

Construction Waste Management Practices In The Construction Site: Virtual Source Analysis

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Abstract: The significant growth in the construction industry has been a bit of a serious issue for most developing countries like Malaysia. Along with construction's growth, the increase of building materials used also adds waste to the construction site. Thus, the practices of construction waste management must be done by the organization, especially for the construction sectors. This research was a study about the construction waste management practices in the construction site. This research aims to study the types of construction waste in the construction site, the construction waste management practice in the construction site, and the differences between construction waste management in the construction site. Furthermore, this research was focusing on the analysis of the video, especially on construction waste management practices in the construction site. Moreover, the five of the video analysis was picked through the open source internet which showed the construction waste management in the construction site. The research design for this research was technical research which analyzed video as a material in data collection using the checklist form to help the researcher to obtain the data. The result for this study shows that the types of construction wastes were made from woods, metals, concrete, and other wastes (drywall, plastics, cardboard, papers, glasses, the product can, *etc*) and bricks, the practices of construction management in construction site were shown the high levels in practicing the construction waste management practices in the construction site was prevention and reduction, reuse, recycle and disposal, the differences between the construction management was the storage of building materials, construction waste segregation, scheduled construction waste collection, and the construction waste disposal. In conclusion, the study of the construction waste management practices by using video could be a guideline as to the effectiveness of the construction waste management practices in the

construction site.

Keywords: Construction Industry, Construction Waste, Contractors, Management, Practices

1. Introduction

The construction industry is one of the first elements that influences the economic sector in our country. Despite that, the significant growth in the construction industry has been a bit of a serious issue for most developing countries like Malaysia (Nagapan & Rahman, 2016). Along with the growth of the construction in Malaysia, the increasing use of building materials also adds waste to the construction site (Osmani, 2012). In the unconscious, the construction industry also contributed to bad wastes construction which is too excessive that leads to harm to the environment of the construction site. Besides, Teshome and Thakur (2017), stated that unstructured construction waste management can be harmful to the environment, health, and safety of construction workers. Besides, construction waste can also cause problems like soil pollution, air and water, floods, environmental damage, soil erosion, damage to the aesthetic value, and so on (Zin, 2005). Therefore, in addressing the issue of construction waste at the site, Ulubeyli et al (2016) suggested that waste could be minimized by assessing or identifying reuse and benefits that may be found for the environment or the construction industry itself. Management activities such as collection, removal, transport to landfill, reuse, recycling, and other activities that could be used to reduce construction waste generation at the construction site needed to take immediate action to resolve construction waste issues complexes and an increasing amount of construction waste.

Based on the research by Nagapan et. al (2013), there was a study to the 30 of the construction site show that there were six types of construction wastes which were concrete (12.32%), metals (9.62%), bricks (6.54%), plastics (0.43%), woods (69.1%) and others wastes (2%). Meanwhile, in the study by Adewuyi & Odesola (2016) shows that the total of the waste construction succeeded in a construction site was over the limit of the allowed which were the lowest-earning was at the phase of installing the asbestos roof (8.4%), meanwhile, the highest-earning were coming from the asphalt concrete (16.61%). The building materials are the natural resources that are now drastically decreasing because of the highest demand from the human who forgets about the preservation of aesthetic value in the environment only for the sole benefit.

The construction growth obviously in the construction industry is one of the most critical problems in some developing countries. There was so much wasted on the construction of the waste were occurred in the construction phase. According to Ahmadvand et

al. (2014), construction waste comes during the construction, planning, and estimation stages. Furthermore, the neglect in managing construction waste has a significant impact on the environment in terms of unstable ecology, change in the living environment, lack of natural resources, energy use and waste generations (Ulubeyli et al., 2016). Whereas, according to Nagapan et al. (2016), neglect in managing construction waste not only causes environmental pollution but also affects the economy and social needs of the community.

