

USING TVD SIMULATION TO IMPROVE COLLABORATION

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WHAT IS

Target Value Design

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Issues of adopting collaborative practices have been observed to be a prominent challenge in TVD projects

TVD SIMULATION

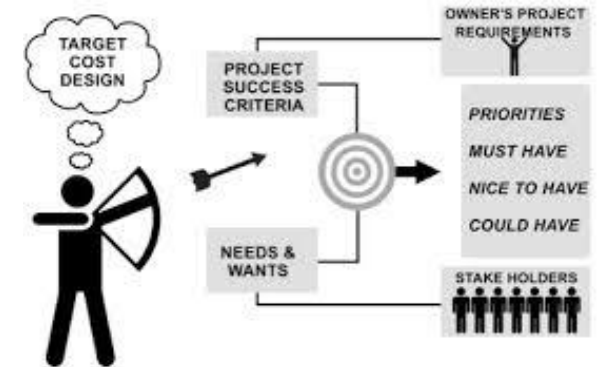
Recently, there has been an increase in the creation, reinvention and use of simulations and serious games to teach TVD

TVD simulation and games help to create awareness and build teamwork and trust required for collaboration

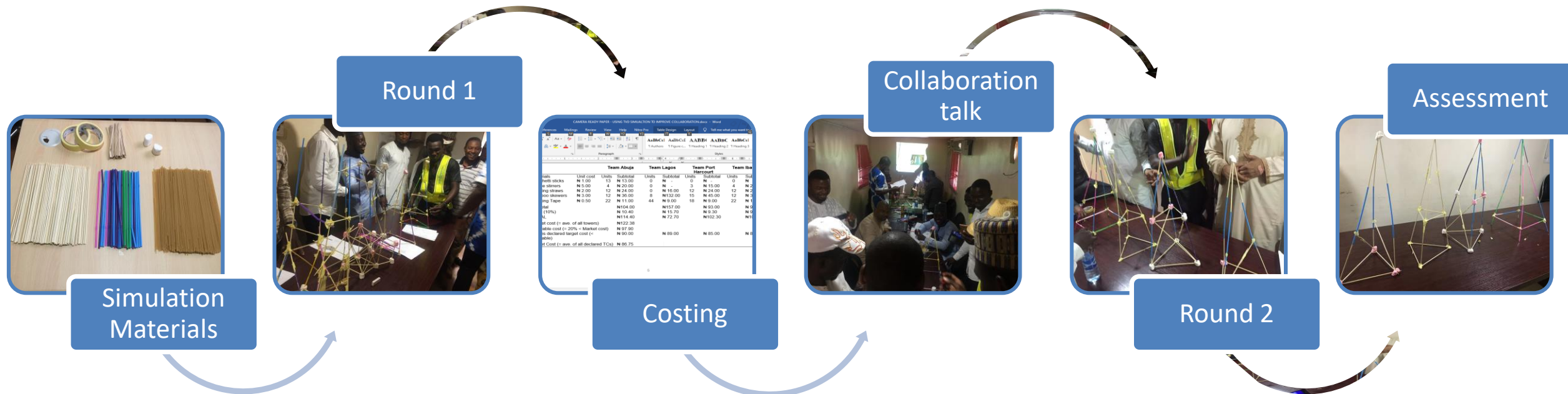
One of the most important discussions in the construction industry and research is the shift towards new collaborative project delivery systems

A TVD simulation game was developed by Munankami (2012) in Texas A & M University to illustrate TVD principles. The game uses the same concepts of Peter Skillman and Tom Wujec's "Marshmallow Challenge" but applies TVD processes

- The game is played in two rounds of simulation.
- Round one simulated traditional design-bid-build (DBB) processes
- Round two simulated TVD processes.
- The simulation was played by four teams, each comprising three groups: owners, designers, and constructors.
- They were used to use only supplied materials to build a free-standing table-top tower
 - **two feet tall**
 - **not more than two inches out of plumb**
 - **capable of holding a marshmallow at the top**

