ANALYSIS OF VISUAL MANAGEMENT PRACTICES FOR CONSTRUCTION SAFETY

Presenter: Dr. Farook Hamzeh

Eva AbdelKhalek, Master Candidate, American University of Beirut, esa17@mail.aub.edu
Mohamad Elsibai, Master CandidateAmerican University of Beirut, mde04@mail.aub.edu
Ghida Ghosson , Master Candidate, American University of Beirut, gkg01@mail.aub.edu
Farook Hamzeh, Associate Professor,, University of Alberta, hamzeh@ualberta.ca

IGLC IRELAND 2019
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION
DUBLIN | IRELAND | 1ST - 7TH JULY 2019

Outline

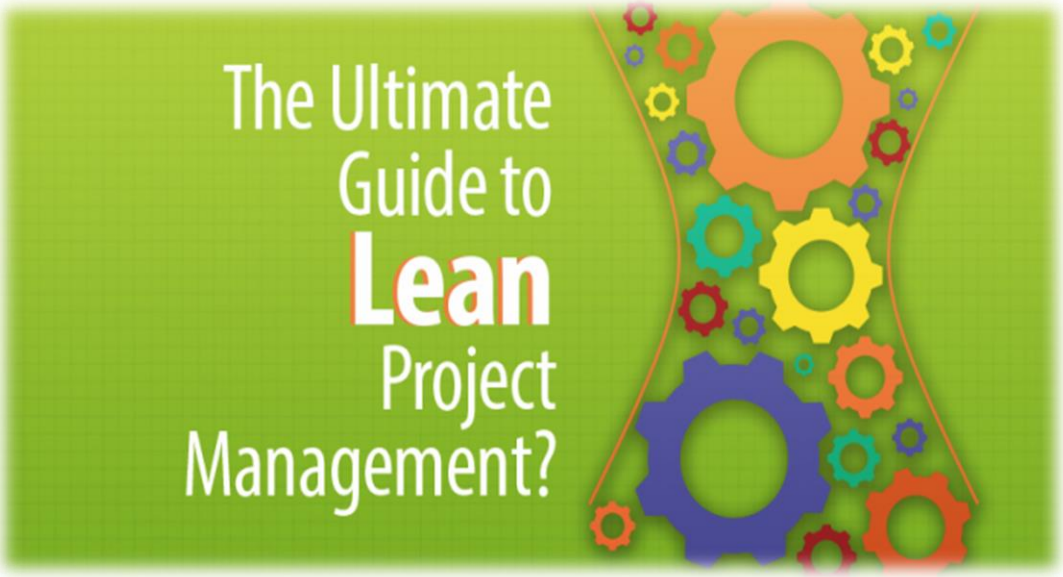
- Visual Management in Lean Construction
- Visual Tools
- Visual Orders
- Methodology
- Case Studies: Construction Sites
- Results and Discussion
- Conclusion

1866 AUB American University of Beirut الجامعة الأميركية في بيروت

IGLC IRELAND 2019
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION
DUBLIN | IRELAND | 1ST - 7TH JULY 2019

