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THE VALUE MANAGER

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COUNCIL MEMBERS OF HONG KONG INSTITUTE OF VALUE MANAGEMENT (2009-10)

AIMS AND OBJECTIVES OF THE HKIVM

- To create an awareness in the community of the benefits to be derived from the application of Value Management in Hong Kong (HK).
- To encourage the use of the Value Management process by sponsors.
- To establish and maintain standards of Value Management practice in HK.
- To contribute to the dissemination of the knowledge and skills of Value Management.
- To establish an identity for the Institute within HK and overseas.
- To encourage research and development of Value Management with particular emphasis on developing new applications of the process.
- To encourage and assist in the education of individuals and organisations in Value Management.
- To establish and maintain a Code of Conduct for Value Management practitioners in HK.
- To attract membership of the Institute to support these objectives.

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EDITORIAL

Welcome to the third issue of The Value Manager 2009.

In this issue, we are happy to present two papers focusing the theme of sustainability. The first paper is written by Oladiran, O.J. who is a researcher from the University of Lagos, Nigeria. On waste management plan (WMP) which can minimize waste, thereby generating and enhancing the sustainable values. This paper discusses the possibility of enhancing sustainable values in Nigerian construction projects through the usage of WMP from public and private organizations' perspectives.

The second paper is written by João Henriques (lead author) who is a researcher from the National Institute of Engineering, Technology and Innovation, Portugal. This paper introduces a new approach on "Sustainable Value" by integrating the value analysis into the concept of sustainability. This approach has been tested in over 20 companies from different sectors and take account of stakeholder needs and expectations in construction projects.

Lastly, we would like to share some photos of our recent activities held in Singapore and Hong Kong.

Jacky Chung

Editor, The Value Manager

SUSTAINABLE VALUES IN CONSTRUCTION PROJECTS THROUGH WASTE MANAGEMENT PLAN: PRIVATE AND PUBLIC ORGANIZATIONS' PERSPECTIVES

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ABSTRACT

Sustainable values can be generated and enhanced in construction projects by minimizing waste generation. Previous works have shown that waste management plan (WMP) can minimize waste, thereby generating and enhancing development sustainably. This study aims at finding out the possibility of enhancing sustainable values in Nigerian construction projects through the usage of WMP from public and private organizations' perspectives. The population of the study is construction professionals in construction companies in Lagos State, Nigeria. It involves the usage of a designed questionnaire to gather information for the study. Descriptive and inferential statistical tools were used for the analysis. The study reveals that WMP has high impact on waste reduction and hence can generate or enhance sustainable values in construction projects. A recipe of important factors for the achievement of these values by WMP is shown in the study; and there is no significant difference between private and public organizations on their opinions about the importance of these factors. The study also sheds light on the content-composition of WMP to generate these values. However, it reveals that "special handling disposal of hazardous waste" is the most important in formulating WMP for public projects and least for private projects. Finally, recommendations for implementation of WMP and its contents for both private and public projects to enhance sustainable values are outlined in the paper.

KEYWORDS

Sustainable values, Waste minimization, WMP, Public and private organizations, Nigeria.

INTRODUCTION

According to Othman (2007), value can be viewed as quality and function to life cycle cost. It can be enhanced via improving function and quality or by reducing cost. Value is the most cost-effective way to carry out a development with the ultimate aim to achieve the desired expectations. On the other hand, sustainability is developing to satisfy both present and future needs. Its effect is environmental, social and economical. Sustainable values in construction projects has to do with procuring construction projects at possible economical cost with less waste generation; reduced landfills' usage and environmental degradation; and so on. Obviously, waste will significantly hinder sustainable values in projects. It has been indicted for high construction cost; poor quality and deficient products; and various forms of unsustainable development such as environmental degradation. Hence efforts to minimize construction waste will enhance or achieve sustainable values in projects.

Sustainable value can be achieved at every stage of construction projects through several means. In this regard, Oladiran (2008a) discovers that WMP has high impact on waste reduction in Nigerian projects. Other authors (Greenwood et.al. 2003; Garas et.al. 2000) support this perspective for their various countries. The use of WMP in Nigeria seem similar to Lean Construction (LC) because they both aim at enhancing values by procuring construction projects at minimal waste generation. They however differ greatly because while WMP is just a technique, LC involves the usage of several techniques such as value stream mapping, 5s, Last Planner and so on (Ballard and Polat, 2005; and so on). This makes LC more comprehensive and have probably better results (Bertelsen 2001; Garnett 1999); but LC is neither known nor used in the Nigerian Construction Industry (Oladiran 2008b)! The aim of this study is therefore to further investigate empirically and established statistically the waste minimization potential of

WMP by comparing the perspectives of private and public organizations in Nigeria. According to Greenwood et. al. (2003) WMP represents issue of waste on plan vis-à-vis types of wastes, estimated volume of waste, proposed waste minimization strategies and the final destinations of waste. However in most Nigerian projects, WMPs are not usually represented in graphical forms, though not correct, and adequate provisions are not made for waste identifications, estimations and treatments. In addition, the contents of their WMPs suggest that they are principally used for materials waste minimization but they also have impacts in minimizing labour, time and equipment wastes. This study is therefore set to achieve dual objectives - first, to find out if WMP can minimize waste thereby generating sustainable values in private and public projects; secondly, to investigate how WMP can achieve this value-enhancement in private and public projects.

HYPOTHESES OF THE STUDY

The following hypotheses are postulated for the study:

1. WMP has significant impact on waste reduction.
2. There is significant difference between private and public organizations on WMP's impact on waste reduction in constructions projects in Nigeria.
3. There is significant difference between private and public organizations on WMP's factors responsible for the achievement of sustainable value (i.e. waste minimization) in Nigerian construction projects.
4. There is significant difference between private and public organizations on the content-composition of WMP to achieve sustainable values.

