

Supplementary Materials for

**Evaluation of Mobile Risk Perception Training System
for Improving the Safety Awareness of Construction
Workers**

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Figure Captions

Figure S1 shows conventional TBM improvement requests.

Table Captions

Table S1 shows results of t -test about the positive perception and satisfaction of daily safety activities.

Table S2 shows results of t -test about TBM training effect and safety awareness of workers.

Table S3 shows full text of the survey.

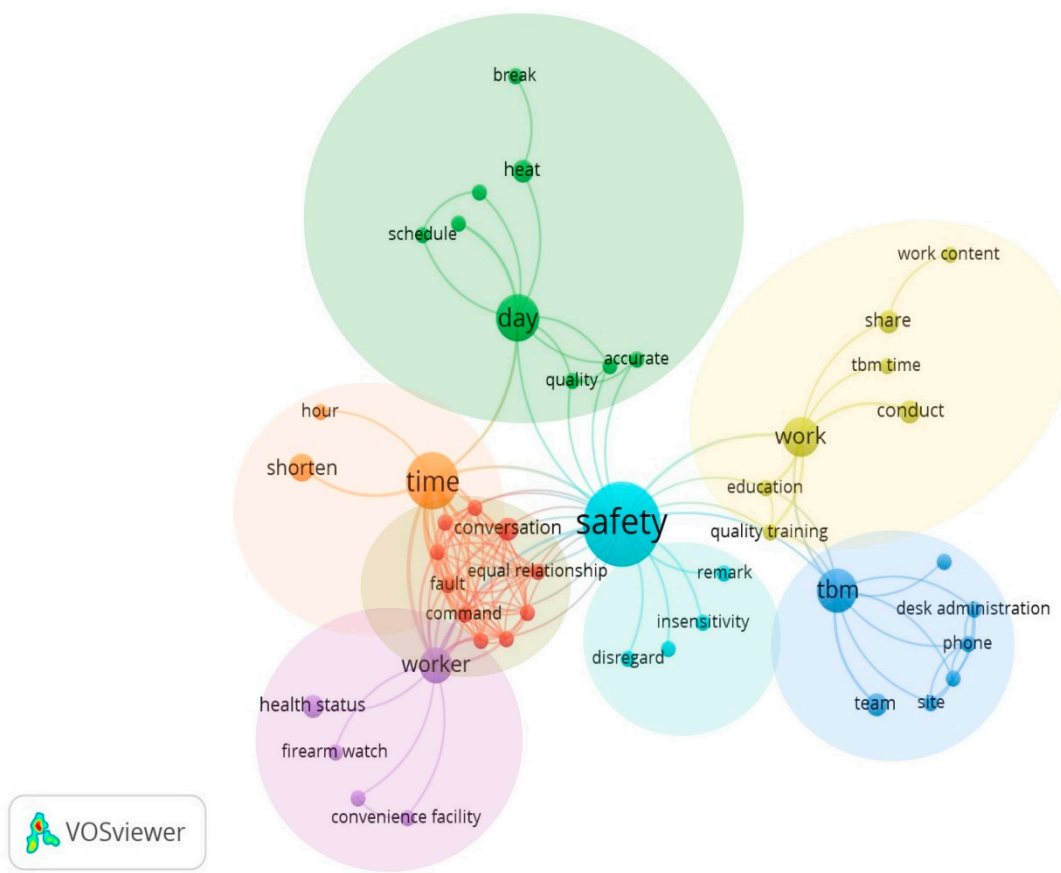


Figure S1. Graph showing the results of VOSViewer on conventional TBM improvement requests.

Table S1. Results of *t*-test about the positive perception and satisfaction of daily safety activities.

Dependent variable	Group	Numbers	Average	Steve. D	<i>t</i> -test	p-value
Education of Risk Assessment	Mobile TBM	400	4.29	0.73	5.39	0.000
	Conventional TBM	400	3.97	0.90		
Positive perception of Risk Assessment	Mobile TBM	400	4.19	0.93	4.67	0.000
	Conventional TBM	400	3.87	1.01		
Education of Permit to safety work	Mobile TBM	400	4.26	0.74	5.23	0.000
	Conventional TBM	400	3.96	0.87		
Positive perception of Permit to safety work	Mobile TBM	400	4.19	0.80	4.88	0.000
	Conventional TBM	400	3.89	0.93		
Sharing of Safety Meeting	Mobile TBM	400	4.20	0.81	4.13	0.000
	Conventional TBM	400	3.95	0.89		
Positive perception of Safety Meeting	Mobile TBM	400	4.14	0.85	3.73	0.000
	Conventional TBM	400	3.91	0.92		
Satisfaction of TBM conduct	Mobile TBM	400	4.35	0.69	5.65	0.000
	Conventional TBM	400	4.03	0.86		
Education of Safety Rules Training	Mobile TBM	400	4.36	0.68	5.52	0.000
	Conventional TBM	400	4.06	0.83		
Education of Safety Inspect	Mobile TBM	400	4.28	0.75	3.76	0.000
	Conventional TBM	400	3.95	0.84		
Positive perception of Safety Check	Mobile TBM	400	4.13	0.89	5.96	0.000
	Conventional TBM	400	3.89	0.88		

Table S2. Results of *t*-test about TBM training effect and safety awareness of workers.