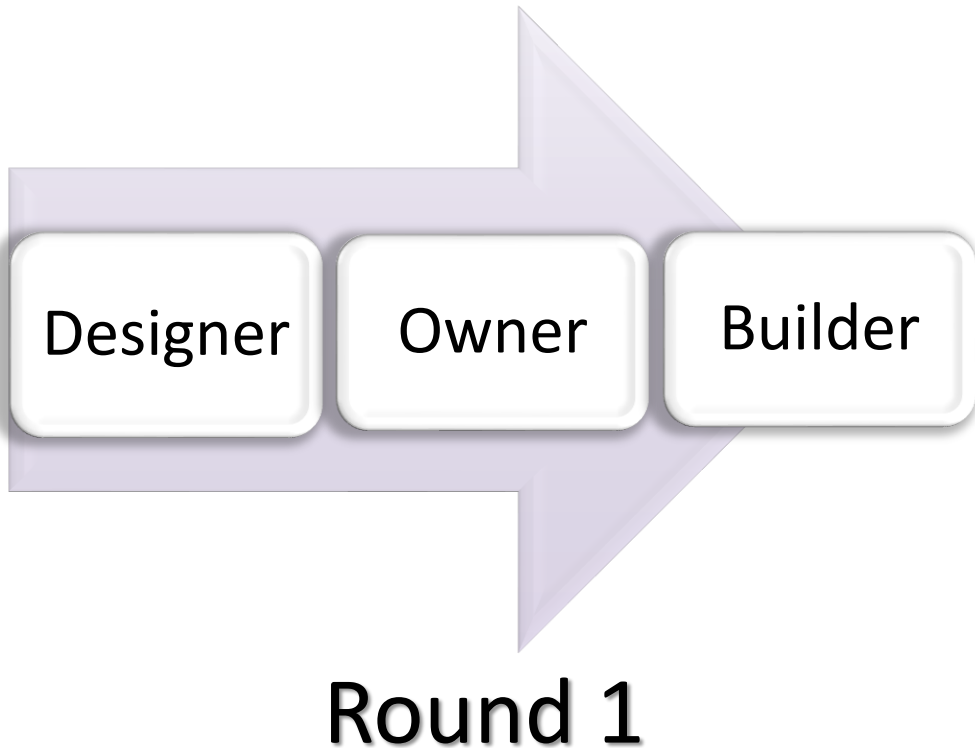


- The materials, methods, and instructions for the game developed by Munankami (2012) were used in this study
- The study used 24 industry stakeholders from a reputable real estate developer in Nigeria.



STEP 1

- The team groups worked in separate rooms to design, the owner approves, and the towers were constructed without regard for cost during the design process