LITERATURE REVIEW

Waste minimization and Sustainable Values

Waste minimization involves waste reduction activities especially in terms of reusing and recycling of materials. Waste can occur at any stage of construction (Faniran and Caban, 1998; Spivey, 1974) but it can be minimized via several practices and bring benefits to the construction industry (Pinto and Agopyan 1994; White et.al. 1995). On the other hand, Teo and Loosemore (2001) observe that the industry has been slow in incorporating these practices. Similarly, Poon et.al. (2004a) observe in Hong Kong that the least important factor considered for the selection of construction methods and materials is waste reduction and hence the negligence of the practices. Teo and Loosemore (2001) attribute this negligence partly to peoples' attitudes towards waste and hence Fuchs (2003) opines attitudinal change. Teo and Loosemore (2001) note that waste reduction entails two principles: - reduce waste generation and adopt a practice to manage the unavoidable waste via reuse, recycling or disposal. However, their study reveals that workers' attitude toward waste reduction is positive but managerial commitment impedes workers' positive attitudes. They therefore recommend measures for managers to cause operatives' attitude to waste to be positive. According to Greenwood et.al (2003), waste minimization connotes reducing the amount and environmental effect of waste generated via reducing the amount of materials used or re-using existing materials. They note that the top priority in minimizing waste is to avoid waste through designing out waste or reducing waste at source. However, reuse or recycling can minimize the impacts of waste once it is generated. As a result, the client, architect and contractor are the major players in minimizing waste though the success is dependent on site operatives and involvement of all the project team. They conceptualize this idea into "sustainable waste hierarchy" that seeks to minimize the volume of raw materials consumed by promoting the reuse and recycling of materials. This is corroborated by waste minimization hierarchy highlighted in their executive summary which has avoidance of waste as top priority and followed by waste reduction; the reuse of waste can then also limit waste generation while recycling and disposal are the last priorities. Greenwood et. al further indicate that the assessment of waste arising can support the development of a benchmark to manage waste according to the sustainable waste hierarchy. Waste stream identification and its volume at various stages will assist to uncover factors, which influence waste

production. They then propose three key project stages where waste minimization initiatives should be introduced (i.e. contractual, design and site operation stages). Architects have key roles reducing waste at the three levels; clients also play major role at the design and contractual stages while the contractor is concerned at the contractual and site operation stages as highlighted in their study.

Furthermore, implementation of waste minimization strategies especially waste management plan, proffers a lot of success and high project profitability (Greenwood et.al 2003). In this regard, Graham and Smithers, 1996 cited in Seydel et.al (2002) found out that it result into 55% waste removal cost saving which added 40% to project profits in trial projects run in Australia. It also enhances contractors' competitiveness via lower production costs (Faniran and Caban, 1998) and Famuyibo (1997) posits that waste disposal is very expensive in Nigeria and hence its reduction will be of economical advantage thereby generating sustainable values to all stakeholders.

RESEARCH METHOD

A questionnaire was designed to elicit the required information to achieve the objectives of the study. 60 copies of the questionnaire were administered through convenience sampling technique and 30 copies were filled and returned which were used for the study. The questionnaire consists of items among others such as name and company of the respondents; nature and type of organization; number of projects executed by the respondents' organization in the last five years; age and number of fully employed construction professionals of the company; the profession, academic qualification, professional body and the grade of membership of the respondents. The questionnaire sought the opinions of the respondents on 11 factors responsible for effective implementation of WMP coined from review of literatures. Their level of contributions to the effectiveness of WMP were measured on a 5-point Likert scale, using 1 to represent very high effect, 2 for high effect, 3 for average effect, 4 for low effect and 5 for very low effect. Similarly, the opinions of the respondents were sought on ten contents of a WMP identified from literatures. The respondents' opinions were rated on a 4-point Likert scale, using 1 to represent strongly agree, 2 for agree, 3 for disagree and 4 for strongly disagree. In addition, the impact of WMP on waste reduction was rated on a 6-point Likert scale of no impact, very low impact, low impact, average impact, high impact and very high impact. The frequency was also computed to know the level of impact. A total of 9 respondents are from organization that are above 20 years in the construction industry while 8,6,6, and 1 are from those that are 6 to 10, 11 to 15, 16 to 20 and less than 5 years in the industry. The respondents also have requisite professional and academic qualifications, which connotes that they have ample knowledge of the issues of study. Descriptive and inferential statistics were used for the analysis of the data.

FINDINGS AND DISCUSSIONS

Waste Minimization through WMP

Previous work carried out on the same sample of this present research revealed that WMP have high impact on waste reduction (Oladiran 2008a). This confirms the assertions of other researchers that WMP can minimize waste thereby generating sustainable values in construction projects (Greenwood et.al. 2003; Poon et.al. 2004; McDonald and Smithers, 1998). This is perhaps the reason for government mandating the usage of WMP in construction sites in UK and the same opinion is shared by Garas et.al. (2001) for Egypt.

To ascertain this finding further in Nigeria, this present study postulates a hypothesis, which states that: WMP has significant impact on waste reduction. A one-sample Kolmogorov – Smirnov test at $p<0.05$ was carried for the hypothesis and the result is shown in Table 1.

Table 1: One-Sample Kolmogorov-Smirnov Test for WMP's impact on waste reduction

Variable	N	Mean	Std. Dev.	Z- Value	p-value (2-tailed)
WMP's impacts.	29	2.45	1.088	1.325	.060

The result in Table 1 reveals that p-value (0.06) for the test of significance for WMP's impact is higher than the critical p-value (0.05), therefore the hypothesis is rejected. This result indicates that even though the respondents rated WMP's impact on waste reduction high in Figure 1, the impact is insignificant in construction project in Nigeria! This is possibly one of the reasons why waste generation rate in Nigeria is high (Akanni 2007). This could also be because of the poor content and implementation of WMP in use on the sites visited. In fact, some of the sites are not even aware of WMP and are not properly formulated and implemented where the awareness exists.