A study shows that until now, almost 95% of solid waste continues to be disposed of in the landfill (Shan, 2015). These reduction steps are not sustainable as it will harm the environment. The recommended waste management hierarchy which is reuse, recycle, and reduce the construction waste is better than sending it to the landfill (Nagapan et al., 2016). According to Hamid et al. (2016), in his study shows that general awareness, ongoing monitoring, and evaluation of construction waste should be done. This can indirectly help to reduce the construction waste on the site. However, the study by Ng (2015), on behalf of the contractor itself is still weak in the implementation of the reduction of construction waste through 4R which is causing unsustainable construction waste management. According to Nagapan et al. (2012), in Malaysia, the implementation of recycling initiatives is poorly

done for construction waste in the construction site.

2. Methodology

The research design for this study was technical research about analyzing construction waste management in the construction site. The design study used for the video analysis using a quantitative approach using a checklist form conducted on samples to obtain the required data. The checklist form helps the researcher to collect the data to identify the construction waste management practices in the construction site from the perspective of the contractors and workers. Therefore, by using the video analyzing method through analyzing the selected videos which are five videos that show the construction project. The source of the videos was from the opened source internet which is youtube.

2.1 Sample

This study was conducted by the video analyzing that related to a construction project in the construction site which is available in the open source internet, youtube. According to preliminary surveys, there are 10 videos related to the construction project. Thus, this study was focusing on five videos in the duration from 2 minutes to 15 minutes related to the construction project in the construction site based on the suitability of time. Table 1 shows the sample for this study.

Table 1: The sample study

No	Video Title	Video Url	Date of Publish
1	<i>How to manage waste on a construction site</i>	https://youtu.be/w_8ByOwj2U	7/1/2015
2	<i>Waste Management Construction Solutions: Reducing, Reusing & Recycling Construction Waste</i>	https://youtu.be/XwStG-LAWbs	27/9/2011
3	<i>2009 Residential Construction Waste Management</i>	https://youtu.be/fajYIFfGQJw	19/5/2014
4	<i>Waste Solution Inc. - Construction & Demolition Waste</i>	https://youtu.be/tbNDvvFsqrU	2/12/2011
5	<i>Construction Waste - Wastecycle</i>	https://youtu.be/YhbHAVtOrx M	10/7/2009

2.2 Research procedure

The research procedure shows a research process conducted at each stage of work that aims to ensure that each work progress is in the right phase. Thus the procedure of this study is a main element in solving the problem statements. Once the researcher could identify the problems that arise, the process of gathering information and data was carried out for the addition of information to the researcher.

Figure 1 shows the process of the study procedure, where the study procedure begins by identifying the problem, title, method planning, statistics and modification of checklist form, analyzing videos and filling out checklist forms, conducting data analysis to obtain results, making discussions and conclusion and end.

