

Integration of Project Implementation Organization of Road and Bridge Construction based Earned Value Management(EVM)

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Abstract— Organization of construction projects (OBS) is an organization formed by the top management of the organization (head office) in order to construct a series of projects appropriate policies for managing the project. In the implementation of road and bridge construction projects, project organization formed based on project requirements of the Work Breakdown Structure (WBS) of the project. WBS become a major element in the concept of EVM in order to establish the project organization. Implementation of the road and bridge infrastructure projects in Eastern Indonesia, became one of the main priorities of government in order to accelerate economic development in remote areas in the region. Therefore, the establishment of a project organization that will be involved in the implementation of development function must be systematically arranged so that the road and bridge project can be completed to the purpose of the project. The aim of this research is to establish an organizational structure of the project who integrated based on the EVM concept. The data required includes secondary data hierarchy organizational functions of 31 contractors in the province of A, 30 contractors in the province of B and 44 contractors in the provinces C. Mapping of secondary data produced 4 models. The primary data through interviews and questionnaire responds to four models of integration project organization system of roads and bridges in order are , OBS of Head Office; Application of WBS by the contract documents; Planning Project Organization and responsibilities; Planning Implementation Costs; Material, equipment, labor allocation schedules, and schedule of work breakdown structure.

Keywords— OBS, WBS, Road and Bridge Construction Project, Eastern Indonesia

I. Introduction

Organization of the construction project is a project organization that was formed by the top management of the organization (head office) in order to construct a series of projects appropriate policies for managing the project. The policy includes among others, stage of the project imposed on the organization; the determination of the parties involved are functionally within the organization and form of management organization that will be used. In the implementation of road and bridge construction projects organization formed based on project requirements of the Work Breakdown Structure (WBS) of the project.

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WBS become a major element in the concept of EVM in order to establish the project organization in order to establish the project organization or Organization Breakdown Structure (OBS) that includes the determination of employment based on a contract document; identify the project organizational structure; provide integration process of cost and time; identification of organizational elements responsible for indirect costs; and integration between WBS and OBS.

Implementation of the road and bridge infrastructure projects in Eastern Indonesia, became one of the main priorities of government in order to accelerate economic development in remote areas in the region. Therefore, the establishment of a project organization that will be involved in the implementation of development function must be systematically arranged so that the road and bridge project can be completed to the purpose of the project namely completion in a timely manner, the right cost and right quality. To achieve the goal of the project is then carried out a study that aims to establish an organizational structure that is Functional Hierarchy System Project Organization for Roads and Bridges based methods or EVM concepts. The organization in charge of running the function of road and bridge project implementation within the framework of the hierarchy to be generated in this study.

II. Organization of road and bridge construction projects as well as EVM

A. Construction Project Organization

The project is an investment activity that uses factors of production to produce goods and services that are expected to benefit in a given period (Bappenas TA-SRRP, 2003). The right project organization to manage road and bridge construction projects carried out by the top management of the organization (Head Office) to draw up a series of policies and appropriate organizational form. The policy includes: 1). stage of the project imposed on the organization; 2). the determination of the parties involved are functionally within the organization and 3). forms management organization that will be used. The OBS displays organizational relationships and then uses them for assigning work to resources in a project. The OBS allows complex projects to be broken down, providing a more organized representation of the work to be completed. While the WBS is used to define the project during early stages of its cycle, the OBS provides an organizational structure for the project as it moves to completion. The hierarchical

nature of the Organizational Breakdown Structure allows for the appropriate resources and responsibilities to be assigned.

B. Road and Bridge Construction Project

Project construction of roads and bridges as one of the physical infrastructure provide significant meaning as the infrastructure of land transport covering all parts of the road, including complementary buildings and equipment intended for traffic, to support the various needs of society in the economic, social, cultural, environmental, politics, defense and security, and prosperity. Construction of better roads and bridges in Eastern Indonesia region, namely the provinces A, state B and C became one of the provinces of Indonesia's top priorities in order to accelerate economic development in remote areas that are in this region

C. Earned Value Management (EVM)

One method that has been widely applied in the International company is Earned Value concept as applied to California Department of Transportation, US Department of Energy and NASA. Meanwhile, the American National Standard Institute (ANSI) has published ANSI / 748 which is a standard application of Earned Value Management System in the management of the project. These systems incorporate and link the elements of the budget, expenses, schedule, score result, the scope of work and implementing organizations, which are summarized in a procedure, with some aspects and criteria that must be met. This indicates that the Earned Value Management System is very necessary to be applied in the management of the project as an integrated activity between the policies, procedures and practices in decision making. According to the national industry standard in the United States (1998) is an American National Standards Institute / Electronic Industries Alliance (ANSI / EIA) 748 - A - 1998, in application of the concept of Earned Value, there are five major aspects of project management, which translated into 32 criteria. The five aspects are: 1). Organization, 2). Planning, scheduling, and budgeting, 3). Accounting system, 4). Analysis and management reports and 5). Revision and repair data.