Another hypothesis was postulated to examine this further and states that: there is significant difference between private and public organizations on WMP's impact on waste reduction in constructions projects in Nigeria. A Wald –Wolfowitz test at $p<0.05$ was carried out for this hypothesis and the result is shown in Table 2.

Table 2: Wald-Wolfowitz test of difference for WMP's impact on waste reduction

Variable	Organizations	N	Min. Z-value	Min. p-value	Max. Z-value	Max. p-value
WMP's impacts.	Private	22	-3.728	.000	.000	.634
	Public	7				

From Table 2, max. p-value (0.634) for the test of significant difference between the two organizations is also higher than critical p-value (0.05), hence the hypothesis is rejected. The implication of this that both private and public projects' practitioners opined that WMP's impact on their projects is not significant, the result of these two hypothesis are complimentary and it is obvious in Nigeria projects. Waste incidence is high and exceeds estimators' allowance in private and public projects in Nigeria (Akanni 2007).

Factors for achievement of sustainable values by WMP from private and public organizations' perspectives

The two groups of respondents were asked to rate 11 predetermined factors coined from literatures .The data were analyzed and Tables 3 and 4 shed light on their responses. Table 3 indicates that while private organization rank "distribution of gains to all involved" as the most important factor for the achievement of waste minimization, public organization rank this factor fourth. This shows that financial incentive is a major motivating factor in private organization or at least very necessary .It is interesting to note that public organization rank "government legislation in favour of WMP" as the most important while private rank it least, this is perhaps because government policies is a major determinant factor in public construction processes and hence it is necessary for WMP to achieve its aim optimally. This is definitely not required in private organizations because company policies influence their own operations. The least ranked factors by public organization is "monitoring the WMP for evaluation and readjustment" but it is second in private organizations' ranking. This reveals the value placed on monitoring due to non-chalant attitudes of government workers and hence they don't consider it important. On the other hand, private organizations give accountability priority because they are more profit- oriented and require prudence to earn high profit and competitiveness. It is clear that the ranking of the two groups is largely influenced by their organizational backgrounds. A hypothesis was postulated to test if this different ranking should be given priorities and considered when implementing projects for the two groups. It states that: there is significant difference between private and public organizations on WMP's factors responsible for the achievement of sustainable value (i.e. waste minimization) in Nigerian construction projects. A Mann

Whitney –U analysis was carried out to test for this in the ranking of the two groups. The result is shown in Table 4. All the p-values are greater than the set level of significance (0.05). This connotes that there is no significant difference between the two groups on the ranking of the factors. This is possibly because both private and public projects are intertwined in that private contractors are used mostly to execute public organizations' project hence the hornogeneous opinions.

Another possible is reason could be due to small public organizations size in the research i.e. eight while private is 22 out of the 30 sample .The lack of proper representation of the public organizations might have affected the result. However, the finding has revealed certain important factors when implementing WMP on both types of projects.

Table 3: Rankings of WMP's achievement factors in Nigerian projects

Factors.	Private Org. (N=22)		Public Org. (N=8)	
	MR	Ranks	MR	Ranks
Staff's involvement in developing WMP	14.84	9	17.31	3
Staff's understanding and acceptance of WMP	14.27	5	18.88	7
Staff training	13.80	3	20.19	10
Communicating the WMP to staff effectively and at appropriate time	14.11	4	19.31	9
Obtaining staff commitment	15.09	10	16.63	2
Monitoring the WMP for evaluation and readjustment	13.77	2	20.25	11
Setting of target for the WMP	14.27	5	18.88	7
Modify the WMP to ensure adjustment	14.41	8	18.50	5
Government legislation in favour of WMP	15.14	11	16.50	1
Management commitment and good policies relating to WMP	14.34	7	18.69	6
Distribution of gains to all involved	13.74	1	18.31	4

Table 4: Mann Whitney – U analysis test for factors

Factors	Organizations.	SOR	Whitney U-value	Z-value	p-value
Staff's involvement in developing WMP	Private	326.50	73.500	-.711	.477
	Public	138.50			
Staff's understanding and acceptance of WMP	Private	314.00	61.000	-1.385	.166
	Public	151.00			
Staff training	Private	303.50	50.500	-1.887	.059
	Public	161.50			
Communicating the WMP to staff effectively and at appropriate time	Private	310.50	57.500	-1.602	.109
	Public	154.50			
Obtaining staff commitment	Private	332.00	79.000	-.451	.652
	Public	133.00			
Monitoring the WMP for evaluation and readjustment	Private	303.00	50.000	-1.927	.054
	Public	162.00			
Setting of target for the WMP	Private	314.00	61.000	-1.362	.173
	Public	151.00			
Modify the WMP to ensure adjustment	Private	317.00	64.000	-1.217	.224
	Public	148.00			
Government legislation in favour of WMP	Private	333.00	80.000	-.393	.694
	Public	132.00			

Management commitment and good policies relating to WMP	Private	315.50	62.500	-1.298	.194
	Public	149.50			
Distribution of gains to all involved	Private	288.50	57.500	-1.341	.180
	Public	146.50			

MR = Mean Ranks; SOR = Sum of Ranks.

Content composition of WMP

Responses were requested in the questionnaire on ten items coined from literature that should form part of the content of a good WMP to achieve sustainable values. The result of the responses from the two groups is shown in Table 5. The Table reveals that while private organization rank ''disposal option'' as the most important items in WMP, it is interesting that it is the least ranked in public organizations. This is possibly because disposal of waste cost a lot of money in Nigeria and profit is of essence to private organizations. Therefore, the most economical option has to be explored and determined early. Public organization may not be bothered because they have several government options and at no or lower cost.

