Effect of web based employee suggestion system software application on system performance: MMK Metalurji case

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Over the last 10 years Employee suggestion systems (ESS) have been extensively used by industrial companies all over the world to improve their operations/business processes in. ESS increases workers' sense of belonging and confidence, cost saving, product quality, process efficiency, new revenue, workplace safety, etc. The success of ESS depends on individual attributes of employees, organizational factors and system features like administration quality, publicity, rewarding policy, feedback and evaluation philosophy, ESS structure and many others., MMK Metalurji ve Liman İşletmeleri A.Ş. (iron and steel producing company), started using an ESS based on suggestion boxes checked by anevaluation group in 2015 and revised its ESS to be based on a software application and a single expert evaluation in the beginning of 2018. The revised procedure also changed some system features. This study compares and discusses the performance of the previously and currently used ESS systems, focusing on the web-based software usage effect and improved system features benefiting the company. According to the collected data, the usage of the revised web-based ESS software has contributed to the drastic increase in the number of received suggestions (45 times exceeding the amount of suggestions collected using suggestion boxes; at that, the suggestions' review and application time was decreased, the suggestion flow speed accelerated and the ESS accessibility, publicity, feedback speed etc. was improved.

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1. Introduction

Industrial ESSs trace their origin back to the 19th century; in 1880, William Denny, a Scottish shipbuilder asked his employees to offer suggestions in order to build ships in better ways but simultaneously at lower cost [1]. The Kodak company became a pioneer in ESSs with its program being introduced in 1896 [2]. So, in the business world, formal and structured suggestion schemes were first introduced as a modern practice more than one hundred years ago.

Today, the industrial enterprises tend to include employees' beneficial opinions regarding their workplaces and favor them to provide mind power for optimizing operation processes and increasing productivity [3]. Employee suggestion system (ESS) is one of the most favorable tools targeting this aim for industrial organizations [4]. ESS is described as a formalized mechanism that encourages employees to contribute constructive ideas for improving the organization they work for [5] A suggestion scheme should elicit suggestions from employees, classify them, and dispatch them to the experts for evaluation. Thereafter, suggestions might be implemented, in which case the suggesting employees may be well rewarded [6].

Many studies were conducted to determine and assess the success factors for an ESS of any organization to achieve the targeted results like cost saving, new revenue, customer and employee satisfaction, product quality increase etc. [7], [8], [9]. F. Lasrado, M. Arif and A. Rizvi et al. carried out one of the comprehensive reviews about the main success factors of ESS [10]. The authors have indicated that the success factors

can be grouped as organizational and work environment factors, individual attributes and system features.

This study investigates and discusses the effect of employee suggestion *system features* on entity's performance and success based on an iron and steel producing company application case sample where the organizational & work environment factors and individual attributes kept constant while the system features were changed.

2. Company profile and methodology of the study

2.1 Company profile and ESS practice story of the company

MMK Metalurji ve Liman İşletmeleri A.Ş. [11] (company) , a large-scale iron and steel producing company invested by Russian MMK Group with 12,7 million tons of crude steel production and USD 8,214 million sales in 2018 in Turkey [12]. Company has started up the flat steel production in 2010 with a totally 2.4 million tons/year of crude steel production capacity in two locations. The main production plant includes a sea port and administrative departments located in the south and the second in the north of Turkey. Company profile is given in Table 1.

Table 1. Company profile

	Main plant	**2nd plant**
Number of total employees	820	334
Number of workers (Blue collar)	638	270
Number of expert/engineer (White Collar)	182	64
Port Capacity (M Tons/y)	11	No
AEF Capacity (M Tons/y)	2.4 (not operating)	No
HSM Capacity (M Tons/y)	2.4 (not operating)	No
CPL Capacity (M Tons/y)	1.2	No
CRM Capacity (Th Tons/y)	750	No
HDGL Capacity (Th Tons/y)	450	450
CCL Capacity (Th Tons/y)	200	200
Cutting Slitting Line Capacity (Th Tons/y)	50	50

In 2015 company launched the ESS in both locations to increase the innovation culture and provide related benefits. After more than 2.5 years of ESS implementation, top management of the company was not satisfied with the results and asked the R&D department to analyze the ESS implementation and revise it to achieve more satisfactory results. Required revisions were done by the experts and the revised ESS was put into operation in the beginning of 2018, and is being currently used.

