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A Follow-up Study on the Level of Corporate Utilization of MOT Methods

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This study focuses on the necessity of MOT methods in companies, especially the utilization level. Based on the analysis structure of the previous study (2012), this study was conducted to compare the results with the previous results. We investigated the settlement level of MOT, the degree of necessity for MOT methods, the degree of actual use, and the Product Realization Process (PRP) for MOT-related researchers in electronic companies (n=184). It was confirmed that the higher the demand for MOT methods in the corporate field, the higher the utilization level (ratio). In particular, the need for and utilization of techniques such as Environmental Analysis, Business Opportunity Analysis, Project Feasibility Review, Roadmap, Risk Management was high. These methods were beneficial along with cost management and quality management techniques. The most challenging part of using MOT methods was the lack of systematic use, the absence of experts, and the difficulty in selecting suitable techniques. The necessity of opening subjects such as Creative Thinking, Communication, Teamwork, and Professional Ethics was high among the PRP subjects. Furthermore, the necessity of opening courses in Cost and Safety Design and Applied Statistics was higher than in the previous study.

Keywords : MOT Methods(Tools, Technique), MOT Subjects, MOT Corporate Utilization, MOT Univ. Education

1. Introduction

For a long time, researchers have argued that MOT (Management of Technology)-related engineering education should teach research methodology to improve creativity and problem-solving skills and increase research efficiency. As a quality that new talents in the digital age should possess, creative ability to solve given problems is essential. As a new paradigm emerges, it is also linked with the demand for convergence technology problem-solving. Furthermore, companies are also increasing their R&D investment to survive the competition and are focusing on solving R&BD problems. Therefore, the key to the success of R&D commercialization can be the MOT talent with R&D management knowledge and problem-solving skills.

Universities play the most critical role in nurturing technical talents with these capabilities and must change their subjects to suit the changing environment. Invariably, the talents we

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want to foster through university education are those with creativity and problem-solving abilities[8] There has been a long-standing demand for the development of problem-solving subjects in order to strengthen university competitiveness[4]. In response to these changes in university education, interest in teaching methods for creative problem-solving is also increasing. In particular, in engineering education, research on the effect of developing a flipped learning class model and applying it to actual classes is being conducted[3]. However, according to the IMD (2021) report, Korea's educational competitiveness is ranked 30th, down three steps from the last year[5]. This result means that the academic background of our university has not yet narrowed its distance from the world level. It is also a tangible indicator of why university education needs to change.

There has been a demand for research methodologies for problem-solving in departments related to R&D. Even SMEs are well aware that problem-solving research methodologies are needed to promote market-oriented R&BD to improve economic performance[17]. In the analysis of educational requirements for enhancing the entrepreneurial competency of the science and technology workforce, problem-solving ability was ranked as the top[13].

From this point of view, research methodologies for problem-solving can be considered necessary in university education and corporate R&D. Paying attention to these demands, the previous study[14] was conducted on the corporate utilization of MOT methodologies in 2012. This time, as a follow-up study, we would like to examine changes in the use of the MOT technique. Therefore, in this study, we focus on analyzing changes in the utilization of the MOT technique examined in previous study. Furthermore, the purpose of this study is to suggest that these courses be opened in universities by referring to the MOT methods used by companies.

2. Framework of This Study

Researchers have been continuously working on problem-solving methods in universities and companies. However, the previous research on research methods[9, 11] is mainly related to research[1, 10, 15] on problem-solving methods related to IT programs or specific topics. Therefore, this study does not focus on a specific method (technique) but considers MOT-related methods comprehensively and analyzes the level of its utilization. As defined in this study, MOT methods are research methods helpful in solving problems that occur from the discovery of technological tasks to commercialization. In this study, MOT includes methods from a comprehensive perspective from the project initiation stage, the progress stage, and the final commercialization stage. Therefore, it encompasses the MOT methods used in the life cycle of a project.

Moreover, this study's overall approach and procedure follow the previous study[14]. In other words, it has a structure that analyzes the level of corporate utilization for the MOT methods derived from the previous study. However, although the respondents to the survey in this study are inevitably different from those in the previous study, the survey was conducted targeting possible previous companies. The structure of this study will be described in more detail as follows: 1) Present the MOT method and PRP topic proposed in the previous study 2) Survey responses on the need and use of MOT techniques 3) Difficulties in using MOT methods are indicated in the order 4) Comparative analysis of response results with the previous study.