Similarly, the most important item in the opinion of the public organization is "special handling disposal of hazardous waste" and also least ranked in the private. This gives an indication of the types of waste that are more prominent on the two sites. Due to the nature of government projects, they may handle projects that generate more of hazardous waste unlike private organizations and hence their first consideration in WMP. The second ranked item for private organizations is ''site plan showing waste management facilities'' while it is ranked third in public. On the other hand, waste sorting and handing facilities is ranked second in public while ninth in private. Again these rankings reflect the organizational background of the respondents.

Table 5: Ranking of content of WMP

Items	Private Org. (N=22)		Public Org. (N=7)	
	MR	Ranks	MR	Ranks
Analysis of waste generated	14.23	3	17.43	9
Alternatives to waste disposal	15.48	6	13.50	7
List of the materials for reuse, salvage and recycling	15.45	5	13.57	6
Disposal options	13.41	1	20.00	10
Materials/waste handling procedures	15.52	7	13.36	5
Appointment of waste management manager	16.07	8	11.64	4
Waste sorting and handling facilities	16.25	9	11.07	2
Special handling disposal of hazardous waste	16.68	10	9.71	1
Names and contacts of salvagers, reusers and recyclers	14.45	4	16.71	8
Site plan showing waste management facilities	14.18	2	11.25	3

MR = Mean Ranks

The last issue to resolve is to find out whether or not the ranking reflects the perceptions of the two groups on what should be the top priorities in formulating WMP. A hypothesis was postulated for this, which states that: there is significant difference between private and public organizations on the content-composition of WMP to achieve sustainable values. A Mann Whitney-U analysis was also carried out to test this hypothesis. The result is shown in Table 6. All the p- values are greater than the critical p-values (0.05) except for special handling disposal of hazardous waste. This result is illuminating. The implication is that their different ranking of this particular item should be maintained when formulating WMP for the two groups. Top and very important priority should be given to "special handing disposal of hazardous waste" in public projects. This may require special equipment and skills in public projects. It could also mean that public organization will be better suited for projects that can generate this type of waste since they have the resources to handle them.

Table 6: Mann Whitney – U analysis test for content items

Items.	Organizations.	SOR	Whitney U-value	Z-value	p-value
Analysis of waste generated	Private	313.00	60.000	-1.081	.280
	Public	122.00			
Alternatives to waste disposal	Private	340.50	66.500	-.630	.528
	Public	94.50			
List of the materials for reuse, salvage and recycling	Private	340.00	67.000	-.567	.570
	Public	95.00			
Disposal options	Private	295.00	42.000	-1.948	.051
	Public	140.00			
Materials/waste handling procedures	Private	341.50	65.500	-.663	.507
	Public	93.50			
Appointment of waste management manager	Private	353.50	53.500	-1.360	.174
	Public	81.50			
Waste sorting and handling facilities.	Private	357.50	49.500	-1.576	.115
	Public	77.50			
Special handling disposal of hazardous waste	Private	367.00	40.000	-2.098	.036
	Public	68.00			
Names and contacts of salvagers, reusers and recyclers	Private	318.00	65.000	-.694	.487
	Public	117.00			
Site plan showing waste management facilities	Private	283.50	46.500	-.909	.364
	Public	67.50			

SOR is Sum of Ranks

CONCLUSIONS

The study reveals the following about WMP in generate sustainable values in construction projects:

- WMP has high impact on waste reduction and hence can generate or enhance sustainable values in construction projects.
- It does not have significant impact on waste reduction in both private and public organizations' projects in Nigeria.
- Eleven factors required for WMP to generate sustainable values were considered important differently in both private and public organizations. However, there is no significant difference in their opinions about the importance of these factors.
- Both groups opined ten items considered fits for inclusion in WMP's formulation important differently. However, it reveals that "special handling disposal of hazardous waste" is the most important in formulating WMP for public projects and is least for private projects.

RECOMMENDATIONS

- Due to the aforementioned, the study therefore recommends that:
- Practitioners should give more consideration to the usage of WMP in their projects to enhance sustainable values by reducing waste.
- Awareness, enlightenment, education and training on WMP should be given to both private and public organizations' staff to enhance its significance on waste reduction in Nigerian construction projects.
- Special handling disposal of hazardous waste should top the items when formulating WMP for public organizations while it should be given least consideration for private organizations.
- Practitioners should include items or procedures in their WMPs specifically for labour, time and equipment waste minimizations.

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VALUE ANALYSIS - AN APPROACH TO SUSTAINABILITY

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ABSTRACT

Since the birth of Value Analysis (VA), during last century, by L. D. Miles all Value Management (VM) tools aim at increasing the Value of a VA subject, this being defined as the relationship between the satisfaction of needs and the resources used in achieving this satisfaction [1]. VA, which led to VM, was seen, formerly, as a cost reduction tool, even if using a functional approach. Today this is no longer possible and any VM study must take into account the different stakeholders needs and expectations. Technical and economical aspects can no longer be separated from environmental and social ones which mean that the three components of Sustainability must be considered. The authors, coming from different backgrounds and experiences, have been developing, testing and implementing a methodology – Sustainable Value – profiting from the synergies between VA and other methodologies and concepts connected with Sustainability, mainly Cleaner Production and Eco-efficiency ones. The main difference towards any ordinary VA application is that through all the VA work plan special attention is paid to the three Sustainability vectors: economical, social and environmental - in the gathering of data, in the characterisation of functions during functional analysis, during creativity and in the evaluation of ideas. This approach has already been tested and implemented in about 20 companies from different areas: metal mechanics, plastic transformation, detergents, automotive components, quarrying and stone processing, etc. The proposal is to present this approach as well as some results and difficulties in its implementation.

KEYWORDS

Sustainable Value, Value Analysis, Value Management, Sustainability, Cleaner Production, Eco-efficiency

INTRODUCTION

For centuries, throughout the industrial history, in a more or less explicit way, the adequate use of resources has always been an objective. When Miles developed Value Analysis methodology, last century, at the end of the forties, he had also this aim in mind. The evolution of concepts lead to the present Value definition as the relationship between the satisfaction of need and the resources used in achieving that satisfaction [1]. In other words, and because it is a functional approach, the objective is reached by improving functions performance and reducing resources.