2.2.   Methodology of the study

ESS was launched in April 2015 and revision was done in the beginning of 2018 on the system features. The organizational/work environment factors and the individual attributes of the employees are not changed during the old and new ESS version application period. The scope of this study covered the results of the last 18 months of ESS application before revision (1st version) and results of the 18 months of the ESS application after revision (2nd version) to avoid from the initial effects of learning period of 1st version and also to equalize data collection periods of both versions. Time schedule of the application and the scope period of the study is illustrated in fig 1.
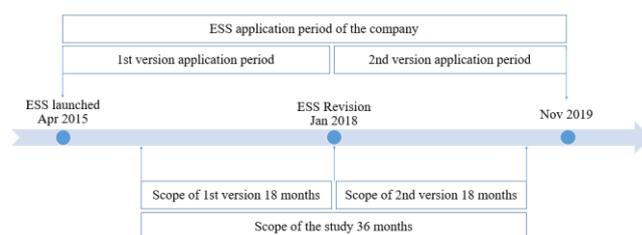

Fig 1. Study scope period

This study is based on the data collected during 36 months of the ESS usage before and after the revision. Some feedback information about the ESS application is obtained from the blue collar employees, white collar employees, suggestion evaluation and implementation responsible persons. This information is also used as a data set. Both versions of ESS are characterized and a comparison chart is created based on the system features of the basic characteristics of each version. Then the application results of both versions are analyzed, compared and discussed from the view point of the success factors related to system features.

3.   Characterization of ESS versions

Characterization of version 1st and version 2nd are done comparatively based on the basic success factors related to system features: publicity, administration, structure, evaluation, rewarding and feedback.

3.1.   Publicity
3.1.1.   Publicity of 1st version

ESS operation procedure, rewarding rules and suggestion forms are created and declared to all employees via e-mail. Suggestion entry forms were printed and sent to the department managers, the forms were also available on intranet of the company for the employees. 21 suggestion boxes are located in the most crowded areas of the plants like dining hall, main entrances, administration building etc.

3.1.2.   Publicity of 2nd version

ESS operation procedure and rewarding rules are revised, suggestion forms and all other hardcopy documentation was transferred to web-based ESS software. The revised

procedure and rewarding instruction sent to all employees via e-mail. Promotional posters were prepared and hanged to some central parts of both company locations to announce the new version's start up. A logo was designed for ESS of the company and used for illustrating the system where needed. The logo with a link to ESS web site was set in the intranet of the company, also the logo and introducing information is published in the company magazine.

A training program about the new version of ESS including system usage, system structure, rewarding rules etc. was prepared and presented to the managers, evaluation responsible personnel, implementation responsible personnel and to blue collar workers.

3.2. Administration of ESS
3.2.1. Administration of first version

1st version of ESS was managed manually. According to procedure, the suggestion entries were done with suggestion forms. The employees were requested to fill the suggestion forms and put them to the suggestion boxes. A suggestion secretary was responsible from collecting forms every week and record them. The suggestion forms received by e-mail was also recorded. The suggestions were evaluated by a committee of related directors/managers once a month. The suggestion submitted employee (SSE) was informed if the committee rejected. Accepted suggestions were projected by a team. Economy department calculates the estimated yearly income of the projected suggestion and the result of this calculation was accepted as a base for rewarding of the suggestion. The project was sent to general managers' approval. Approved projects were sent to the related department for implementation.

In the 1st version all the steps were followed by a suggestion secretary manually on hardcopy forms. Directors of human resources, finance, production, quality etc. were responsible for evaluation, general manager was responsible for final acceptance, related department managers were responsible from implementation and administrative department was responsible from rewarding. The communication between steps was via manual e-mailing.

3.2.2. Administration of 2nd version

According to the revised procedure, 2nd version has been operated on web-based ESS software. Suggestion entries have been done on PC, mobile phone or any device which can connect to internet. A suggestion coordinator has been acting as an admin and directing the accepted entries to the relevant departments' expert or supervisor assigned to evaluate the suggestion technically by the department manager before. The SSE has been informed instantly with an automatic e-mail service including the rejection rationale in the case of rejection. After technical evaluation, the evaluation result is approved by the related departments' manager and directed to the implementation department by the suggestion coordinator. Implementation has done and the data regarding the application results are submitted to the system by the implementation responsible. If monetary profit was obtained,

the data transferred to the economy department and the final reward calculation based on this calculation results.