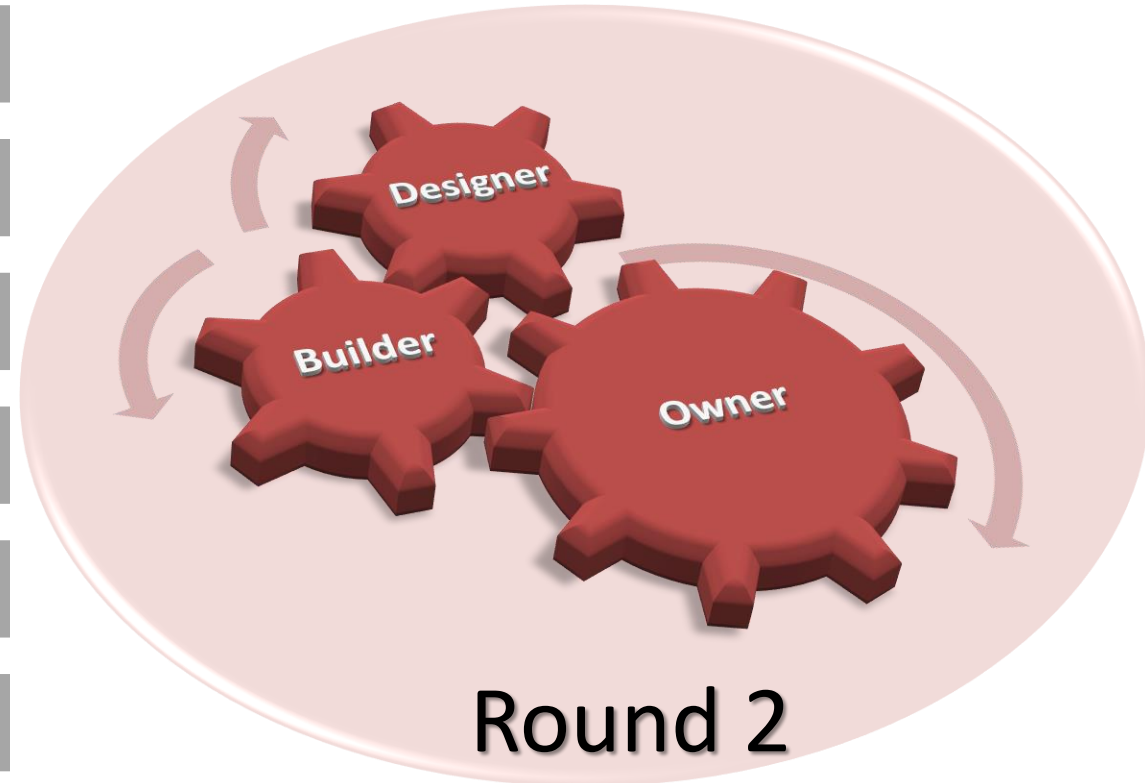


STEP 2

Discussion on TVD and levels of collaboration
Networking, Cooperation, Coordination,
Coalition & Collaboration

STEP 3

- The team groups worked together as a single unit to collaboratively design and build the tower



Costing for teams

		Team Abuja		Team Lagos		Team Port Harcourt		Team Ibadan	
Materials	Unit cost	Units	Subtotal	Units	Subtotal	Units	Subtotal	Units	Subtotal
Spaghetti sticks	₦ 1.00	13	₦ 13.00	0	₦ -	0	₦ -	0	₦ -
Coffee stirrers	₦ 5.00	4	₦ 20.00	0	₦ -	3	₦ 15.00	4	₦ 20.00
Drinking straws	₦ 2.00	12	₦ 24.00	0	₦ 16.00	12	₦ 24.00	12	₦ 24.00
Bamboo skewers	₦ 3.00	12	₦ 36.00	8	₦ 132.00	15	₦ 45.00	12	₦ 36.00
Masking Tape	₦ 0.50	22	₦ 11.00	44	₦ 9.00	18	₦ 9.00	22	₦ 11.00
Subtotal			₦ 104.00		₦ 157.00		₦ 93.00		₦ 91.00
Profit (10%)			₦ 10.40		₦ 15.70		₦ 9.30		₦ 9.10
TOTAL			₦ 114.40		₦ 72.70		₦ 102.30		₦ 100.10
Market cost (= ave. of all towers)			₦ 122.38						
Allowable cost (= 20% < Market cost)			₦ 97.90						
Teams declared target cost (< allowable)			₦ 90.00		₦ 89.00		₦ 85.00		₦ 83.00
Target Cost (= ave. of all declared TCs)			₦ 86.75						

Round two: In round two, two teams (Abuja and Lagos) exceeded the cost target of ₦ 86.75



