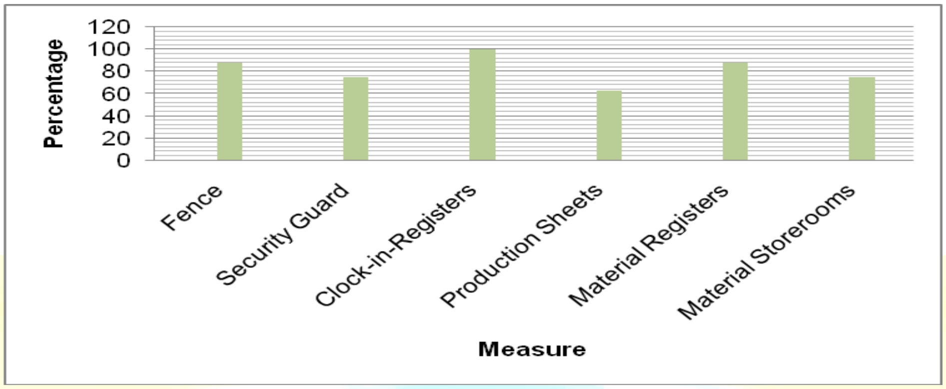

Figure 2: Site measures to manage resources

4.3.1 Labour Resources

On all projects, the human resources department is responsible for employment of labour. To ensure economics of engagement, project labour is engaged when need arises. In 75% of the cases, contractors retain a certain fraction of skilled labour on permanent appointment and employ labourers on each project as demand arises, while 25% employ project specific labour as and when need arises. To reinforce the top-down approach and functionalism, the site raise requisitions for additional labour and the human resources department procures the labour.

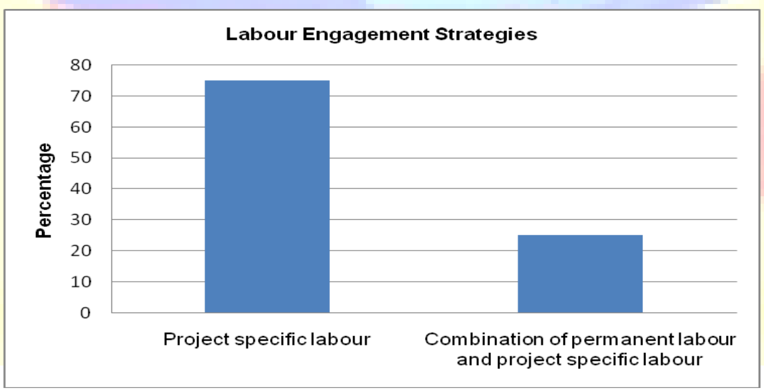

Figure 3: Labour Engagement Strategies

On some sites labour productivity sheets are used to check efficiency of labour. However, these are hardly updated since they are hardly used, for example, in calculation of wages. On 75% of the projects labour is remunerated at National Employment Council (NEC) for the construction industry rates not on productivity. The hourly rates are reviewed periodically. Use of bonus payments to meet certain targets is another strategy used on sites.

4.3.2 Plant and Equipment Resources

Overall 44% of the contractors use plant hired from external sources, while 33% rely on internal hiring and 11% use 'pool' plant. Plant policy depends on organisational culture and economics of each strategy/policy. For example, on Project E (shown on Figure 4) the contractor chose to be labour-intensive regardless of the fact that the project is a three storey commercial building whose delivery is expected within economic time-frame. Whilst use of labour was considered economic than mechanical plant, however, a 20% project delay exposed the shortcomings of labour to meet targets on a project of such magnitude. In a bid to remain on schedule the contractor resorted to; crashing of activities, use bonus incentives for meeting production targets and working long hours. These are symptoms of planning of poor planning (Memon and Zin, 2010).

Figure 4: Limited Use of Mechanical Plant

4.2.3 Material Resources

With the exception of the labour-only contract where the client procures materials for the project, materials procurement in 85.7% of the projects is centralised. The project site raise requisitions for materials and the purchasing department at contractor's head office procures the materials on behalf on the site(s). This method is preferred because it ensures enterprise-wide accountability for company resources. However, balancing the 'urgency' with which the site(s) need resources and the length procurement procedure is a challenge to the project. Contractors adopt various lead times when procuring materials, for example, 13% use two weeks, 37% one week and 50% depends on circumstances prevailing on the project such as; type of material, availability on the market and site storage. On the other hand, reconciliation of materials is hardly done on most projects. In cases when material reconciliation is done, 40% of the times it will be at the end of the month concurrently with monthly project reports. In extreme cases material reconciliation is done at project close-out. Delayed reconciliations also delay the time within which contractors realize that the project is overspending.