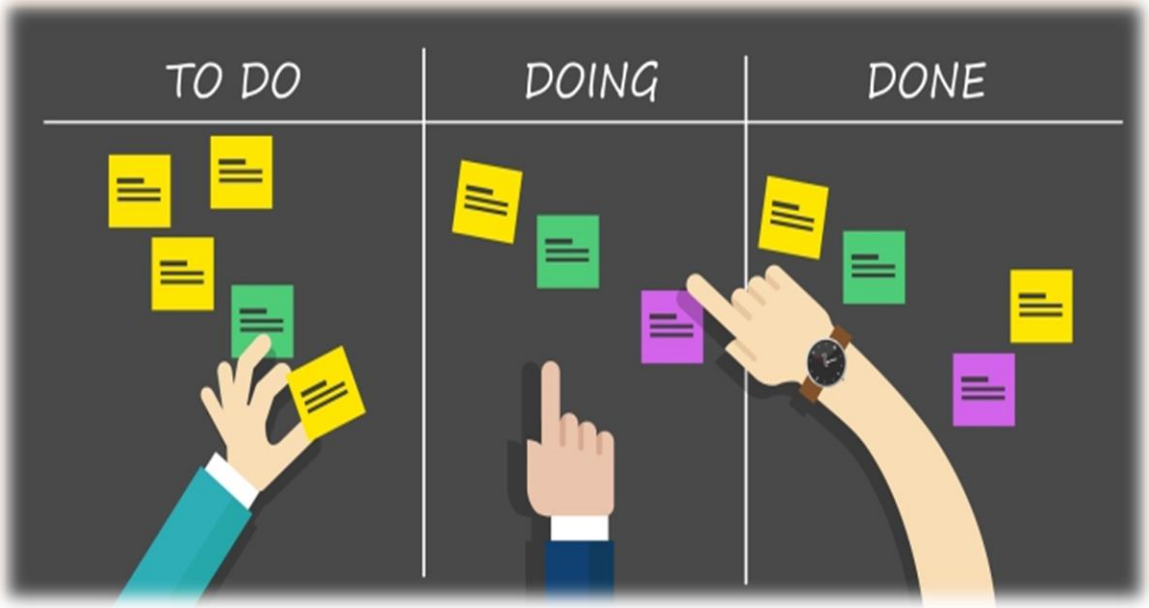
What is Visual Management

- Visual Management is a set of techniques for creating a place embracing visual communication and control throughout the environment. (Grief, 1991).



Visual Management in Lean Construction

- VM in construction is adopting different visual tools and orders in construction buildings to enhance safety and reduce wastes.

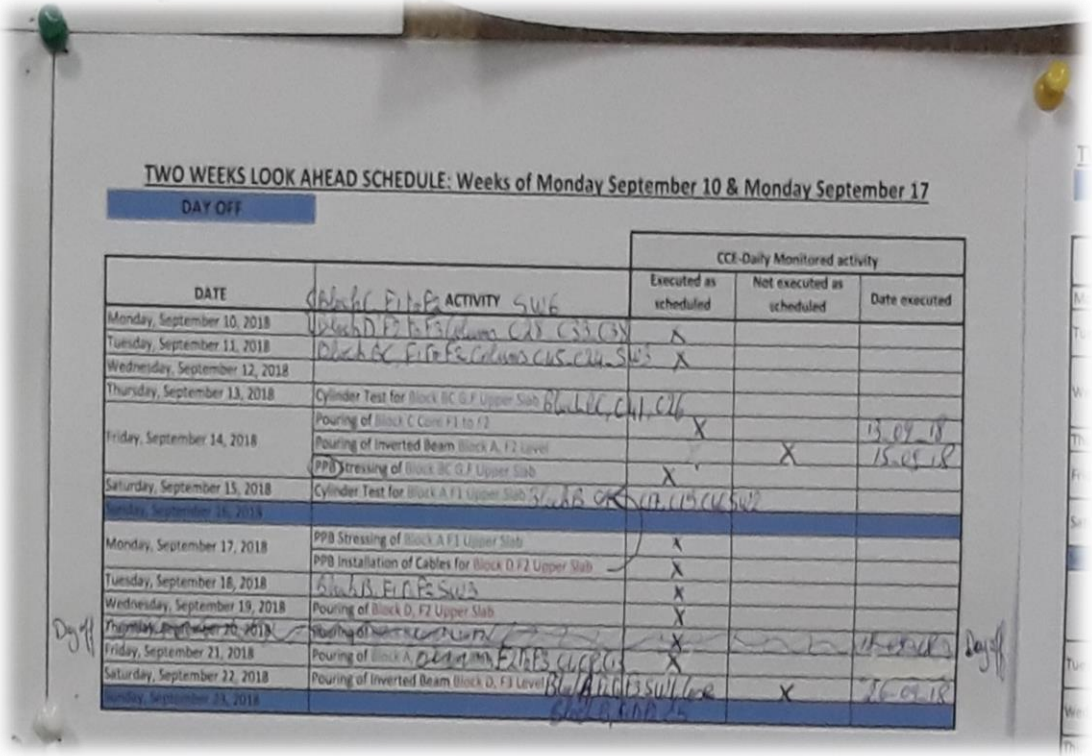


Visual Tools According to Galsworth (Galsworth 1997)

- Visual Indicators
- Visual Signals
- Visual Controls
- Visual Guarantees

Visual Indicators

- They are used to pass crucial information from management operational level intending to affect human's behaviour.