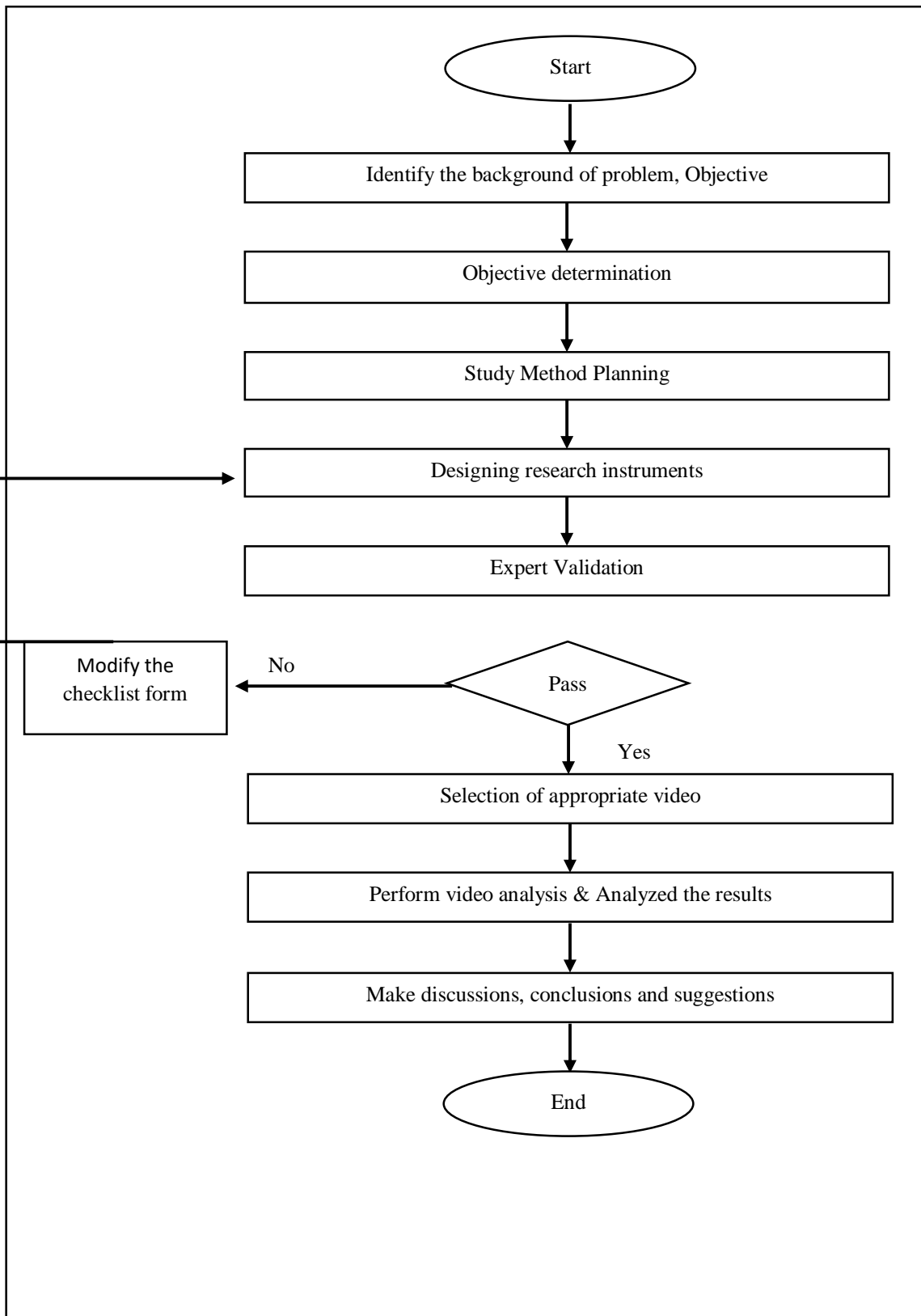


Figure 1: Flow chart of the study procedure

2.3 Research Instrument

The instrument used in this study was a check-list form to obtain the data from the sample. The check-list form consists of three sections, Section A, Section B and Section C. For Section A the details of the samples, Whereas, Section B was through the check-list methods that consist of the types of the construction waste. Besides, Section C consisted of the item of construction waste management practices in the construction site. Table 2 shows the item used in the check-list form which is developed from the literature analysis.

Table 2: Item used in the check-list form

	Type of Construction Waste	Practices of Construction Waste Management
Author	i. Franklin (2017) ii. Poon <i>et al.</i> (2001) iii. Begum <i>et al.</i> (2006) iv. Uyasatean & Utwarujikulchai (2007) v. Bergsdal <i>et al.</i> . (2008) vi. Lau <i>et al.</i> (2008) vii. Kofoworola & Gheewala (2009) viii. Solis-Guzman <i>et al.</i> (2009) ix. Llatas (2011)	i. Jabatan Pengurusan Sisa Pepejal Negara (2013) ii. CIDB Malaysia (2008)
Element	i. Woods ii. Metals iii. Concrete iv. Bricks v. Other wastes (Plastics, Drywall, glasses and so on)	i. Prevention and Reduce ii. Reuse iii. Recycle iv. Recovery v. Disposal

3 Results and Discussion

The data obtained from the checklist form will be quantitatively analyzed using descriptive statistical methods to obtain percentage values. The data obtained are recorded, analyzed, and summarized in an easy-to-understand form and performed in a quantitative manner in which each item addresses each of the study objectives.

3.1 Results

All the data and information of the samples obtained in sections A, B, and C were analyzed using Excel. The description has been provided in the form of descriptive analysis. The results of the study were presented in the graph bar that includes the percentages.

3.2 Analysis of the video details

This analysis shows the details of the video that has been analyzed. In this video details analysis consist of the title of the video, video URL, and the date of the video that has been published. Table 3 shows the detail of the video that has been analyzed.