4.4 Resource Planning

Sixty percent (60%) of the case-study projects use Gantt Charts and 30% use the Critical Path Method (CPM) for scheduling project works as shown on Figure 6 below.

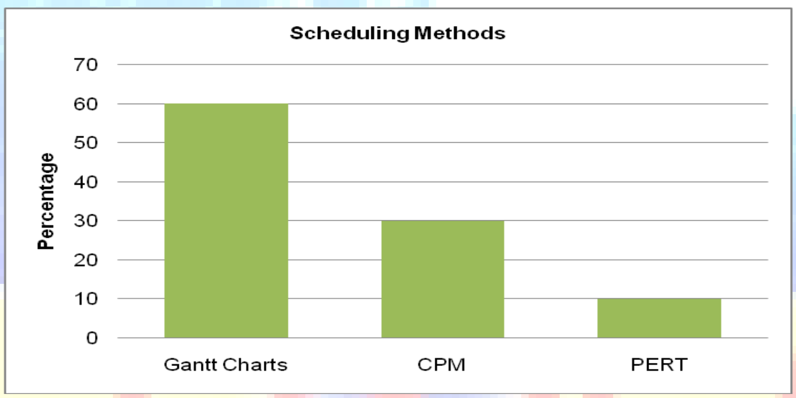

Figure 6: Methods of Scheduling Project Works

On the other hand, Microsoft Excel (46%) and MS Project (38%) are the common softwares that are used for preparing project schedule. Apart from the fact that construction projects are resource-driven, the results above show that contractors are dependent on duration-driven scheduling and planning methods. The Gantt chart and CPM fail to seamlessly synchronize activity planning and resource planning – the two integral functions in project planning (Lu and Li, 2003).The risk created by this arrangement is that schedules are unlikely to be unrealistic thus creating potentially contentious areas especially when such schedules are not practically met. This observation concurs with Nicholas (1990) who observed that unrealistic estimates of resource requirements, activity durations and completion durations are some of the reasons why projects fail. On Project G, a radical shift from initial plan that included use of mechanical plant to labour-only plan delayed the project by 20%. As a result, shift-work and working long hours were some of the reactionary measures employed by the contractor to manage project time on this project.

Generally, contractors prepare their pre-tender schedules in competition. In that regard, contractors prepare their schedule of works on the assumption that resources would be available when needed, hence the use of duration-driven scheduling as shown in Figure 6 above. Consequences of this are what Memon and Zin (2010) identified as unanticipated overtime, schedule delays, and the resulting cost overruns. Failure by the entire studied projects to met time and cost simply save to reinforce this argument.

4.5 Synchronisation of Resource Utilization Information

Weekly and fortnight site meetings provide the platform to assess project progress and to identify troubled areas that may need attention. Monthly progress reports are the most common documents conveying information between site and head office. Only 37.5% of the sites use web-based communication for transmitting information between site and head office. These reports together with site meetings provided avenues for synchronization of resource usage information within the organisation. Apart from the 37.5% sites that had internet connection, there was no immediate evidence of any form of technology to monitor resource usage on site such as Global Positioning System, Radio Frequency Identification (RFID) or Real-Time Location Systems (RTLS). These observation contrasts with the emerging trend in most developed countries where there is a movement towards enterprise-wide real-time location systems in construction resource management. What is more disturbing is that nearly three decades down the line, observations made by Moavenzadeh and Rossow (1975) are still obtaining in Zimbabwe. They observed that developed countries were widely using computers for many standard firm operations like accounting, payroll and purchasing, and that they were being used increasingly in construction related activities like estimating, scheduling, monitoring and control. The paper-based system is severely limited by the time delay required in order to provide accurate reports of project performance in terms of schedule, budget and quality, thus, impacting management decisions on work carried out on construction sites (Brodesky et al).

Contrary to the findings in Zimbabwe, Kim et al (2005); Rodriuez, Zhang and Hammand (2010); Brodesky et al (nd) advocate for automation with RTLS technologies like RFID, GIS GPS, Ultra Wideband (UWB) bar-coding etc on construction projects.

4.6 Benefits of Resources Management

Contractors stand to benefit a lot from efficient management of resources. Most contractors think that efficient resources management would minimize loss of site resources, improve productivity and subsequently deliver the project at profit. Figure 7 summaries the benefits of efficient resources management to a contractor.