In the 2nd version all the steps run on software automatically. SSE has been informed instantly about the movement of the suggestion and was allowed to check the status of the suggestion in his profile. Any hardcopy has not used and any manual mailing has not needed during the administration of the 2nd version of ESS in the company. Technical evaluation has performed by a single expert who has assigned before and from the implementation and follow up stage a single person has been responsible as well.

3.3. Structure
3.3.1. 1st version ESS structure

The structure scheme of the 1st version of ESS (fig 2.) had 7 steps: recording, evaluation, projecting, economic calculation, approval, implementation and rewarding. There was a unique evaluation step consisted of a group of high level members. Accepted suggestions were converted to project again by another group. To be implemented, the projected suggestion should have been approved by the top level managing authority, general manager. The rewarding was done one time and at the end of all steps.
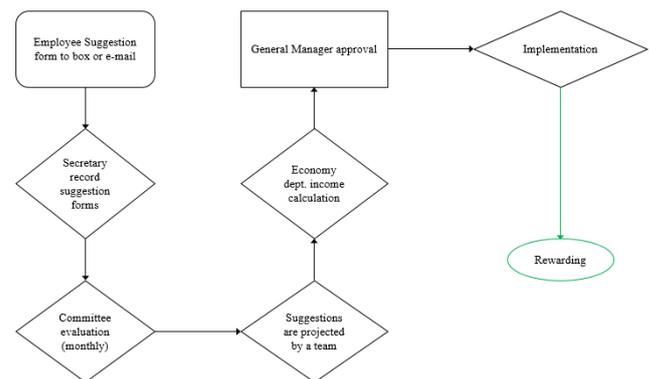

Fig 2. ESS 1st version structure scheme

3.3.2. 2nd version ESS structure

The structure scheme of the 2nd version of ESS (fig 3.) had 4 steps: review and routing, technical evaluation, implementation and follow up the results and rewarding. There was a review step which the submitted ideas were checked if the shape requirements of being a suggestion was met. The content of the suggestion was evaluated in the technical evaluation step by a single expert and the decision of the expert was approved by the manager of the expert. Implementation was done by the related department and the economical income calculations were done according to the realization results of the implementation. Rewarding was done three times after each step.
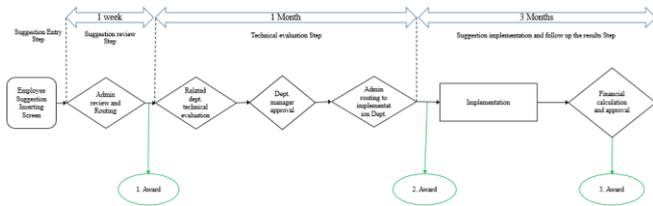
Fig 3. ESS 2nd version structure scheme

3.4. Evaluation
3.4.1. Evaluation in 1st version

Evaluation was done by a committee consisted of financial director (committee leader), human resources (HR) and administrative affairs director and purchasing manager, technical director, economy department manager, HR supervisor (committee secretary). Committee met every month and might have been included related managers if needed. Committee evaluated the suggestions due to the suggestion forms recorded and collected during the previous month. If a clear decision could not be taken the committee leader took the votes of the committee members and gave the final decision about the suggestion.

3.4.2. Evaluation in 2nd version

There are two step of evaluation, review and technical evaluation. In the review step, the semblance of the submitted idea of the employee was evaluated by the suggestion coordinator (admin) according to the predetermined criteria like, the idea should have not been about any of the following: salaries, out of core business of the company, worker union related subjects, the ideas should have included a solution to any problem or an offer for an improvement but should have not been a complaint or grumble. In that way, review step aimed to select the suggestions in an idea pool for a further detailed evaluation step.

The second evaluation was the technical evaluation and done by an employee who was expert on the subject of the suggestion or supervisor of the related department of the suggestion subject. The technical evaluation responsible (TER) employees are predetermined by the department managers and suggestion subject-responsible technical evaluation employee matching was done by the suggestion coordinator on the software.

3.5. Rewarding
3.5.1. Rewarding of 1st version

There is one reward at the end of all steps. The reward was %2 of the yearly profit provided by the suggestion implementation which was calculated before implementation by the economy department. For group suggestions each group member was rewarded with the same ratio of the yearly profit, 2% for each member. The suggestions with nonmonetary benefits were awarded by a fixed amount of money.