As in the previous study, this study inquired about the level of utilization of MOT methods in electricity, electronics, machinery, and semiconductors, and the target companies were the same as possible (Samsung Electronics, LG Electronics, LG Display, Posco, Hyundai Motor). The number of respondents was 184, who responded effectively from September 6 to September 30, 2021. This study intends to examine changes and trends using the mean and standard deviation compared with the previous research results. But, we did not perform various statistical analyzes of the differences between the two groups because the study time points, response target, and sample sizes were all different. However, the average score or priority between the two-time points was examined based on the Kendall rank correlation.

The most significant difference from the previous study is that this study focused on the use of MOT methods within the company and did not analyze the current status of education on MOT subjects or topics in universities or educational institutions. Therefore, an absolute comparison is impossible because the analysis timing and respondents are different, but the flow of change can be sufficiently estimated since the questionnaire items are the same. Therefore, the significance of this study is that it is possible to estimate changes in the use of the MOT technique.

3. MOT Methods and Survey Composition

There are still differences of opinion among scholars on the classification and concept of the MOT methods[2, 7]. However, this study follows the framework of the previous study and classifies them as follows. Although the MOT methods presented in this study cannot be said to be complete, it is a well-known fact that leading companies in the MOT field in Korea have been using them so far[6]. The MOT methods presented in this study were constructed based on the advice of the MOT consulting research group and the MOT CTOs. The MOT methods presented in this study are as follows <Table 1>.

<Table 1> MOT Methods Classification

	MOT methods
Environmental Analysis & Opportunity Analysis	TF(Technology Forecasting), TA(Trends Analysis), Scenario Planning(or Scenario Technique)
	Opportunity Analysis(SWOT, GTO, GIO, etc.)
	Project Profiling(NABC, Project Summary)
Technology Strategy and Plan	Business Feasibility Review(Evaluation)
	Roadmap Technique
	R&D Portfolio
	QFD(Quality Function Deployment)
	Technology Tree, Element Technology
Project Management	Project Select Technique
	DR(Design Review), Stage-Gate Technique
	Time Schedule Tools(WBS, PERT-CPM, etc.)
	Risk Management
	Visual Goal Management
	Concurrent Engineering
Problem Solving Technique	Six Sigma, DFSS
	DOE(Design of Experiment), Taguchi Method
	Decision-Making Methods(AHP, EMTP, etc.)
	TRIZ
	RCA(Root Cause Analysis)
Operation Management	IE(Industrial Engineering)
	VE(Value Engineering)
	Quality Management Tools(QC, TQC, SQC, TPM, etc.)
	Cost Down
	Matrix Organization Design
	Dual Ladder System

Source: Lee and Na[14].

The questionnaire for conducting this study consists of three categories. One is about the level of MOT, the second is about the need and level of use of MOT methods, and the rest asks about the necessity of opening a university course for methodologies related to PRP (Product Realization Process)[18]. The research results on the necessity and application of the MOT methodology need to be utilized as a strategy for future engineering education and related subject openings. Moreover, to reduce the gap in understanding of the MOT methodology, the survey respondents focused on researchers with more than five years of MOT-related work experience. The following <Table 2> summarizes the questionnaire composition.

<Table 2> Questionnaire Composition

MOT Level (5-point Likert scale)	MOT work proportion	
	MOT settlement degree	
	MOT methods utilization level	
	MOT performance contribution	
	MOT workforce supply/demand satisfaction level	
	Satisfaction with MOT University Education	
MOT Methods Necessity/ Utilization	Degree of need for MOT methods (5-point Likert scale)	
	Degree of use of MOT methods (%)	
PRP (Product Realization Process) (5-point Likert scale)	1) Concurrent Engineering	11) Design for Manufacture
	2) Design Reviews	12) Design for Performance
	3) Communication	13) Design for Reliability
	4) Sketching & Drawing	14) Design for safety
	5) Professional Ethics	15) CAD Systems
	6) Teams & Teamwork	16) Geometric Tolerancing
	7) Creative Thinking	17) Value Engineering
	8) Systems Perspective	18) Application of Statistics
	9) Design for Assembly	19) Reliability
	10) Design for Cost	20) Manufacturing Processes

4. MOT Methods Utilization Level

The analysis results on the level of technology management are presented in <Table 3> below. The application range of MOT was also increased overall compared to the previous one. In particular, the level of utilization of the MOT methods was relatively high, and the satisfaction with MOT human resources supply and demand and MOT university education increased. However, the proportion of MOT work and performance contribution is at the same level as before. Also, the standard deviation of each item was relatively decreased compared to the previous study.