TWO WEEKS LOOK AHEAD SCHEDULE: Weeks of Monday September 10 & Monday September 17

DAY OFF

DATE	ACTIVITY	CCE-Daily Monitored activity		
		Executed as scheduled	Not executed as scheduled	Date executed
Monday, September 10, 2018		X		
Tuesday, September 11, 2018		X		
Wednesday, September 12, 2018				
Thursday, September 13, 2018	Cylinder Test for Block BC G.F Upper Slab			
Friday, September 14, 2018	Pouring of Block C Core F1 to F2	X		13.09.18
	Pouring of Inverted Beam Block A, F2 Level		X	15.09.18
	PPB Stressing of Block BC G.F Upper Slab	X		
Saturday, September 15, 2018	Cylinder Test for Block A F1 Upper Slab			
Monday, September 17, 2018	PPB Stressing of Block A F1 Upper Slab	X		
	PPB Installation of Cables for Block D F2 Upper Slab	X		
Tuesday, September 18, 2018		X		
Wednesday, September 19, 2018	Pouring of Block D, F2 Upper Slab	X		
Friday, September 21, 2018		X		
Saturday, September 22, 2018	Pouring of Inverted Beam Block D, F3 Level	X	X	22.09.18

Visual Signals

- They are used to provoke a response to the eyesight tending to grab attention for some essential points.

Visual Controls

- They are used to show deviations and enforce full human control by limiting the response to specific height, size, colour, width, length, quantity and volume.

Visual Guarantees

- They are used to ensure that everything's done in the right way enabling only the correct outcome.
- They are known as mistake proof or Pokayoke striving to eliminate human errors.

Visual Orders

5S + ?

5S

(Hafey, 2010)

6th S: Safety

Safety is eliminating all hazards and verifying that suitable control measures are in place (Sukdeo 2007).

Purpose Of The Study

The study highlights the importance of VM in the workplace for construction crews and the public as well as its relation to safety.

It presents an investigation on the significance of implementing VM in construction projects in Lebanon and how it enhances safety.

Methodology

Case studies' analysis of 12 building construction sites in Lebanon that differ by type and total built area.

- Visiting different projects
- Meeting multi-disciplinary engineers and project managers
- Interviewing 31 of them
- Filling the surveys which include questions answered by the interviewed parties using 5 point Likert scale to grade the statements and one open-ended question
- Analyzing survey results including the mean and standard deviation of all responses to get detailed information about safety management in Lebanon.

Case Studies: Construction Sites

Case Study	Type	Total Area (m^2)	Extent of VM Usage
A	Residential	2940	No usage
B	Residential	4500	Slight usage
C	Commercial	22400	Slight usage
D	Residential	3750	No usage
E	Residential	3900	Slight usage
F	Commercial	7000	No usage
G	Residential	1350	No usage
H	Residential	1820	No usage
I	Residential	2040	No usage
J	Residential	2760	No usage
K	Commercial	15000	Slight usage
L	Residential	2880	No usage