III. Research Method

The primary data and secondary data made against contractors in the research area is the construction of roads and bridges in Eastern Indonesia region in the province of A, province B and province C.

Secondary data in this study include the shape or model the functional hierarchy of the organization that runs the project construction of roads and bridges are usually applied by contractors in their respective areas.

Primary data in this study is the contractor data from the opinion stated in the answer to question either orally (interviews) and written (the questionnaire) as a response to the secondary data model of the functional hierarchy of the organization projects that have been mapped.

IV. Functional Hierarchy System Project Organization for Roads and Bridges Development Based EVM

Secondary data were obtained from each contractor with a population of contractors who are in the province A , total of 33 contractors, provinces B, total of 32 contractors and provincial C by 47 contractors.

To simplify the process of determining the sample size for a finite population, Krejcie & Morgan came up with a table using sample size formula for finite population.

Table 1. Krejcie & Morgan Table

Table for Determining Sample Size of a Known Population									
N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	100000	384

Note: N is Population Size; S is Sample Size Source: Krejcie & Morgan, 1970

Source : KENPRO (2015)

Sampling population using the Table 1. above of Krejcie-Morgan . A representative sample of the population of this study with an index of 95%, with a significance level of 0.05 alpha ($\alpha = 5\%$) are as follows:

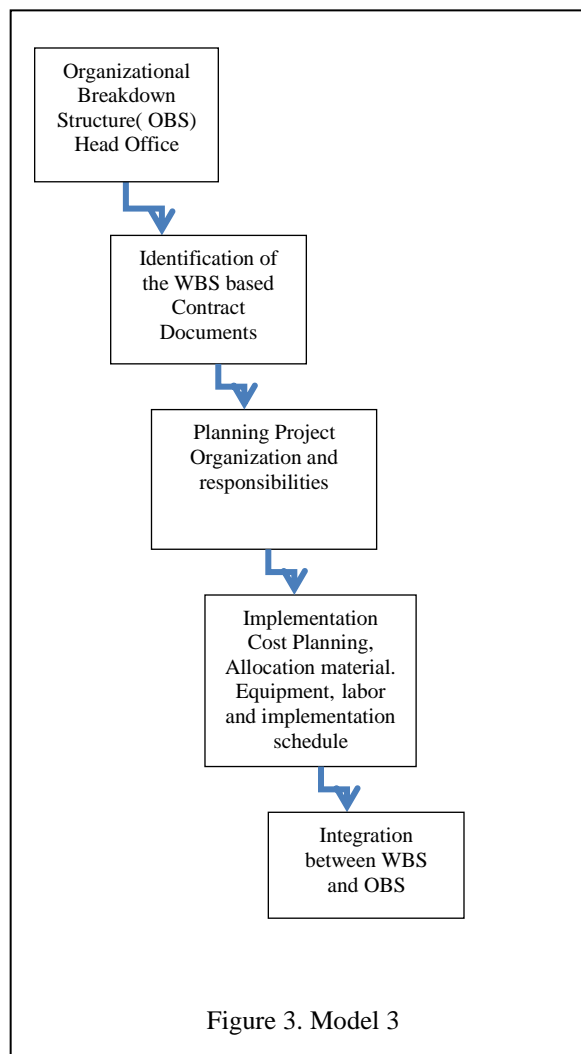
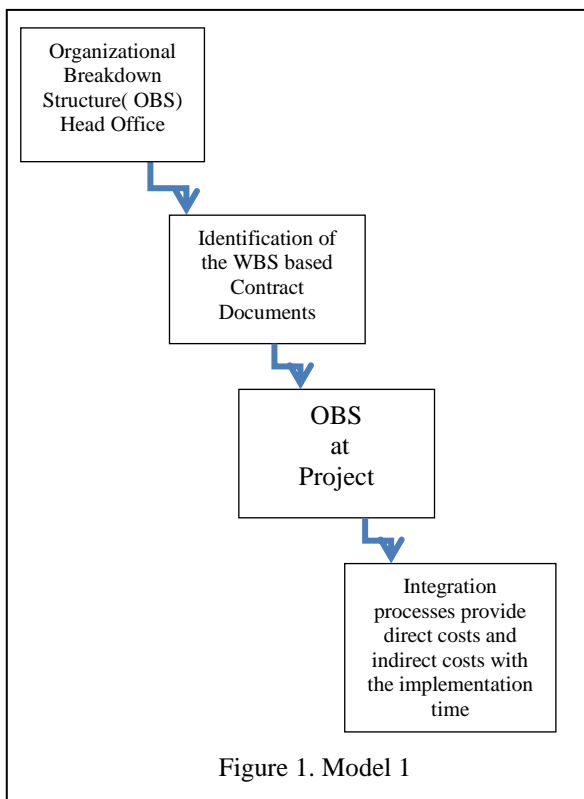
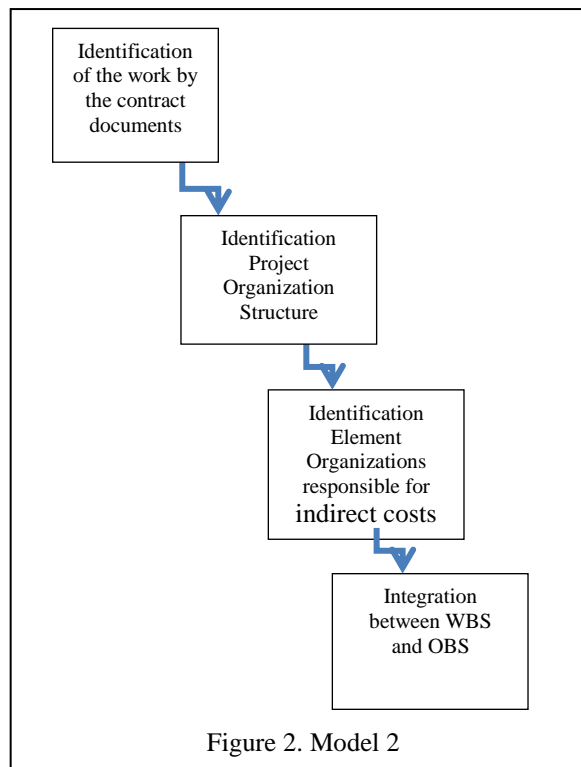
Province A, the population is 33 respondents so the sample is 31 respondents,