We need to pay attention to the two items with the lowest average score, namely, the MOT human resources supply

<Table 3> MOT Level Results

MOT Level	Previous Study(n=168)		Follow up Study(n=184)	
	Average	S.D	Average	S.D
MOT work proportion	4.27	.730	**4.25**	.801
MOT methods settlement degree	3.64	.843	**4.02**	.816
MOT methods utilization level	3.63	.830	**3.89**	.713
MOT performance contribution	3.60	.821	**3.75**	.632
MOT workforce supply/demand satisfaction level	2.82	.751	**3.15**	.497
Satisfaction with MOT University Education	3.09	.944	**3.25**	.544

and demand and the satisfaction of MOT university education. Combining these analysis results means that although the use of MOT methods in companies is gradually increasing, the level of MOT education in universities is not relatively high.

<Table 4> shows the analysis results of the level of change regarding the necessity of MOT methods. Compared with the results of the previous study, the overall level of necessity was improved. Environment and Opportunity Analysis, Business Feasibility Review, Roadmap, and Risk Management methods were relatively high, with an average of 4 points or more on a 5-point scale.

In particular, the average value for the need for the MOT technique for the environment and opportunity analysis was the highest. These results mean that it is crucial to quickly respond to changes in the external environment and seize new business opportunities.

<Table 4> MOT Methods Necessity

	MOT Methods / Technique	Previous Study(n=168)			Follow up Study(n=184)		
		Degree of need (Necessity)			Degree of need (Necessity)		
		Average	Raking	S.D	Average	Raking	S.D
Environmental Analysis & Opportunity Analysis	Environmental Analysis Technique	**3.88**	**5**	1.188	**4.25**	**4**	.734
	Opportunity Analysis Technique	**3.80**	**7**	1.200	**4.30**	**1**	.890
	Project Profiling Technique	3.54	17	1.247	3.90	10	.794
Technology Strategy and Plan	Business Feasibility Review	**3.89**	**4**	1.158	**4.15**	**5**	.818
	Roadmap Technique	**4.28**	**1**	.960	**4.29**	**2**	.860
	R&D Portfolio	**3.95**	**3**	1.104	**3.98**	**7**	.941
	Quality Function Deployment(QFD)	3.58	14	1.052	3.73	15	.723
	Technology Decomposition	**3.96**	**2**	.984	**3.99**	**6**	.814
Project Management	Project Selection	3.72	10	1.132	3.86	12	.921
	Design Review(DR)	3.57	15	1.311	**3.97**	**8**	1.002
	Schedule Management	3.76	9	1.347	3.88	11	.947
	Risk Management	**3.80**	**7**	1.092	**4.28**	3	.523
	Visual Goal Management	3.55	16	1.361	3.45	19	1.013
	Concurrent Engineering	3.05	23	1.517	3.00	24	1.117
Problem Solving Technique	Six-Sigma, DFSS	**3.81**	**6**	1.032	3.78	14	.841
	DOE, Taguchi Method	3.58	13	1.196	3.60	16	.916
	Decision-Making Method	3.09	22	1.344	3.55	18	.748
	TRIZ	3.42	18	1.221	3.60	16	.832
	Root Cause Analysis	3.25	20	1.483	3.24	22	1.013
Operation Management	IE Technique	2.65	25	1.586	3.35	20	.867
	VE Technique	2.92	24	1.476	3.25	21	.986
	Quality Management Tools	3.62	12	1.208	3.82	13	.823
	Cost Management	3.69	11	1.299	3.92	9	.712
	Matrix Organization Design	3.35	19	1.276	2.89	25	1.066
	Dual Ladder System	3.11	21	1.408	3.01	23	1.014

On the other hand, awareness of necessity decreased slightly for Visual Goal Management, Concurrent Engineering, 6-sigma, DFSS, DOE, Taguchi Method, Root Cause Analysis, Matrix Organization Design, and Dual Ladder System. It seems that these MOT techniques have become less necessary or new systems developed to replace them over time.