Table 1: Construction Sites' Case Studies

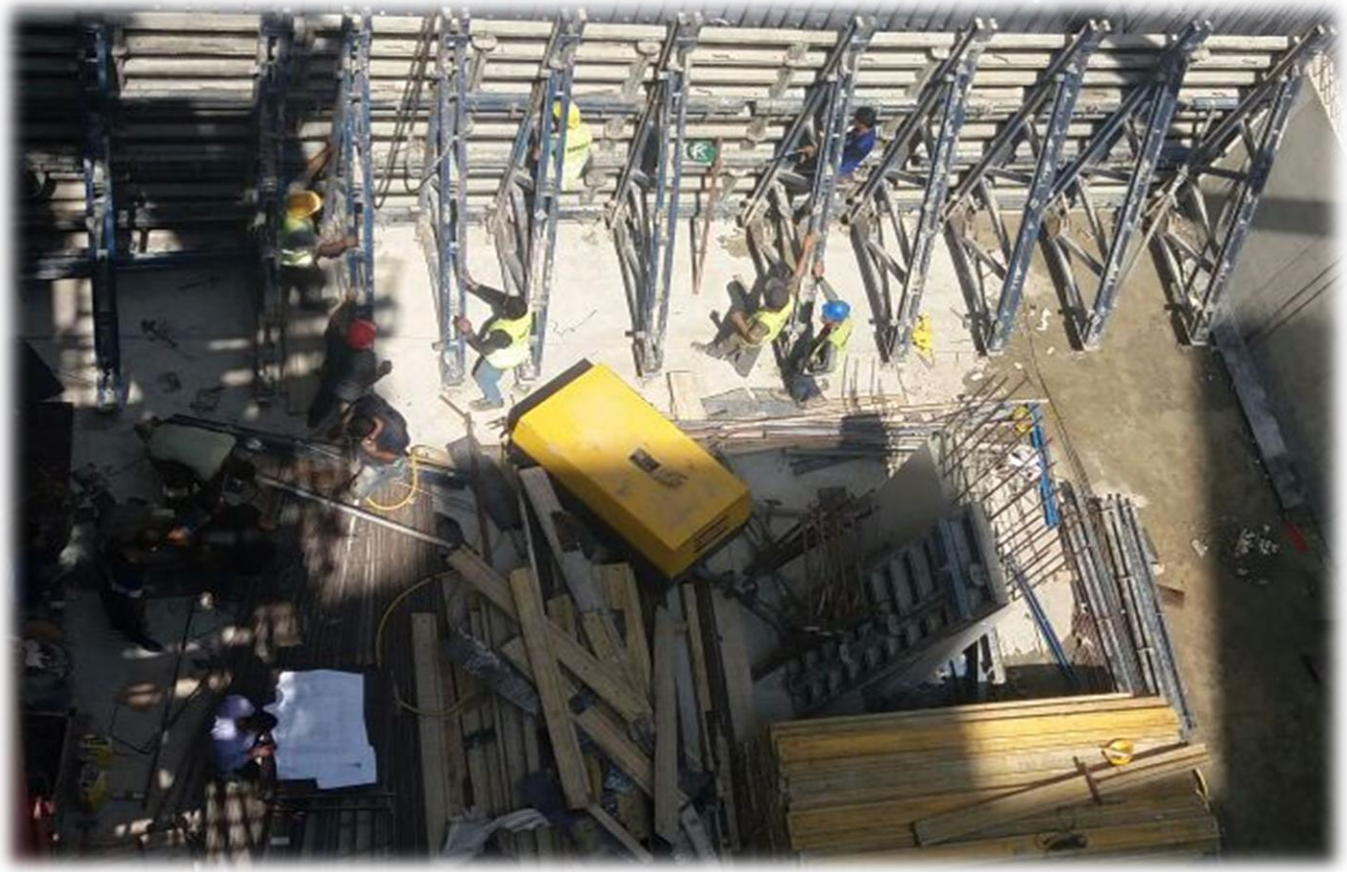
Results

	Statement	Mean $\bar{x}$	Standard Deviation σ
1	The construction site is kept clean	3.92	1.44
2	Every material/tool in its place	3.17	1.27
3	Safety nets are available	3.50	1.81
4	PPE are clearly displayed	2.1	1.44
5	Workers wear hard hats	2.00	1.81
6	Workers wear hard and closed shoes	2.33	1.67
7	Workers often face accidents on site	4.17	1.11
8	First aid tools location is known & accessible	2.83	1.34
9	Slab openings and shafts are marked & closed	4.50	0.90
10	All exits are clearly marked	2.75	1.29
11	All walkways are unobstructed	3.50	1.57
12	Emergency evacuation indicators are available	2.00	1.28
13	Disposal procedures are visually displayed	2.50	1.00
14	Visual tools are used to make waste apparent	2.42	1.00
15	Caution signs to indicate newly casted areas	1.75	1.14
16	Safety mistakes are regularly reflected	3.25	1.22
17	Meetings held to increase safety awareness	1.67	1.07
18	Major barriers of VM implementation	Open-Ended	