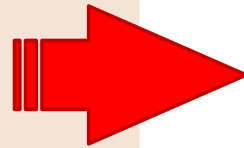
		Team Abuja		Team Lagos		Team Port Harcourt		Team Ibadan	
Materials	Unit cost	Units	Subtotal	Units	Subtotal	Units	Subtotal	Units	Subtotal
Spaghetti sticks	₦ 1.00	0	₦ -	0	₦ -	0	₦ -	0	₦ -
Coffee stirrers	₦ 5.00	0	₦ -	0	₦ -	0	₦ -	0	₦ -
Drinking straws	₦ 2.00	19	₦ 38.00	6	₦ 12.00	0	₦ -	3	₦ 6.00
Bamboo skewers	₦ 3.00	13	₦ 39.00	21	₦ 63.00	15	₦ 45.00	12	₦ 36.00
Masking Tape	₦ 0.50	6	₦ 3.00	10	₦ 5.00	10	₦ 5.00	3	₦ 1.50
Subtotal			₦ 80.00		₦ 80.00		₦ 50.00		₦ 43.50
Profit (10%)			₦ 8.00		₦ 8.00		₦ 5.00		₦ 4.35
TOTAL			₦ 88.00		₦ 88.00		₦ 55.00		₦ 47.85

A second attempt was carried out to redesign to cost by the teams that exceeded the target cost. Cost less than the target cost was achieved at the second attempt after value engineering and brainstorming sessions were used to iteratively redesign to target cost without affecting function and quality (see table 4)

Table 4: Costing redone after the iterative redesign to target cost

		Team Abuja		Team Lagos	
Materials	Unit cost	Units	Subtotal	Units	Subtotal
Spaghetti sticks	₦ 1.00	0	₦ -	0	₦ -
Coffee stirrers	₦ 5.00	0	₦ -	0	₦ -
Drinking straws	₦ 2.00	15	₦ 30.00	6	₦ 12.00
Bamboo skewers	₦ 3.00	12	₦ 36.00	16	₦ 48.00
Masking Tape	₦ 0.50	8	₦ 4.00	8	₦ 4.00
Subtotal			₦ 70.00		₦ 64.00
Profit (10%)			₦ 7.00		₦ 6.40
TOTAL			₦ 77.00		₦ 70.40

- ❖ What were some basic differences between the two rounds?
- ❖ How did the decision-making processes differ between the two rounds?
- ❖ Which round was more stressful for you?
- ❖ Which round offered better cooperation?
- ❖ In which real-life circumstances might round one be more appropriate?
- ❖ How about round two?



ROUND 1	ROUND 2
More time spent	Less time spent
Team barely understood the scope of work	Team understood the scope of work better
More stressful	Less stressful
Information was transferred from team to team	Frequent communication characterised by mutual trust
Teams were cooperating	Ideas were put together collaboratively