Other tools and approaches, in different areas, have been developed with identical objectives. When speaking about Cleaner Production, for example, the aim is to produce more with higher levels of quality using less materials, water and energy. As to eco-efficiency what is meant is the double aspects of economics and ecology, or going further on, into Sustainable Development as a process whose main objective is to satisfy the needs of present generation but leaving opportunities to the future ones. Therefore by Sustainability is meant the result of optimisation of a multi criteria process in a very complex system that takes into account three basic dimensions: economical, ecological and social.

Five years ago, in INETI (a Portuguese state laboratory for engineering, technology and innovation), the authors of this paper joined in a working team – the Sustainable Value (SV) team. The objective was to develop a methodology which profits from those technicians' different experiences in the above mentioned tools and areas and from the existing synergies between those ones.

It is the output of this experience that will be presented in this paper - the methodology and the Manual [2] where it was published. More

than 20 companies coming from different sectors: metal mechanics, plastic transformation, detergents, automotive components, quarrying and stone processing, just to name some, have already tested it.

THE METHODOLOGY STEP BY STEP

Starting from the VA work plan, as defined in the EN 12973: 2000 [3] (Table 1), the SV team developed a new work plan (Table 2).

The Manual was elaborated in order to support both the work done by the multidisciplinary team constituted by elements of each company involved in the application of the methodology and the process of decision making within companies. In this Manual, together with some introductory text, are compiled the different sheets used in each phase of the work plan. They can also be used in Excel program.

The greatest amount of work to be done along the process has to do with the gathering and processing of information. Even when the companies have all the needed information available, most of the times it is not worked in order to satisfy the methodology needs. Therefore there is a lot of work to be done by each company working team.

The application in a particular company (case study) will be used to exemplify some of the phases of the methodology, namely those where special attention is paid to the three Sustainability vectors: economical, social and environmental - in the gathering of data, in the characterisation of functions during functional analysis, during creativity and in the evaluation of ideas. This company manufactures automotive components and its study subject was the manufacturing process with the objective of increasing the Sustainable Value of a certain component.

All the unitary operations were identified (Figure1) as well as the inputs and outputs of materials, energy and water. All the collected information is treated and gathered in the eighteen forms referred to as IG in the third column of Table 2. The detailed costs for each operation related to the components are quantified in what concerns human resources, equipment, energy, materials, water and emissions and waste management. The global repartition of costs is shown in Figure 2.

The study subject is then submitted to functional analysis this being a systematic process to describe completely the study subject's functions and their relationships. They are systematically identified, characterised (Figure 3), classified and evaluated [3].

The level of satisfaction of the user will depend on the performance of those functions, being the user more and more aware of the environmental and social aspects associated to the goods he uses.

In order to contribute for a progressive orientation of companies towards Sustainable Value it is essential that when working on this Functional Analysis phase, the stakeholders' needs (expressed in functions terms) through the life cycle of the study subject take into account not only social and economical worries, but also the environmental aspects.

To estimate Value, or more precisely in this context, Sustainable Value, it is used the definition of Value already mentioned [1]:

Value = Satisfaction of needs/use of resources

The needs are characterised and quantified by the outputs of phase 4 (AF01 – functions listing, AF02 – functions characterisation, AF03 – functions hierarchization, AF04 – cost / function, AF05 – cost / importance, part of AF06 – satisfaction of needs).

As to the resources quantification it comes directly from phase 3 (IG 01 – general manufacturing diagram, IG 02 – specific manufacturing diagram, IG 03 – study subject components, IG 04 – operations description, IG 05- raw materials, IG 06 – auxiliary materials, IG 07 – packages, IG 08 – water, IG 09 – energy, IG 10 – final products, IG 11 – sub products, IG 12 - intermediary products, IG 13 – waste, IG 14 – atmospheric emissions, IG 15 –waste water, IG 16 – noise, IG 17 – mass balance, IG 18 – cost model) where all the inputs and outputs were costed

In all these elements, whenever possible, the three components of Sustainability (economical, social and environmental) are taken into account and therefore the designation of the Value relation as

Sustainable Value. This indicator will later be compared to the ones that will be obtained by implementing the proposals generated in phase 6.

The eco inefficiencies of the study subject and its social and environmental impacts detected in phase 3, as well as the non adequate performance of its functions that may have to do either with a non desired level of satisfaction, higher cost than the relative importance of the function, or any other problem are then synthesized in phase 5. The results of this synthesis are good starting points for the creativity process that will follow. Using collective creative methods, of which brainstorming is one commonly used, a lot of ideas can be gathered in a relatively short period of time.

In this case study 66 ideas were generated being the materials costs one of the starting points due to its weight in the costs distribution (Figure 2). They were classified according to the time needed for implementation as follows:

- Short term implementation – 5 ideas
- Medium term implementation – 27 ideas
- Long term implementation - 23 ideas
- Ideas not be considered - 11.

Another classification of the generated ideas that can be used is related to Cleaner Production techniques, and for the case study analysed the results were:

- 25 ideas dealing with good practices
- 22 ideas to modify the process
- 6 ideas about materials changes
- 4 ideas for internal valorisation
- 3 ideas for product modification

When classified according to eco – efficiency principles the results were:

- 37 ideas for materials reduction
- 16 ideas for energy reduction
- 5 ideas for toxic dispersion reduction
- 5 ideas for incentive to recyclability
- 3 ideas for maximization of renewable resources consumption

Then it is analyzed the viability of the selected ideas and here again the Sustainability principles are present, and so there is a technical, an environmental and an economical viability analysis (with its specific sheets, AV01, AV02, AV03) as well as the sustainable value calculation (AV04) for each chosen proposal so that the ones with higher values and in accordance with the objectives and constraints defined in phase 2 will be chosen for further development planning and implementation, thus completing the Sustainable Value work plan.