Table 3 Video Details

No	Title	Video Url	Date of publish	Publisher
1	How to manage waste on a construction site	https://youtu.be/w_8ByOwj2U	7/1/2015	Netregs SEPA/NIEA
2	Waste Management Construction Solutions: Reducing, Reusing & Recycling Construction Waste	https://youtu.be/XwStG-LAWbs	27/9/2011	Waste Management
3	2009 Residential Construction Waste Management	https://youtu.be/fajYIFfGQJw	19/5/2014	Southface Institute
4	Waste Solution Inc. - Construction & Demolition Waste	https://youtu.be/tbNDvvFsqrU	2/12/2011	Waste Solutions Inc. (WSI)
5	Construction Waste - Wastecycle	https://youtu.be/YhbHAVtOrxM	10/7/2009	Wastecycle

3.3 Data analysis of section B: the types of construction waste in the construction site

In this analysis, the researcher analyzed the first objective which is to identify the types of construction waste in the construction site. The result of this finding is calculated in the percentage value as in Figure 2

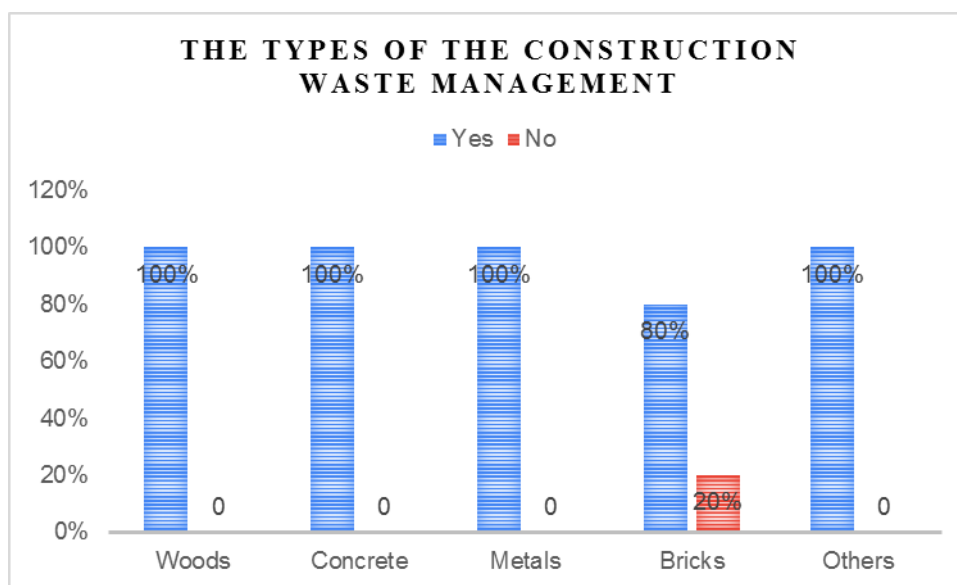


Figure 2 The types of the construction waste in the construction site

Based on Figure 2, 100 percent of the samples produced construction waste like woods, metals, concrete, and other wastes. The other wastes consisted of drywall, cardboard, papers, glasses, cans, etc. Whereas 80 percent of the samples produced bricks wastes, and 20 percent of them were not produced from the bricks wastes. Therefore, this shows that the construction waste produced in the construction site consisted of the various types of construction wastes.

3.4 Data analysis of section C: the construction waste management in construction site

This analysis included construction waste management practices in the construction site. Besides, this analysis section will answer the objective of identifying the construction waste management practices in the construction site. Table 3.1 shows the analysis data of the construction waste management practices in the construction site.