Province B, the population is 32 respondents so the sample is 31 respondents and

Province C, the sample of the population of 47 respondents is 44 respondents.

Secondary data that is needed is covering functional form or the hierarchical model of the project organization that undertakes the construction of road and bridge. The data is then mapped. The principle of mapping the initial screening is done to see the same meaning and the not same meaning of the functional hierarchical organization model who used contractors. Data are the similarity of meaning is mapped once to prevent overlapping while the data is not the same meaning mapped back.

After mapping the secondary data obtained four models of organizational structure contracting company based EVM shown in Figure 1 to Figure 4 below:



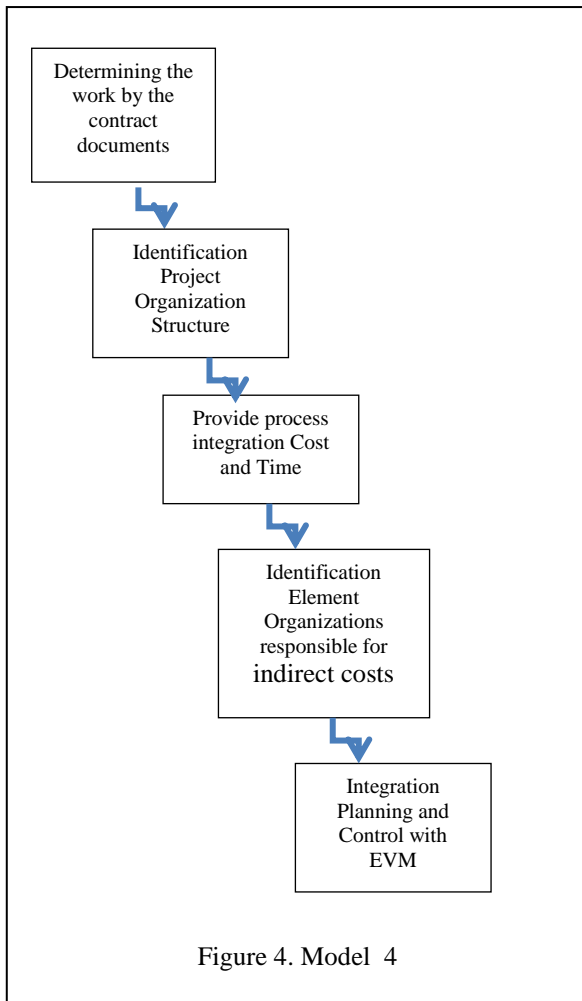


Figure 4. Model 4

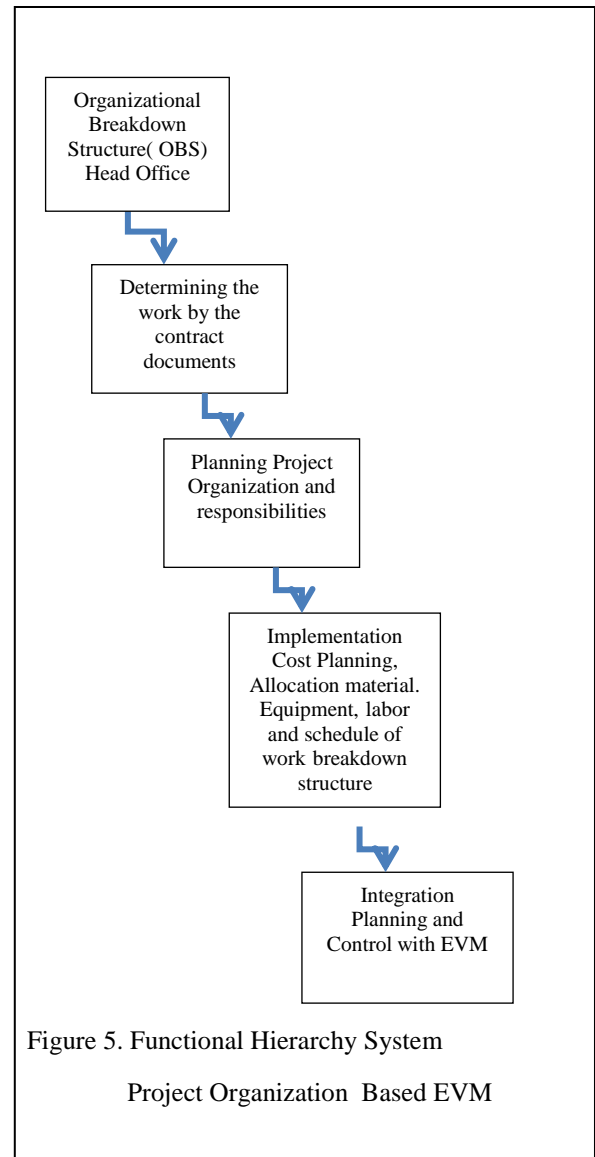


Figure 5. Functional Hierarchy System

Project Organization Based EVM

Furthermore, all four models above mapping results are fed back to the respondent to give an opinion on these models. Based on respondents' answers using Guttman then the results of the analysis are shown in Table 1 below:

Tabel 2. Opinions of respondents

No	Model	Province A (31 R)		Province B (30 R)		Province C (44 R)	
		Yes	No	Yes	No	Yes	No
1.	Model 1	0	31	1	30	0	44
2.	Model 2	0	31	1	30	0	44
3.	Model 3	29	2	30	-	37	7
4.	Model 4	30	1	30	-	44	0

Based on Table 1, the average respondent selection is model 3 and model 4. Thus the model 3 and model 4 can be combined to obtain a model of the development of EVM method as shown in Figure 5 below:

v. Discussion

Organization Breakdown Structure (OBS) is a hierarchical model describing the established organizational framework for project planning, resource management, time and expense tracking, cost allocation, and work management.