Table 2: Conducted Surveys related to Construction Sites

Discussion Of Results

Chaotic /Unclean Sites



Discussion Of Results

Chaotic /Unclean Sites

1866
AUB
American University of Beirut
الجامعة الأميركية في بيروت

IGLC
IRELAND 2019
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION
DUBLIN | IRELAND | 1ST - 7TH JULY 2019

Discussion Of Results

Slips, Trips & Falls

Discussion Of Results

Nail Wounds

Discussion Of Results

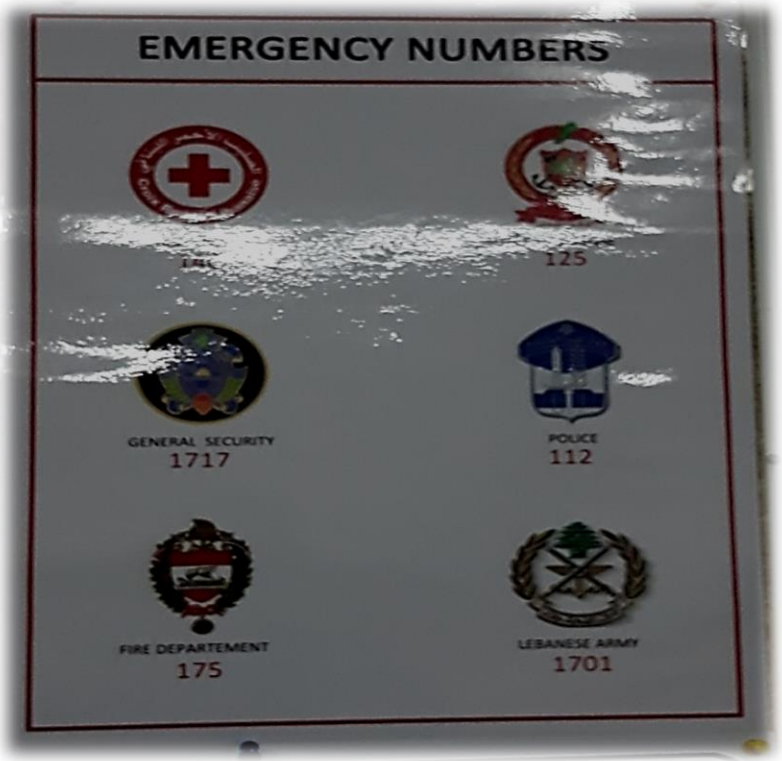
Clean Sites

Discussion Of Results

First Aid on Site

Discussion Of Results

Visual Indicators



Discussion Of Results

PPE

Discussion Of Results

Safety Nets

Barriers Of VM On Construction Sites

1- Inertia/Resistance to Change

Barriers Of VM On Construction Sites

2- Overconfidence

Barriers Of VM On Construction Sites

3- Cost

Barriers Of VM On Construction Sites

4- Time

Barriers Of VM On Construction Sites

5- No Government Regulations

Barriers Of VM On Construction Sites

6- Culture

Conclusion

Results of the studied cases show that VM needs further improvement in Lebanon and highlight the importance of implementing VM to reduce accidents.

As a recommendation,

- Visuals should be utilized everywhere to direct actions and enhance.
- Engineers and contractors should dedicate enough time and spend more money on training workers to efficiently use VM tools and reduce accidents.
- A lean culture should be cultivated to enhance utilization of VM.
- Further research is recommended to determine strategies for implementing VM in construction sites so that invested efforts will pay off in more effective results.

Thanks For Your Attention!

1866 AUB American University of Beirut الجامعة الأميركية في بيروت

IGLC IRELAND 2019
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION
DUBLIN | IRELAND | 1ST - 7TH JULY 2019