Table 3.1 Analysis data of the construction waste management practices in the construction site

No	Items		Frequency	Percentage (%)
1	Workers practice construction waste management at construction sites	Yes	5	100
		No	0	0
2	Workers plan the use of building materials well	Yes	5	100
		No	0	0
3	Employees carry out construction waste management systematically	Yes	5	100
		No	0	0
4	Workers practiced the concept of reuse of building materials at construction sites	Yes	5	100
		No	0	0
5	Workers implement alternative recycling of building materials at construction sites	Yes	5	100
		No	0	0
6	Workers provide a special area to collect construction waste before disposal	Yes	5	100
		No	0	0
7	Workers collect and dispose of construction waste in designated areas.	Yes	5	100
		No	0	0
8	Workers send construction waste to landfills.	Yes	5	100
		No	0	0

Based on Table 3.1, shows that 100 percent of the construction workers practiced construction waste management at the construction site. The results of this study show that the workers in the high level of practice in construction waste management in the construction site. Based on the video analysis, shows that the construction workers were using reduction and prevention, reuse, and recycle. The methods of the reduction and prevention were applied during the preparation phase of the materials in which the construction workers used the materials according to the specification and the materials also stored in a better place. Moreover, the workers keep reusing the materials repeatedly before disposal. Besides, the sample was recycled from the construction waste to something creative to prevent the increase of the construction waste in the construction site. Basically through the analysis conducted to the samples, shows that the separation of each construction waste was done in the first phase by preparation of a specific barrel for each waste on the construction site. This will indirectly assist in the distribution of reusable and recycled materials to further reduce the construction waste in the construction site. In conclusion, the result of this study based on the video analysis shows that the samples have a systematic and effective construction waste management practices in the construction site.

3.5 The analysis of the differences of the construction waste management in the construction site

This analysis included construction waste management practices in the construction site for each video. Besides, this analysis section will answer the objective of identifying the differences of the

construction waste management practices in the construction site. Table 3.2 shows the analysis data of the differences of the construction waste management practices in the construction site.

Table 3.2 The analysis data of the differences of the construction waste management practices in the construction site

Method	Video	Wood s	Bricks	Concrete	Metals	Other s
Material storage in the store	Video 1	/		/	/	/
	Video 2	/		/	/	/
	Video 3	/	/		/	
	Video 4	/	/		/	/
	Video 5	/		/	/	/
Construction waste segregation	Video 1	/	/	/	/	/
	Video 2	/	/	/	/	/
	Video 3	/	/	/	/	/
	Video 4	/	/	/	/	/
	Video 5	/	/	/	/	/
Scheduled construction waste collection	Video 1	/	/	/	/	/
	Video 2	/	/	/	/	/
	Video 3	/	/	/	/	/
	Video 4	/	/	/	/	/
	Video 5	/	/	/	/	/
Disposal of construction waste to landfills	Video 1	/	/	/	/	/
	Video 2	/	/	/	/	/
	Video 3	/	/	/	/	/
	Video 4	/	/	/	/	/
	Video 5	/	/	/	/	/

Based on Table 3.2, it shows that the findings from this study found that each video analyzed focuses on the segregation of construction waste, collection of scheduled construction waste and disposal of construction waste to landfills. Isolation of construction waste is intended to identify construction waste that can still be reused and recycled and should be disposed of for non-reusable construction waste. This makes it easier for workers to minimize construction waste on construction sites. In addition, the scheduled construction waste collection is to reduce the dumping of construction waste at the construction site as well as the disposal of construction waste to the landfill after the construction waste segregation process is done. Furthermore, through the results of these findings found that the storage of building materials in stores, wood and metal is done very well for each analysis video. This is because wood and metal are building materials that need careful care to prevent material damage and to ensure good quality material care. In addition, for the storage of bricks in the store, it is done in video 3 and video 4, while video 1, video 2 and video 5 do not do the storage of bricks in the store.

In conclusion, the findings conducted through this video analysis show that there is a slight difference for each video that is analyzed and each video shows the construction waste management practices on the construction site better and effectively.

3.6 Discussions

Based on the video analysis, there are various types of construction waste generated at the construction site. Woods waste usually occurs during the cutting process because the size and shape of the woods cannot be ordered according to the design (Suib., 2016). Besides, concrete waste also occurs due to excess during the casting of the concrete to the mold as well as excess quantity orders compared to the actual quantity to be used at the site (Suib, 2016). Furthermore, based on the video analysis, the

brick waste was a lower result than the rest of the construction waste. However, brick waste often occurs due to poor handling during construction activities (Foo et al., 2013). Next, metals waste was often produced at the site. The production of metals waste has occurred during the cutting process (Suib, 2016). There was also another construction waste generated during the construction activities including plastic packaging materials, drywall, glasses, etc. This is due to the lack of awareness among the workers and contractors in reducing construction waste (Adams et al., 2017). Therefore, the production of the construction waste should be managed wisely to ensure a cleaner and healthier environment, while also providing awareness among the workers and contractors to ensure that the construction waste production at the construction site is minimized.