3.5.2. Rewarding of 2nd version

The 2nd version of the ESS had a stepwise growing amounted 3 rewards after passing each step. 1st award was a small gift, 2nd award was a shopping card and the 3rd award was 2% of the yearly profit provided by the suggestion implementation where the data regarding implementation results submitted to the software and approved by the economy department. Also 3rd level rewards for the group suggestions decreased for per member of the group by increasing number of group members. So the given money amount by the company for 3rd award per suggestion increased but the gained amount of money for each group member was decreased to avoid from the unrealistic grouping. In the 2nd version all the calculations and management of the rewarding is processed on the web based software. The structure of rewarding in 2nd version is given in Table 2.

Table 2. Rewarding structure of 2nd version of the ESS

	1st award	2nd award	3rd award	
			Implemented	
	Pass review	Pass technical evaluation	Monetary value added	Non-monetary value added
Single Employee Suggestion	Small Gift	Shopping Card	2 % of yearly benefit	Shopping Card
Two Employees Group Suggestion	Small Gift	Shopping Card	1.5 % of yearly benefit for each group member	Shopping Card for each group member
Three Employees Group Suggestion	Small Gift	Shopping Card	1.3 % of yearly benefit for each group member	Shopping Card for each group member

3.6. Feedback
3.6.1. Feedback system of 1st version

The feedback to the SSE about the status of his/her suggestion was sent via a manual e-mail by the ESS secretary in the 1st version. This feedback was consisting of an informative e-mail message about the acceptation or rejection of the suggestion. If the suggestion was deserved to be rewarding, the e-mail also indicated the award details.

3.6.2. Feedback system of 2nd version

All the feedback information was sent via an e-mail message to the SSE automatically after each step by the software. When any action was taken on the suggestion status, software triggered the e-mail sending, to all participants related to the suggestion. For example, when a suggestion passed the review and directed to a TER;
a.   a mail sent to SSE informing that his/her suggestion (including the name and the number of the suggestion) passed

the review, directed to the TER (including name and department of the TER) and he could take his award from awarding responsible.

b.　　　a mail sent to TER informing that he/she was appointed as a TER for a suggestion (name and number of the suggestion was included). The manager of the TER was also received that e-mail.

c.　　　a mail sent to awarding responsible informing that a suggestion (including, the name of SSE, the name and the number of the suggestion) passed the review and reserved for awarding.

The SSE could also sign in and follow the status of his/her suggestion in his/her profile screen on the ESS software.

3.7.　Summary of characterization of the ESS versions

Version 1st and version 2nd of ESS of the company are characterized based on the basic success factors related to system features: publicity, administration, structure, evaluation, rewarding and feedback. Fundamental attributes of the versions are given in Table 3 comparatively.

Table 3. Summary of the attributes of versions

ESS of the company		
	1st version	2nd version
Publicity	1. ESS procedure emailed to employees 2. Suggestion entry forms put to intranet 3. 21 suggestion boxes are located	1. ESS procedure emailed to employees 2. Promotional posters were hanged 3. ESS logo was designed 4. A link given to ESS web site on intranet 5. ESS advertisement in company magazine 6. A training program to related employee
Administration	1. Administration was manual 2. Coordinated by suggestion secretary 3. All records were on forms 4. Teams and departments were on duty 5. General Manager was on charge	1. Administration was run on software 2. Inter-step flow was automatic 3. Coordinated by admin 4. Single person and some departments were on duty
Structure	1. 7 steps 2. Complex structure	1. 4 steps 2. Simple structure
Evaluation	1. No review for suggestion selection 2. Evaluation was done by a team 3. Team members were directors 4. Evaluation was done once a month 5. Evaluation in a limited time	1. Idea semblance were reviewed 2. Single expert technical evaluation 3. Instant and on time evaluation
Rewarding	1. Single award at the end of all steps 2. Nonmonetary benefits were also rewarded 3. For single and group suggestions rewarding ratio was same 4. Rewarding was followed manually	1. 3 increasing valued awards 2. Nonmonetary benefits were also rewarded 3. Rewarding was incentive for group suggestions 4. Rewarding was designed to avoid fake grouping
Feedback	1. Feedback was sent to SSE manually by e-mail 2. Single e-mail to SSE for each suggestion 3. Feedback include only the result and award 4. Feedback was sent only to SSE	1. Feedback was sent to SSE automatically by instant e-mail 2. E-mail to SSE for each step of each suggestion 3. Feedback include all details about each action 4. All the participants were informed 5. SSE could follow the status of each suggestions via internet based software