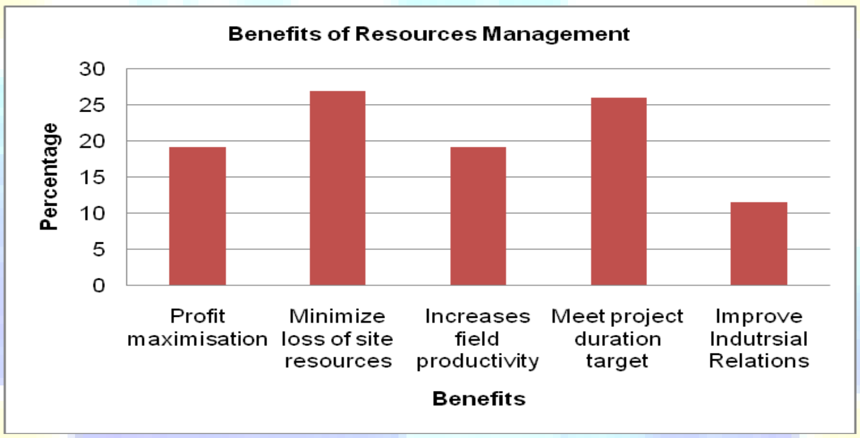

Figure 7: Benefits of Resources Management to a Contractor

These observations concur with contractor approach to resources management. Measures such as perimeter fencing, site watchman and material registers are meant to reduce loss of resources on site. On project A the contractor managed to make a profit of around 20% at project completion. On the other hand, clients are the major losers if a contractor does not effeciently manage resources. Fialure to meet both time and budget targets on these projects is a major blow to client's expectations. Although there are a number of other contributing factors, however, poor planning and coordination of site actvities, delayed material procurement and relational contracting were amongst the drivers of project failure.

4.7 Challenges to Resources Management

The contractor's efforts to manage project resources are affected by some internal and external factors. The major challenge affecting resource management is unavailability of material (for example, steel, bricks, cement and finishes) and skilled labour (tradesmen) resources on the domestic market. These shortages impacted negatively on project duration on most projects. The Zimbabwean building materials manufacturing industry has not fully recovered from the economic depression that the country went through before the introduction of the multi-currency regime in February 2009. Long queues for bricks and cement testify this. The greater part of the 'finishes' to Project H are imported from South Africa, whilst hularbond and calorifiers for Project A were imported from China and South Africa respectively. The long lead times on both local and imported materials had significant impact on project duration and cost. On Project F, superstructure walls were delayed by two weeks due to non-availability of bricks. Bureaucratic procurement procedures as noted in preceding discussions further compound the problem. On the other hand, liquidity challenges affected financing capabilities of clients and contractors. Weak cash flow, suspension of pre-purchases and advance payments on government projects further exacerbate the problem. Delay by government to honour interim claims increased business mistrust whose ripple effects worked negatively on project time for public sector projects. Equally, variations to scope of works and materials specification affected project cost and contractor planning. Increased foundation wall thickness from 230mm to 345mm doubled cost of that element on Project D. These findings mirror those by Enhassi, Mohamed and Abushsban (2009) and Yankov and Kleiner (2001) that the construction industry is facing shortage of skilled labour and materials. However, what is surprising from our study and earlier studies is that unavoidable challenges to resource management like force majeure had little impact on the studied projects. Arguably, this observation reinforces the arguments by Nicholas (1990) that the root cause of many project failures is not intractable technical problems, nor uncontrollable forces, nor the user, but implies bad project management. This kind of failure is the output of a defective project management system – organisations, practices, or procedures.

4.8 Effect of Resource Management Practice on Project Performance

Inefficient resources management results in increased wastage of resources on site, idleness of resource and sometimes reduced productivity. This will increase cost of resources and hence erode the profit margins of the contractor. Such inefficiencies would rope the client into extra expenses that may jeopardize his/her budget. On Project B, plant lying idle during project suspension period had a negotiated net cost effect of `10% of claim value to the client. The cost overrun is attributed to a number of factors such as underestimation of works (resources) and design omissions. On Project F substructure reworks had a net effect of 25.43% over the contract sum, just to mention some. Meanwhile such inefficiencies cost the contractor through reduced profit margins. Failure to get Extension of Time (EOT) on Project B and C has seen contractor's profits being reduced to break-even point and 5.2% respectively. On the other hand, the client also suffers from these inefficiencies since the contractor sometimes offload the additional cost on the client. A claim for increases of cost of resources is one avenue through which contractors' budgets may be protected. These may emanate from delays in honouring interim claims. This arrangement creates situations where a contractor makes profits on a project while the client incurs budget overrun. On Project A, the client incurred a budget overrun of 41.32% while the contractor made a profit of around 20%. On the other hand, relational contracting especially on public sector projects worked against instituting penalties on parties to the contract. This later is particularly evident on Project B, where the client's efforts to institute penalties for extension of time are still outstanding despite the delays by the contractor to complete the project on time.