According to the video analysis, the construction waste management practices in the construction site were how the waste produced is managed to the landfill. The systematic construction waste management procedure refers to Figure 2.1.

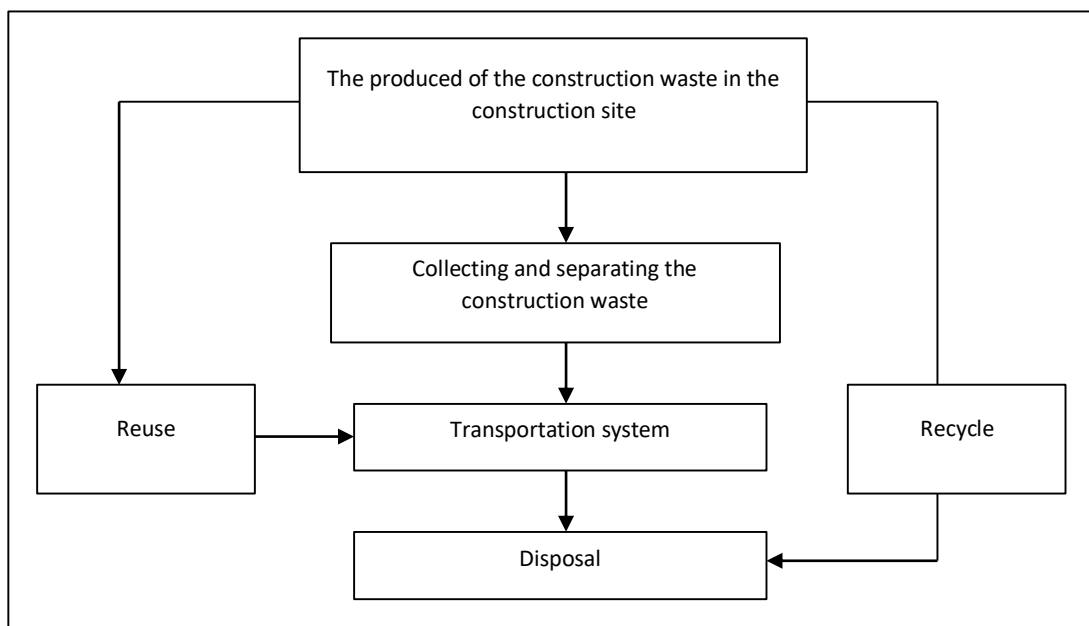


Figure 2.1 The phases of the construction waste management practices in the construction site

The construction waste management practices on the construction site are one of the best initiatives in reducing the dumping of construction waste in the construction site. Construction waste management practices on the site were based on the recommendations of the Guidelines of the Construction Waste Management on the Site (2013) as well as the Guidelines of Construction Waste Management Practice from CIDB (2008). Reducing the materials methods are easier to implement because the workers must obtain good financial benefits to reduce the excess purchase of construction materials and avoid producing waste on construction site (Hamid et al., 2016). Besides, the reuse method is also a good step in reducing the construction waste at the site. Thus, these reuse methods could reduce the negative impact on the environment and save on transportation costs to landfills (Hamid et al., 2016). Furthermore, recycling practices is one of the initiatives to reduce construction waste at the construction site. This is because these recycling methods could minimize the production of waste by generating a creative idea to produce the latest product from construction waste. Therefore, the result of this study could help the researcher in achieving the objectives which according to the video shows about the systematics and effectiveness of the construction waste management practices in the construction site.

4 Conclusion

As a result, the researcher has achieved the objectives. Based on the findings, the study concludes that the construction waste management practices are in the high level of practices in which the contractors and the workers were shown the high levels in practicing the construction waste management practices in a construction site were systematics and effective. In conclusion, the study of the construction waste management practices by using video could be a guideline as to the effectiveness of the construction waste management practices in the construction site.

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