<Table 5> indicates the result of analyzing the utilization of the MOT technique, and there is a big difference from the previous research results (Kendall rank correlation 0.635, sig. (2-tailed) 0.000). The analysis result of this study shows that the level of utilization of MOT methods is generally higher than before. Furthermore, as the demand for R&D-related problem solving is gradually increasing, the utilization of the MOT technique is also higher than before.

The most notable result is the high utilization of methods related to 'Environment and Opportunity Analysis,' 'Business Feasibility Analysis,' and 'Quality and Cost Management.' In addition, the utilization ratio of these MOT methods increased the most compared to the previous study.

MOT methods are mainly used for quality and cost management and are estimated to capture business potential by analyzing external environments and business opportunities. On the contrary, MOT methods with almost the same or reduced utilization ratio compared to the previous study were identified as 'Visual Goal Management,' 'Concurrent Engineering,' 'Root Cause Analysis,' 'Matrix Organization Design,' and 'Dual Ladder System.' The above methods were helpful at one time, but now alternative programs have been developed, and it seems that only some are being used. In the case of 'Risk Management' and 'Project Selection,' the utilization ratio was confirmed to be significantly increased compared to the previous study.

This analysis explains that it is essential for companies to increase project success and effectively respond to risks

<Table 5> MOT Methods Utilization

	MOT Methods / Technique	Previous Study(n=168)		Follow up Study(n=184)	
		Degree of use (Utilization)		Degree of use (Utilization)	
		Utilization rate(%)	Ranking	Utilization rate(%)	Ranking
Environmental Analysis & Opportunity Analysis	Environmental Analysis Technique	50.0	12	**88.7**	**2**
	Opportunity Analysis Technique	**62.5**	**5**	**90.4**	**1**
	Project Profiling Technique	48.2	15	68.2	17
Technology Strategy and Plan	Business Feasibility Review	**61.9**	**7**	**85.1**	**5**
	Roadmap Technique	**83.3**	**1**	**81.3**	**8**
	R&D Portfolio	**62.5**	**5**	78.2	10
	Quality Function Deployment(QFD)	46.4	16	70.6	14
	Technology Decomposition	**67.3**	**3**	76.5	12
Project Management	Project Selection	46.4	16	**82.4**	**7**
	Design Review(DR)	59.5	9	78.4	9
	Schedule Management	**66.1**	**4**	**82.8**	**6**
	Risk Management	50.0	12	78.2	10
	Visual Goal Management	49.4	14	42.0	20
	Concurrent Engineering	29.2	22	18.3	23
Problem Solving Technique	Six-Sigma, DFSS	**74.4**	**2**	75.2	13
	DOE, Taguchi Method	**61.3**	**8**	68.9	15
	Decision-Making Method	26.8	23	36.5	21
	TRIZ	41.1	19	68.3	16
	Root Cause Analysis	35.1	20	22.4	22
Operation Management	IE Technique	15.5	25	50.3	19
	VE Technique	33.9	21	52.1	18
	Quality Management Tools	56.5	10	**85.4**	**4**
	Cost Management	51.8	11	**86.3**	**3**
	Matrix Organization Design	45.8	18	12.0	24
	Dual Ladder System	26.2	24	11.4	25

that may arise in realizing it. Furthermore, combining the analysis results on the necessity and utilization rate of MOT techniques, we can be confirmed that the higher the required level of the MOT techniques, the higher the utilization rate.

<Table 6> demonstrates the results of combining the level of necessity and utilization of MOT methods(Kendall rank correlation 0.463, sig.(2-tailed) 0.000). The MOT methods shown in the highest order are Opportunity Analysis, Environmental Analysis, Business Feasibility Review, Roadmap, Risk Management, Cost Management, Quality Management Tools, and Schedule Management. This result shows that R&D researchers mainly use MOT methods in R&BD's strategy(plan), project management, and operation stages. On the other hand, the ranking of MOT methods for practical problem solving was relatively low. This phenomenon also shows that MOT researchers are putting more weight on seizing opportunities and executing strategies to preoccupy markets and technologies. It can be seen that the companies, focusing on MOT to adapt and preoccupy with the rapidly changing market environment. In addition, the Risk Management method is also ranked high.