Apart from the effect on cost, ineffective resource management practice delayed project completion on studied projects. None of the projects under study was within its time targets. However, the worst performers were noted on public and quasi public sector projects. Overall, projects suffered an average duration overrun of 86%. Projects suffered from underestimation of resources and delayed procurement of materials among other factors. On most of these projects materials was not available on the local market and when available, supply would not meet supply resulting in long lead times for such materials. The situation was compounded by delays in honouring interim claims. However, a contrasting situation was noted on Project D. Despite the magnitude of that project, the contractor has managed to keep the project within reasonable delay. Table 2 summarises these effects.

Table 2: Effect of Resources Management of project Duration and Cost

Project	contract duration	Start	Planned completion	Actual completio	%age variance	Planned Cost	Cost to Date	%age Varian

	(months)			n		(US$)	(US$)	ce
A	8	Nov-10	Jun-11	Aug-11	25	1,153,000	1,629,414	41.32
B	9	Nov-10	Jul-11	pending	111	6,500,000	7,450,000	14.62
C	8	Oct-10	Jun-11	pending	138	950,000	1,600,000	68,42
D	12	Apr-11	Mar-12	pending	8	4,500,000	5,200,000	15.56
E	8	Mar-10	Oct-10	pending	225	2,900,000	3,400,000	17.24
F	3	Aug-11	Oct-11	Jan-12	100	650,000	950,000	46.15
G	10	Jan-11	Nov-11	Feb-12	30	1,200,000	-	-
H	8	Apr-11	Dec-11	pending	50	4,600,000	6,000,000	30.43

Overall, the effect on project cost and duration is negative. Besides the fact that 62.5% of the contractors had indicated that they have resources management systems, however, the fact that none of the projects was within budget or time bound raises questions on their efficiency and effectiveness. Nicholas (1990) argued that this kind of failure is the output of defective project management system – organisations, practices or procedures. This suggests some deficiencies in these systems thereby reaffirming the arguments by Killinc and Sen (nd) that poor resources management can make or break the project. These deficiencies were note on underestimation of resources, poor planning and procurement approaches, just to mention some. This is particularly obtaining where there are huge differences between the planned duration and budget, and the actual. However, it is important to note that the thin line separating pure resource management issues and other project management issues makes an assessment of project performance on the basis of resource management alone incomplete.

5.0 CONCLUSION

Due to various deformities of resource management systems employed by building contractors in Harare and Bulawayo, none of the projects was within expected budget or time bound. Resources management policies developed along functional lines increased the procurement route thereby delaying release of resources for project site use. The top-to-down approach to resources management translate policies to practice at two operational areas; on-site and off-site. On project sites, contractor's commitment to resources management is seen through physical controls like; perimeter fencing, materials storerooms and employment of security guards, while on the other hand; labour, plant and material registers are the administrative tools for site resource management, whilst about two thirds of the contractors had some system of managing project resources. Regardless of advances in information technologies, the traditional paper-based system is still the most preferred system of resource management on building projects in Zimbabwe. However, apart from these efforts directed at resources management, poor performance exhibited by the study projects is disturbing and retrogressive thus raising questions on the efficiency and effectiveness of such efforts. The reasons behind this failure lie squarely on resource management as it do on other tools of project management. The paper-based system, for example, suffered from supervisory omissions and inability to reconcile resource usage data in real time. In addition, poor planning, failure to synchronise resource availability with project scheduling, poor coordination of site activities and delays in procurement of materials were among the drivers of the longer than expected project durations on most of these projects. On the other hand, relational contracting, unavailability of skilled labour and key materials on the domestic market, variations and liquidity challenges were some of the factors that constrained resources management efforts. Against such a background one would argue that the success of a project depend not only on resource management but upon the integration of resources management with other facets of project management. Notwithstanding the foregoing, when effectively implemented, resource management will, among other things; reduce loss of site resources, boost contractor profits and deliver the project on time thus improving industrial relations between contractor and client. Against this background, the research suggests that contractors in Zimbabwe perk up their resource management systems to integrate resource utilization information in real time; take a more active role in training of staff on innovative and best practice on site resource management. In addition, the inclusion of clauses in the existing legal contracting framework that require contractors to submit, along with tender, a resources management plans and providing for punitive ways of dealing with the ills of ineffective resources management emanating there-from would also benefit clients of the industry.

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