In a first stage, the implementation in the company that has been used to illustrate this paper had as main results the increase of Sustainable Value in 25% obtained through resources decrease and performance increase. This results from reductions in water consumption (28%), waste water (100%), noise (25%), emissions (90%), and waste generation (20%). The improvement of the company image as well as working conditions must also be referred as well as a better awareness towards the social aspects related with the company activities.

DIFFICULTIES IN THE PROCESS

Even when the needed information is available in the company, it is not processed in the way needed to be worked within the frame of the proposed work plan. So and in order to use the working sheets there is always a lot of work to be done.

The problem is that most of the times the company thinks that it is enough just to provide the unorganised information and the team leader will do the job. But this methodology implies the effective involvement of the working team. This involvement has to do with two main aspects: the first one is that the ones who better know the organisation and its particularities are those living and working there. Of course that an external look can also bring added value, but for most aspects it is essential the real involvement of the most interested parts in the process, those who know every detail of its inside – the company itself. Besides, the objective of an intervention of this kind is not only to solve a specific problem but above all to introduce and implement in the company a

new methodology and a new way of thinking and solving the daily problems. And the only way of learning such methodologies is by doing.

All those problems vanish or at least are significantly reduced when there is a real and effective support from the Decision makers, this being translated not only in the interest on the working progress but and specially in providing the necessary resources (human resources availability, material, financial whenever necessary) for the work to be performed.

RESULTS AND GENERAL CONCLUSIONS

In a general way the application of this methodology, in several SME lead to the following global results:

- Increase of Sustainable Value;
- Company eco - efficiency improvement;
- Development of new products;
- Expression of user's needs;
- Diagnosis of manufacturing processes at environmental, economical and social levels;
- Identification, control and reduction of cost;
- Optimisation of manufacturing processes;
- Adoption of environmental best practices;
- Improvement of the environmental profile of processes and products
- Reduction of materials, energy and water consumption;
- Waste preventive approach;
- Reduction of toxic dispersion;
- Company competitiveness improvement;
- Improvement of internal and external communication – with workers, suppliers clients and local community;
- Attitudes and behaviour change;
- New competences development in companies namely in what concerns Sustainability;
- Adoption of more social responsible behaviour by the companies.

The present edition of the Manual Valor Sustentável [2] must also be mentioned as an important result of the work developed.

One of the main conclusions to be taken is the applicability of the methodology in companies from different areas and dimensions, with different study subjects and the confirmation of the good results that can be obtained with its application.

The methodology enables the companies, which apply it, to diagnose the main problems concerning their manufacturing processes and products (for those that decide for an integrated study of the product) leading to the quantification of the total costs including the environmental and social ones. It also leads to the improvement of functional performance of the study subjects by improving the satisfaction of the user's needs and by using a pollution preventive approach and by taking into account the eco efficiency principles through the application of the methodology. It also contributes to costs reduction by minimizing resources intensity (materials, energy, water, operation time, …) of products and services.

The application of the methodology leads to ideas that increase the sustainable value of the study subject of the company and improve communication. It also leads to the adoption of more responsible corporate social behaviour by the companies as well as to the increase of their competitiveness.

The methodology shows a high potential to be used as an operational tool for the development of sustainability at entrepreneurial level.

The success of such an approach depends on the effective support of company's Top Management.

Table 1: Responsibility (●) and participation (X) during the phases of the VA work plan [1]

Phase Name	Phase Nr.	Decision maker	Team leader or VA project leader	Working group	Operational departments
Preliminary Phase	0	●			X
Project Definition	1	●	X		X
Planning	2		●		
Gathering data	3		●	X	X
Functional Analysis	4		●	●	X
Gathering ideas	5		●	●	X
Evaluation of solutions	6		X	X	●
Development of proposals	7		●	●	●
Presentation of proposals	8	●	●	●	X
Implementation	9	●	X		●

[1] The responsibility and participation will vary from project to project and from organisation to organisation

Table 2: Value Analysis versus Sustainable Value work plan and its working sheets

Value Analysis Phase Name	Sustainable Value Phase Name (Sustainable Approach)	Sheets to be used by the working team (option Excel sheets)
0. Preliminary Phase	1. Company general data	DG 01 – general identification DG 02 – labour conditions DG 03 – staff flowchart DG 04 – relationship with stakeholders
1. Project Definition 2. Planning	2. Project specific data	DE 01 – study subject DE 02 – working team DE 03 – objectives DE 04 – constraints DE 05 – information about the product
3. Gathering data	3. Global inventory	IG01 – general manufacturing diagram IG 02 – specific manufacturing diagram IG 03 – study subject components IG 04 – operations description IG 05- raw materials IG 06 – auxiliary materials IG 07 - packages IG 08 - water IG 09 – energy IG 10 – final products IG 11 – by products IG 12 - intermediary products IG 13 - waste IG 14 – atmospheric emissions IG 15 –waste water IG 16 - noise IG 17 – mass balance IG 18 – cost model
4. Functional Analysis	4. Functional Analysis	AF 01 – functions listing AF 02 – functions characterisation AF03 – functions hierarchization AF 04 – cost / function AF 05 – cost / importance AF 06 – sustainable value
5. Gathering ideas	5. Problems synthesis	SP 01 – problems synthesis
	6. Previous identification and selection of ideas	II O1 – ideas listing and classification II 02 – ideas description II 03 – definition of groups of ideas
6. Evaluation of solutions 7. Development of proposals	7. Viability analysis	AV 01 – technical viability AV 02 – environmental viability AV 03 –economical viability AV 04 –sustainable value
8. Presentation of proposals 9. Implementation	8. Action plan	PA 01 – action plan