<Table 7> reveals the practical difficulties in using the MOT methods. It is the result of responding with priority to the ten items prepared based on the opinions of MOT executives of the responding companies. The most challenging part of using MOT methods was the lack of systematic use, the absence of experts, and the difficulty in selecting suitable techniques. Another difficulty was identified as lack of education on MOT techniques, lack of linkage between MOT methods, and lack of preparation for the method used. In addition, the aspect of sticking to the existing familiar MOT methods and the fact that the internalization of the MOT methods was insufficient for companies were also presented as difficult points. For this reason, it seems that there is a gap between

<Table 6> MOT Methods Necessity & Utilization

	MOT Methods / Technique	Follow up Study(n=184)			N×U Score Top Ranking
		Degree of need (Necessity, 5 point scale)	Degree of use (Utilization, %)	Necessity × Utilization (out of 5)	
Environmental Analysis & Opportunity Analysis	**Environmental Analysis Technique**	4.25	0. 887	**3.769**	**2**
	Opportunity Analysis Technique	4.30	0. 904	**3.887**	**1**
	Project Profiling Technique	3.90	0. 682	2.659	14
Technology Strategy and Plan	**Business Feasibility Review**	4.15	0. 851	**3.531**	**3**
	Roadmap Technique	4.29	0. 813	**3.474**	**4**
	R&D Portfolio	3.98	0. 782	3.112	10
	Quality Function Deployment(QFD)	3.73	0. 706	2.633	15
	Technology Decomposition	3.99	0. 765	3.052	12
Project Management	Project Selection	3.86	0. 824	3.180	9
	Design Review(DR)	3.97	0. 784	3.112	10
	Schedule Management	3.88	0. 828	**3.212**	**8**
	Risk Management	4.28	0. 782	**3.346**	**6**
	Visual Goal Management	3.45	0. 420	1.449	20
	Concurrent Engineering	3.00	0. 183	0.549	23
Problem Solving Technique	Six-Sigma, DFSS	3.78	0. 752	2.842	13
	DOE, Taguchi Method	3.60	0. 689	2.480	16
	Decision-Making Method	3.55	0. 365	1.295	21
	TRIZ	3.60	0. 683	2.458	17
	Root Cause Analysis	3.24	0. 224	0.725	22
Operation Management	IE Technique	3.35	0. 503	1.685	19
	VE Technique	3.25	0. 521	1.693	18
	Quality Management Tools	3.82	0. 854	**3.262**	**7**
	Cost Management	3.92	0. 863	**3.382**	**5**
	Matrix Organization Design	2.89	0. 120	0.346	24
	Dual Ladder System	3.01	0. 114	0.343	25

the required level of MOT methods and the level of utilization.

<Table 7> Difficulties in using MOT Methods

Response Item	Score[a)]	Priority
Inexperience in the systematic use of MOT methods	1.85	1
Lack of experts in MOT methods	2.67	2
Insufficient selection of suitable MOT methods	3.45	3
Lack of education on the use of MOT methods	3.87	4
Lack of linkage between MOT methods	4.56	5
Lack of preparation for using MOT methods	5.81	6
Adhere to familiar MOT methods	6.80	7
Lack of internalization of MOT methods	7.24	8
Time constraint of using MOT methods	7.71	9
Missing the application timing of MOT methods	8.87	10

a) The score is a simple average that sums up the priorities of each item, and the lower the score, the higher the difficulty.

Lastly, <Table 8> is the result of analyzing the necessity of opening PRP as a university course, and it shows results similar to those of the previous study(Kendall rank correlation 0.734, sig.(2-tailed) 0.000). It means there is a high demand for topics related to so-called essential competencies for organizational life, such as Communication, Teamwork, and Professional Ethics. These analysis results are consistent with the results presented in engineering capability industry demand analysis[12. 16].

The average value of the need to open courses in Cost Design, Safety Design, and Application Statistics was relatively high. This aspect is interpreted as emphasizing the importance of customer safety and realizing it at a reasonable cost. In particular, as the most basic study that analyzes and interprets social phenomena such as AI and Big Data, the necessity of opening statistics-related subjects was relatively high. However, the need to open courses related to manufacturing and design (Assembly, CAD, Geometric Tolerancing, Sketching Drawing) was not high. These results are interpreted to be due to the characteristics of respondents being MOT-related researchers, not manufacturing fields.