QUESTIONNAIRE DATA COLLECTION

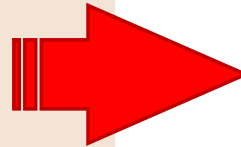


FINDINGS FROM SIMULATION QUESTIONNAIRE

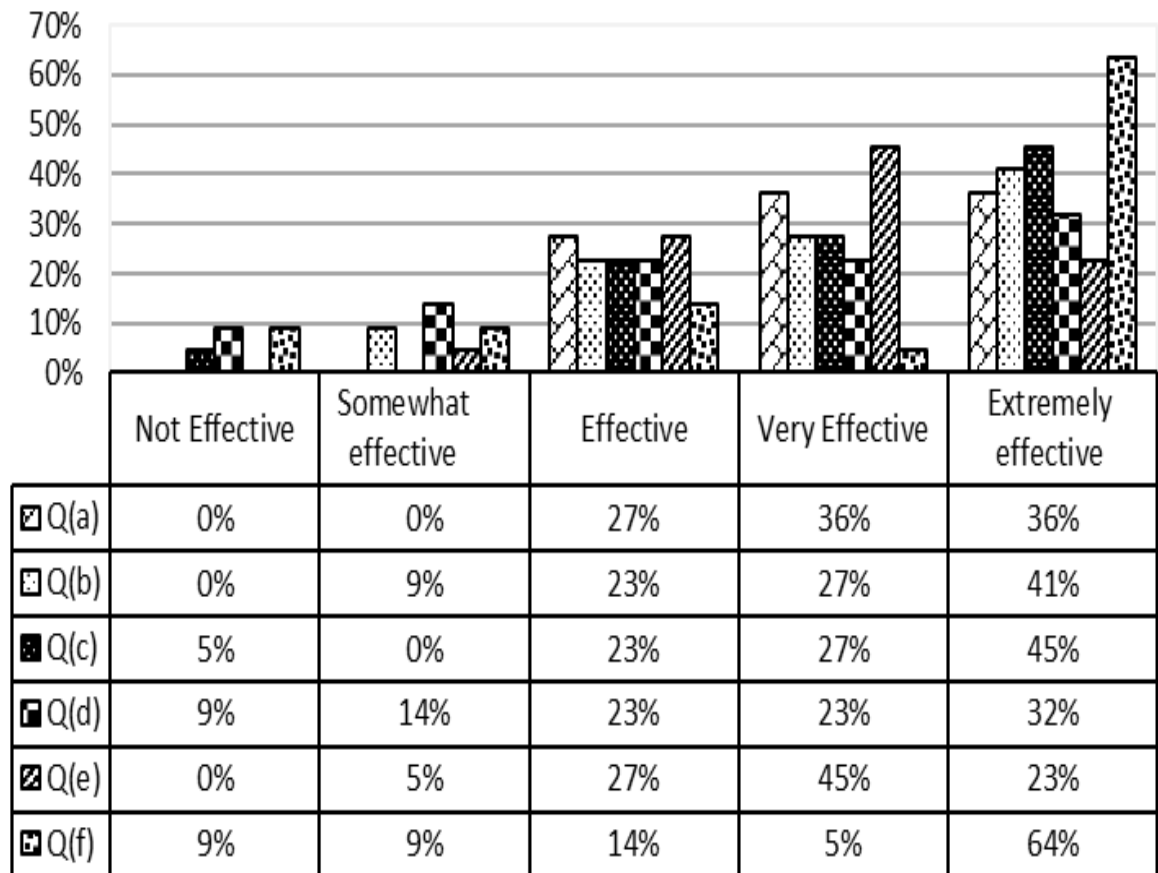
A 5-point Likert scale questionnaire ranging from “not effective” to “extremely effective” was administered to participants.

The questions focus on the effectiveness of the simulation in explaining:

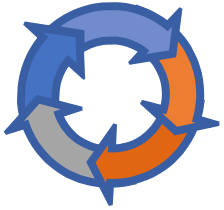
- (a) mutual respect and trust;
- (b) mutual benefit and reward;
- (c) Collaborative innovation
- (d) early involvement of key partners;
- (e) early goal definition,
- (f) open communication.



TARGET VALUE SIMULATION QUESTIONNAIRE



DATA COLLECTION FROM LIVE PROJECT



Subsequent to the TVD implementation on the live project



58% of the simulation game participants were interviewed.

FINDINGS AFTER IMPLEMENTATION ON LIVE PROJECT





Team members that participated in the simulation game had a better understanding of TVD and performed better than those that did not.

The simulation was explanatory and enabled them to implement TVD successfully

The simulation will serve as a support and success factor for the implementation of TVD on any project

The simulation has proven to be a simpler and more practical method of understanding collaboration and TVD practices than formal training and workshops

CONCLUSIONS

-  Work environments characterised by collaboration is more enjoyable to work in and work takes little time when compared to the environment without collaboration.
-  The TVD simulation game has demonstrated to be effective in teaching the principles and practices of TVD to first time users
-  It is also very effective in illustrating mutual respect and trust, collaborative innovation and decision-making.
-  Recommends the inclusion of the TVD Simulation Game in training and workshops for project team before the commencement of construction projects since it has demonstrated to be a more simple and practical method of understanding collaboration and TVD practices

QUESTIONS
PLEASE