Dependent variable	Group	Numbers	Average	Steve. D	<i>t</i> -test	p-value
Memorizing Safety Rules	Mobile TBM	400	4.09	1.05	1.87	0.061
	Conventional TBM	400	3.95	0.98		
Memorizing Accident cases	Mobile TBM	400	3.83	1.19	2.29	0.022
	Conventional TBM	400	3.63	1.21		
Memorizing safety notice	Mobile TBM	400	3.93	0.65	2.02	0.044
	Conventional TBM	400	3.83	0.78		
Conduct of Safety Inspection	Mobile TBM	400	4.54	0.66	6.11	0.000
	Conventional TBM	400	4.21	0.84		
Accident Prevention Effect	Mobile TBM	400	4.33	0.78	4.52	0.000
	Conventional TBM	400	4.08	0.81		

Table S3. Full text of the survey.

Construction Site TBM Progress Questionnaire	
1. What type of TBM are you conducting/participating in?	① Mobile TBM application ② Conventional TBM application
2. What is your occupation?	① Partner manager ② Team leader ③ Workers
3. What's your performance?	① Electric/mechanic ② Facility/plumber
4. Who is conducting TBM activities?	① Original Contractor Construction Manager ② Supplier Construction Manager ③ Safety manager ④ Team leader ⑤ Worker
5. How many people are doing TBM activities?	① No more than 5 people ② 5 to 10 people ③ 10 to 15 people ④ 15 to 20 people ⑤ More than 20 people
6. During TBM, are you speaking the safety rules you need to follow?	① Not at all ② Speak if asked ③ Speak when necessary ④ Occasionally ⑤ Every time
7. How long does the TBM take?	① Less than 1-minute ② 1~3 minutes ③ 5~10 minutes ④ 10~15 minutes ⑤ More than 15 minutes
8. How much would you watch if you provided safety information you're your smartphone?	① Not look at all ② Hardly look at all ③ Sometimes ④ Often ⑤ Frequently
9. How well is the training for risk assessment in TBM?	① Be not doing ② Be on the same ③ Be the normality ④ be going well ⑤ be going very well
10. How much does risk	① Be of no help ② Be of little help ③ Be the normality ④ be of help ⑤ be very helpful

assessment help you comply with your own safety regulations?	
11. How well is the training for dangerous work permits in TBM?	① Be not doing ② Be on the same ③ Be the normality ④ be going well ⑤ be going very well
12. How much does the hazardous work permit system help you comply with your safety rules?	① Be of no help ② Be of little help ③ Be the normality ④ be of help ⑤ be very helpful
13. How well is the content of TBM city managers' safety meetings shared?	① Be not doing ② Be on the same ③ Be the normality ④ be going well ⑤ be going very well
14. How much does a manager's safety meeting help you comply with your safety rules?	① Be of no help ② Be of little help ③ Be the normality ④ be of help ⑤ be very helpful
15. How much does TBM activity help you comply with your safety rules?	① Be of no help ② Be of little help ③ Be the normality ④ be of help ⑤ be very helpful
16. How well is the training on safety rules to be followed in TBM?	① Be not doing ② Be on the same ③ Be the normality ④ be going well ⑤ be going very well
17. How well is training conducted on the results of safety inspection (work monitoring) during TBM?	① Be not doing ② Be on the same ③ Be the normality ④ be going well ⑤ be going very well
18. How much does the safety inspection (work monitoring) activity help	① Be of no help ② Be of little help ③ Be the normality ④ be of help ⑤ be very helpful

you comply with your safety rules?	
19. Do you remember some safety rules (CCLs) that you should follow when using TBM?	① Not more than one ② Two things ③ Three things ④ Four things ⑤ More than five things
20. How many accidents do you remember that were transmitted during TBM in the last 3 months?	① Not more than one ② Two things ③ Three things ④ Four things ⑤ More than five things
21. How much do you remember about the TBM safety notice?	① I don't remember at all ② I think there was an announcement ③ Have a rough recollection of ④ remember almost everything ⑤ remember everything
22. Do you conduct a safety inspection on the safety rules trained during TBM?	① I don't remember at all ② I think there was an announcement ③ Have a rough recollection of ④ remember almost everything ⑤ remember everything
23. How much effect do you think the safety inspection after TBM will have on preventing accidents?	① Not at all ② There isn't much ③ Be the normality ④ Be high ⑤ Be very high
24. TBM Improvements (key word)	

Table S1 is the result of the *t*-test on the positive perception and satisfaction of daily safety activities. The groups were divided into two groups, and if the p-value was or was less than 0.001, the numbers in each group were divided into 400, confirming that there was a difference in the mean between the two groups.

Table S2 is the result of the *t*-test on the TBM training effect and safety awareness of workers. The groups were divided into two groups, and if the p-value was or was less than 0.1, the numbers in each group were divided into 400, confirming that there was a difference in the mean between the two groups.