5. Conclusions

This study was carried out as a follow-up study to the previous study on the necessity and utilization level of MOT methods in the corporate field. MOT levels are more established in the enterprise sector compared to the previous study. There

<Table 8> Necessity of Opening PRP Subject

MOT Level	Previous Study(n=168)			Follow-up Study(n=184)		
	Average	Ranking	S.D	Average	Ranking	S.D
Concurrent Engineering	2.99	18	1.654	2.65	19	1.021
Design Review	3.34	15	1.451	3.30	15	.961
Communication	**3.98**	**3**	1.052	**4.24**	**1**	.886
Sketching Drawing	2.98	19	1.408	2.70	18	1.121
Professional Ethics	3.77	9	1.026	**3.85**	**7**	.861
Teams/Teamwork	**4.10**	**2**	.856	**4.15**	**2**	.786
Creative Thinking	**4.32**	**1**	.898	**3.98**	**3**	.918
Systems Perspectives	3.71	12	1.191	3.68	10	1.004
Design for Assembly	3.16	17	1.296	3.15	17	.917
Design for Cost	**3.85**	**5**	1.003	**3.92**	**5**	.790
Design for Manufacture	3.78	8	1.041	3.60	13	.913
Design for Performance	**3.84**	**6**	1.046	3.65	11	1.002
Design for Reliability	**3.95**	**4**	.996	3.80	8	.997
Design for Safety	**3.80**	**7**	1.016	**3.95**	**4**	.848
CAD Systems	3.22	16	1.086	3.25	16	.873
Geometric Tolerancing	2.90	20	1.387	2.10	20	1.012
Value Engineering	3.75	10	1.037	3.65	11	.897
Application of Statistics	3.61	13	1.084	**3.90**	**6**	.843
Reliability	3.72	11	1.116	3.74	9	1.021
Manufacturing Processes	3.59	14	1.046	3.48	14	.916

was no significant difference in the proportion of MOT-related tasks, but MOT technology utilization and the supply and demand aspect of MOT human resources improved compared to the previous ones. The main results derived through this study are presented, and practical implications and limitations are summarized as follows.

First, the level of MOT technique utilization was high in the area of Environment and Business Opportunity Analysis and Strategy establishment considering the project life-cycle. Next, Cost and Quality control techniques, Project Risk, and Schedule Management utilization were relatively high. In short, MOT methods recognized as having high necessity had a higher actual utilization rate, and the utilization rate was higher than that of the previous study. On the other hand, practical obstacles in using MOT methods were identified as insufficient systematic utilization, lack of experts, difficulty in selecting appropriate methods, lack of related education, and lack of linkage between MOT methods.

Therefore, practical suggestions to increase the level of utilization of MOT methods are as follows:

1. It is to organize and operate a learning organization (team) for the correct understanding and use of MOT methods.
2. The company systematically prepares the MOT methods expert nurturing program for human resource development.
3. The most suitable MOT methods are selected according to the nature of the project, and the learning ability is enhanced.
4. Improvement points are found and supplemented in MOT methods in the PDCA approach. In particular, it is necessary to look for improvement points by paying attention to the case where the level of use of MOT methods is low while the level of necessity is high.
5. We are benchmarking the best practices of other companies and applying them to the company's project situation.

Among the PRP subjects, 'Creative thinking,' 'Communication,' 'Teamwork,' and 'Professional Ethics,' which are essential for organizational life, were recognized as necessary as core subjects. In addition, the need for the 'Design of Cost' and 'Design of Safety' was higher than the general design of manufacturing, and with the flow of the digital age, the need for opening 'Application of Statistics' was also high.

Therefore, the following are suggestions to consider when opening courses related to the MOT methods and PRP subjects at universities.

1. Encourage students to communicate and collaborate while working on MOT-related projects
2. Courses focused on micro topics such as quality, cost, safety, and reliability rather than macro courses such as strategy, planning, and environmental analysis
3. Reinforcement of applied statistics curriculum used in various fields in the digital age
4. Opening MOT courses from a demand-oriented perspective by reflecting the needs of the industry
5. Conduct field-based academic activities such as seminars invited by celebrities and high-tech lectures in connection with industry-university

Finally, this study has several limitations to be improved. First, we could not perform an in-depth statistical analysis to verify the clear difference between the two-time points. Second, it is insufficient as a complete comparative study because the respondent companies and respondents are somewhat different from the previous study. In particular, this study does not include companies in many industries using MOT methods but tends to focus on large enterprises (electronics). Third, only the overall aspect of the need and use of MOT methods in the company was analyzed, whereas the analysis on the specific application method was not carried out. Nevertheless, we hope that the results of this study will be utilized to continue related research in the future.

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