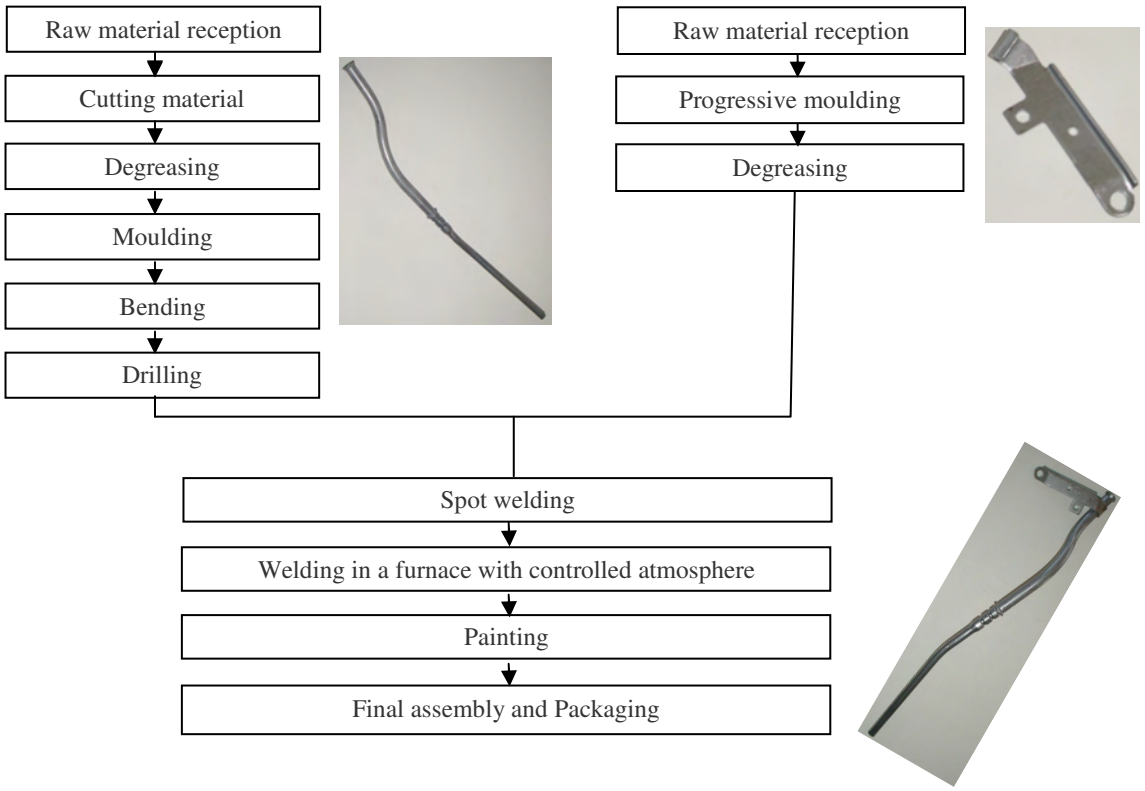

Figure 1: Example of a general manufacturing diagram (IG 01)

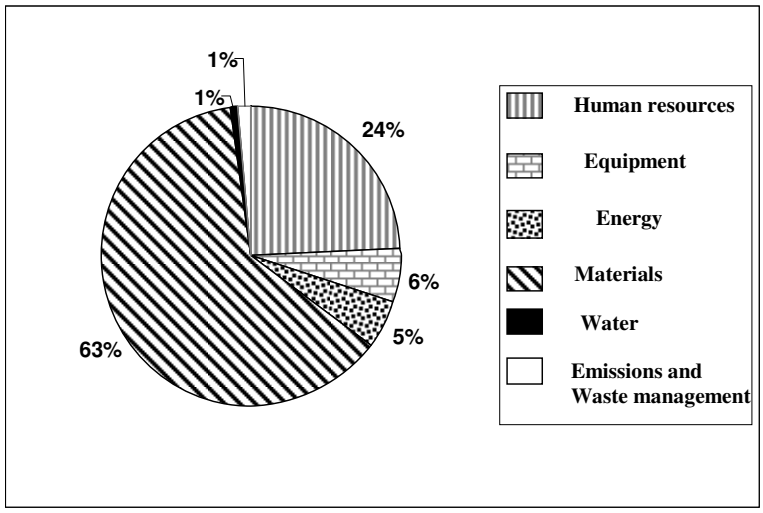

Figure 2: Osts distribution - example

Function	Criteria	Desired level	Existing level	Comments
Mould component	**Technical**			
	% internal iron scrap	0%	30%	
	Tools Setup	30 min.	45 min.	
	Environmental			
	Legal conformity of noise level at working post	90 dB	94,9 dB	Press 160 t
	Social			
	Legal conformity of noise level at working post	90 dB	94,9 dB	Press 160 t

Figure 3: Example of function characterisation (technical, environmental and social criteria)

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- European Standard Value Management EN1325 -1 – 2001
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- European Standard Value Management EN12973

HKIVM NEWS AND EVENTS

JOINT SEMINAR WITH CIOB (HK) - APPLICATION OF VALUE MANAGEMENT IN CONSTRUCTION

A CPD seminar on "Application of Value Management in Construction" was jointly organised by the HKIVM and the CIOB Hong Kong at The Hong Kong Polytechnic University on 9th July 2009. Dr. Ann Yu, Secretary of the HKIVM, and Mr. Ivan Au, Membership Secretary of the HKIVM, gave a presentation introducing the definitions, historical development, components, methodology and job plan of VM as well as its applications with real life examples in this seminar. The seminar was received and attended by over 100 construction professionals.

ABOUT THE SPEAKERS

Dr. Ann T.W. YU is the assistant professor of Department of Building and Real Estate at The Hong Kong Polytechnic University. Ann has over ten years of experience in project management, design and quantity surveying of construction projects in the industry. She is with PolyU since 1996 conducting research, pursuing PhD and academic role.

Mr. Ivan Y.L. AU is the centre Manager of Construction Industry Council. Ivan has more than 20 years experience in civil engineering projects. He has particular interest in value management and he is a PhD candidate in value management.