4.　Results of 1st and 2nd ESS version application and discussion

Usage of a web base software in the 2nd version completely changed the relevance of the employees to the system comparing to the 1st version which was based on hard copy forms and manual application, such that total number of suggestions submitted to the system was 45 times more than the 1st version. 28 total suggestions were received from 15 different employees to the 1st version and 1252 suggestions were received from 371 different employees to the 2nd version. The more the number of suggestions and the more the employees included to the system actively brought a functioning system perception in the company both for employees and system responsible personnel. ESS and suggestions submitted to the system were started to be spoken among the workers and managers and became an agenda topic of work places after initialization of the 2nd version.

The evaluation process times shortened and the number of total processed suggestions increased drastically with the 2nd version. During the application period of the 1st version, the members of the evaluation team were high level directors and the work density of their schedule was not allowing them to share time for the suggestion evaluation activity. In the 1st version period of 18 months, the evaluation team members abled to meet for three times and could be able to discuss only on 11 of 28 received suggestions. In the same time period of the 2nd version the number of processed suggestions was 827 of 1252 submitted suggestions. Long response time of the 1st version blinded the employees' desire to make suggestion.

In the last 18 months of application period of the 1st version, 2 of 8 accepted suggestions were implemented. The number of implemented suggestions for the first 18 months of the 2nd version was 172 of 368 accepted suggestions.

2 suggestions were rewarded during the 1st version's application period. On the other hand, all of the 999 suggestions which have passed the review were rewarded with the first level award in the application period. Also, 368 were rewarded with second level and 172 with third level awards. So, 631 suggestions were rewarded with first level award, 368 both first and second level awards and 172 all three of the awards.

The provided monetary income quantities for the company from the 1st and the 2nd version ESS applications in the scoped periods are not indicated in this study because of privacy but as might be predicted, the revisions on the 1st version and especially the effect of shifting the system to web based software caused a huge increase on company's monetary income, 122 times.

The summary of the results of the ESS versions are given in Table 4.

Table 4. The summary of the results of the ESS versions applications

	1st version			2nd version		
	Quantity	Ratio (%)	Suggestion per employee	Quantity	Ratio (%)	Suggestion per employee
Total Employees	1154			1154		
Total Suggestion Submitted Employees	15	1.3		371	32.1	
Total Suggestions	28	100	0.024	1252	100	1.085
Waiting for Review	-	-	-	0	0.0	0.000
Waiting for Revision	-	-	-	47	3.8	0.041
Rejected at Review	-	-	-	206	16.5	0.179
Waiting for Technical Evaluation	17	60.7	0.015	135	10.8	0.117
Rejected at Technical Evaluation	3	10.7	0.003	496	39.6	0.430
Waiting for Implementation	8	28.6	0.007	196	15.7	0.170
Implemented Suggestions	2	7.1	0.002	172	13.7	0.149

Some of the managers indicated that after some time of initiating the application of the 2nd version, they observed increase of innovation culture in some of their workers' behaviors where they began to discuss about some traditional applications which were used for years.

Some managers and supervisors suffered from the extra work load they had faced for evaluation and implementation of the suggestions after the 2nd version was started. Another displeasing issue for them was the low qualified suggestions bombardment of some employees who were over focused on suggesting something.

5. Conclusion

The revision of the company's employee suggestion system features like publicity, administration, structure, evaluation, rewarding and feedback drastically changed the success of the system from the view point of the number of suggestion received, number of employees actively involved to the system, evaluation speed and performance, number of awarded suggestions, income of the company from the suggestion implementation and innovative behavior of the workers. The improvement on the output performance of the ESS increased the satisfaction of both the employees and the management from the system. The web-based software paved the way for all these changes on the features of the ESS and so the increase on the output performance of the system.

The increased satisfaction from the speed and performance of the new version encouraged the tendency to suggest for the employees. This tendency provided some positive effects on the innovative behavior of some employees, while on the other hand causing some attempts and tendency to misuse of the system by some employees and reactions by managers and supervisors.

A further study may have done to analyze the problematic areas of the new version and to offer solutions to increase performance of the system.

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