Work Breakdown Structure (WBS) captures all elements of projects in an organized fashion. Provides a better framework for organizing and managing current and future projects. WBS facilitates resource allocation, task, measurement and control of project cost. The WBS is utilized at the beginning of the project to define scope, identify cost centers and is the starting point to developing project plans.

The Organization Breakdown Structure groups together similar project activities and relates them to the organization's structure. OBS is used to define the responsibilities for project management, cost reporting,

billing, budgeting and project control. The OBS provides an organizational rather than a task-based perspective of the project. The hierarchical structure of the OBS allows the aggregation of project information to higher levels. When project responsibilities are defined and work is assigned, the OBS and WBS are connected providing the possibility for powerful analytics to measure project and workforce performance at a very high level or down to the details .

VI. Recommendation

Things that need to be considered by the top management at the time of forming the organization of projects such as how many people will be involved, how the relationship between the parties involved, when the involvement of such parties. Organizations should unite under one command in carrying out the functions of planning, execution functions and control functions in an integrated manner.

Resource management in the organization of road and bridge projects based on WBS, control functions performed by the project manager. Leaders at the head office must perform periodic monitoring

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Organization Breakdown Structure (OBS) is a hierarchical model describing the established organizational framework for project planning, resource management, time and expense tracking, cost allocation, and work management.