VM CONFERENCE IN SINGAPORE - VM IN THE CONSTRUCTION PROJECT RISK MANAGEMENT

Mr. Anthony Wilson, Past-president of the HKIVM, and Dr. Mei-yung Leung, Vice-president of the HKIVM, were invited by the International Quality and Productivity Centre to present the Value Management in the Construction Project Risk Management Conference in Singapore on 28th - 29th July 2009. The conference conducted successfully and it was attended by over 60 senior managers in the construction industry in Singapore.

VM SEMINAR IN SINGAPORE - INTRODUCTION OF VALUE MANAGEMENT

Dr. Mei-yung Leung, Vice-President of the HKIVM, was invited by the Paul-Y Management Limited to present a seminar titled "Introduction of Value Management" on 26th September 2009. This seminar covers a logical team decision-making process in the VM for construction projects. There was over 60 managers participated.

ABOUT THE SPEAKERS

Dr. Mei-yung LEUNG has more than twenty years of practical/teaching experience in the construction industry/education and has participated in a number of prestigious construction projects in HK. At the CityU, Dr. Leung is conducting a VM course that has obtained the accreditation from the SAVE in USA. In the industry, she facilitated various VM workshops for construction professionals in HK, including public piers, traffic management, highway, sewages, water supplier, public housing and library.

VM SEMINAR IN DAVIS LANGDON AND SEAH

Ms. Shirley C.S. HO, Honourable Treasurer of the HKIVM, was invited by the Davis Langdon & Seah Hong Kong Limited, which is a famous international cost consultant firm, to present a short seminar on VM for training purpose on 30th July 2009.

ABOUT THE SPEAKER

Ms. Shirley C.S. HO is a chartered quantity surveyor with over 10 years experience in construction. She joined DLS in 1995 and promoted to Senior Team Leader in 2006. Besides providing traditional quantity surveying services, she specializes in workshop facilitation, research studies, technical specification writing, contractual advice, loan monitoring and claim valuation.

VM RESEARCH IN THE HONG KONG POLYTECHNIC UNIVERSITY

In the recent exercise of applying for funding from the Research Grants Council under the highly competitive and prestigious "General Research Fund" scheme, Prof. Geoffrey Shen, President of HKIVM, has won a grant of HK$ 644,700. The following is a brief description of the project:

Title of Project:

The effect of using group support systems on virtual value management workshops for major construction projects

Abstract of research:

The construction industry is struggling to meets its customers' demands for value for money. This problem has been rectified to some extent by the practice of Value Management (VM), in which major stakeholders of the construction projects work together in a workshop, to systematically and proactively improve value for money for the projects by providing the required functions and specifications at the lowest life cycle cost, and eliminating potential sources of wastage and inefficiencies. For a number of practical reasons such as time and cost savings, there is an increasing need to conduct VM workshops virtually, with participants of the workshops geographically dispersed. The lack of understanding of the effects of this special setting on the processes and outcomes of the VM workshops, however, poses a serious problem to the use of VM for major construction projects. This research aims at improving the performance of virtual VM workshops through the use of Group Support Systems (GSS), which combine computing, communication, and decision support technologies to facilitate workshop participants in their search for value for money. It builds on and extends the investigators' recent CERG project which investigated the viability of using GSS in VM workshops with participants in the same location. The research question of this new project is: to what extent does the use of GSS affect the processes and outcomes of virtual VM workshops where participants are geographically dispersed and rely on mediated (rather than face-to-face) communication to produce outcomes?

The research objectives of this investigation are three-folds: (1) Identify the essential features and functions to be possessed by a purposely-designed GSS in order to support virtual VM workshops for major construction projects; (2) Design and develop a prototype GSS which is able to support workshop participants in the execution of planned tasks in a virtual VM workshop environment; and

(3) Evaluate the extent to which the use of the purposely- designed GSS affects the processes and outcomes of virtual VM workshops for major construction projects. These objectives will be achieved by adopting a group of rigorous and integrated research methods involving case studies, personal interviews, focus group meetings, experimental studies, and action research. The novelty of this proposal includes: 1) increasing understanding of the effect of using GSS on the facilitated and participatory virtual VM workshops with participants dispersed geographically; and 2) improvement in information capture, generation of solutions, and decision-making through virtual VM workshops. This project will lead to new knowledge and improved understanding of group dynamics (i.e., actions, processes, and changes that occur among stakeholders) in virtual VM workshops for major construction projects. The findings of this investigation are likely to enhance the effectiveness and efficiency of collaborative working of multiple stakeholders in a virtual workshop environment, and to have a significant impact on the way these workshops should be managed and conducted to ensure best value for these projects.

For more details, please contact Prof. Geoffrey Shen, Department of Building and Real Estate, The Hong Kong Polytechnic University, Tel: (852) 2766 5817, Fax: (852) 2764 5131, Email: bsqpshen@polyu.edu.hk .

THE VALUE MANAGER
CALL FOR ARTICLES

THE VALUE MANAGER is the official publication of the Hong Kong Institute of Value Management. It intends to provide a lively forum and means of communications for HKIVM members and those who are interested in VM. To achieve this objective, we need your support by sharing with us your articles or comments. The following are the notes to contributors:

1. Articles submitted to the journal should fall in one of the following categories: New VA/VE/VM techniques or methodologies, Review of conference VM papers, VM case studies, VM research trends and directions, Reports of innovative practice.
2. Papers or letters should be submitted on a CD / DVD and A4 hard copy. Discs will be returned to authors after editing. Figures, if any, should be sent separately, in their original and preferred sizes. The length of each paper should be around 1000-1500 words.
3. The preferred software for processing your article is Microsoft Word, other packages are also acceptable. If the above word processing package is not available, please find a computer with scanning capabilities; the typewritten copy can be transferred to a file as specified.
4. All articles and correspondences should be sent directly to the Editor:

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