Integration Process Models of Quality, Safety, Health and Evironmental Management Systems to Achieve Sustainability Construction

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Abstract

Implementing Quality Management Systems (QMS), Environment Management Systems (EMS) and Occupancy Healthy and Safety Management System (OHSMS) on The Construction Project Management must orient principle of sustainable improvement. Construction industry uses all of economic, social, and environment resource that are at a critical point so that they must be harmonized and efficiency. The integration process significantly to impact the sustainability of construction projects management, especially risk reduction of economic, social and environmental, organizing a good organization, transparent and accountable, optimization of resources, application of reward and punishment and development of new innovation technologies. Process integration of management system with clauses in the High Level Structure of ISO:2015 impact the system to achieve sustainability improvement. Correlation between process integration components is in accordance with the PDCA process approach as the main structure of management system standards (MSS). Commitment and awareness of leadership become most importance factor in management system to achieve sustainability improvement. Policy and planning important factor successes the implementation of the integration process. The process of integration of management systems with the model proposed in this research can be applied at the level of implementation of different management systems standards.

Keywords
Implementation management systems, construction project management, integration process model, sustainability improvement.

1. Introduction

Application of the quality management system (QMS) environmental management system (EMS) and Occupancy Healthy and Safety Management System (OHSMS) in the Construction Project Management is an inevitability. The application of the various management systems causes the occurrence of conflict and one of the benefits of

integrating management system is reducing conflicts between management systems (Rebelo, Santos & Silva, 2014; Bernardo, et.al., 2015; Calcedo, et.al., 2015; Muzaimi, Boon & Hamid, 2016). The application of standardized management system in an organization requires human resources, financial, and time, so that the application of two or more standard management system will enhance the Organization's ineffectiveness (Vadastreanu, et.al., 2015).

Sustainable development in Indonesia only indicates the sustainable development in the short term, but not in the long term, the construction also gave rise to problems in the form of a decline in social resources, i.e. areas that are the development of a more advanced tend to have lower social resources (Oxtavianus, 2014). Construction projects in developing countries gave a huge burden on a sector of the economy and have a major impact on the community, the environment and other social tools, so that the above facts underscoring the importance of ongoing integration on construction project management in these countries (Banihashemi, et.al., 2017). It is also visible above is based on an investigation into the disclosure of the database's Global Reporting Initiative (GRI) of 50 (fifty) global contractor showing the performance of sustainability against the GRI guidelines; European companies had the highest percentage (63%) followed by contractor Asia (50%) and Americans (43%) as well as contractors Australia is at the bottom with only 6% (Afzal, Lim & Prasad, 2017). Indonesian contractors that do the GRI sustainability reporting standards are still low, though in the "Sustainability Reporting Awards 2016" the first winner in the infrastructure sector is PT Wijaya Karya (Persero) Tbk (National Center of Sustainability Reporting, 2016). Construction activity becomes the main source of the waste material, waste, noise, decreased water quality, and environmental pollution in various developing countries (Banihashemi, et.al., 2017).

One of the approaches toward sustainability is an effective and competitive integrated management system (Muzaimi, Boon & Hamid, 2016). This can be understood because the application of QMS, EMS, and OHSMS reflects the dimensions of balance in a system that is sustainable; economic sustainability can be achieved with the application of the QMS, application of OHSMS contribute to the realization of social sustainability, while ecological sustainability can be achieved by optimizing business processes of organizations that focuses on the EMS (Klute-Wenig & Refflinghaus, 2015). The level of integration of management systems depending on the process of integrating management system, especially in the development strategy and methodology (Bernardo, 2014). The integration process is impacted significantly to sustainability, especially in the aspect of balance economic, social, political, and environmental (Sadyrtdinov & Rodnyansk, 2015), decrease environmental impact (Foo & Tan, 2016) and optimization of resources (Klemes, Varbanov & Kravanja, 2013). Ten Clauses in HLS and components of innovation are an important step towards a fully integrated management system, including from the point of view of its activities (Nagel-Picioruş, C.,Nagel-Picioruş,L. & Sârbu, 2016. The higher the level of integration of business process, then the higher level integrated performance management process (Forslund, 2015).

Based on background research on objects, phenomena and problems above, the aim of this research is to propose a model of the integration process to achieve sustainable improvement on a construction management project. The integration process model in this research would use company of construction to implementation Quality Management Systems (QMS), Environment Management Systems (EMS) and Occupancy Healthy and Safety Management System (OHSMS) on the construction project. The research also had the aim between, namely evaluating the correlations between clauses in the integration process towards sustainable improvement.

2. Literature review

2.1. Sustainability

For the term of sustainable development has been growing rapidly both in terms of definitions, principles, as well as its characteristics. Sustainable development, according to the WCED (1987) is the development that aligns the needs now with the next generation's ability in meeting the needs (Mustapha, Manan & Wan Alwi, 2017). Sustainability according to Deloitte & Touche (1992) was adopted strategy and business activities that meet the needs of the company and also the significance of the moment while protecting, sustaining and enhancing human resources and natural will be needed in the future (Silvius, et.al, 2017). Sustainability is defined by Gladwin et.al. (1995) as a process that creates a vision of society that appreciates the use of natural resources wisely to ensure that the generation now reaching a high level of economic security and can achieve democracy and participation the people in control of their communities while maintaining the integrity of ecological systems and life (Martens & Carvalho, 2017). Sustainable development is a process of change that leverages resources, direct investment, focus on

technological development, and institutional change that was implemented with a view to the future as well as it needs now (Klute-Wenig & Refflinghaus, 2015). Sustainability in construction project management is the increased awareness to understand the consequences of social, economic, and environmental issues related to how the project and its supporting system is designed, constructed, operated, maintained, and finally demolished (Martens & Carvalho, 2017).

A sustainable system that harmonizes the three elements of sustainability; sustainable economy, environmental sustainability, and sustainable communities within a single system that is fully integrated (Mustapha, Manan & Wan Alwi, 2017). Sustainability is a balance and harmonization of economic sustainability, social sustainability and environmental sustainability (Silvius, et.al, 2017).

2.2. Integration Process

The integration process has developed more than four decades, especially in the field of the environment and the manufacturing industry with the development of the concept of unification, standardization towards the synergy model (Klemes, Varbanov & Kravanja, 2013). The integration process is a holistic approach to design and operate that emphasize the unity of the process (El-Halwagi, 2017). The integration process is the concept/methodologies to combine some parts of the process or processes to reduce overall resource consumption or emissions harmful to the environment (Klemes, Varbanov & Kravanja, 2013). The integration of process management is to integrate the entire activity in all aspects so that there is no duplication of activities in one single system (Forslund, 2015).

Based on management system standards (MSS) that was published in ISO, the result is consistent and predictable achieved more effective and efficient if activities are understood and managed as interrelated processes that serve as a coherent system as well as understanding how the results produced by this system allows an organization to optimize the system and its performance.

Procedure for integrating the whole system is a key element of sustainability and systems maintainers can help facilities to implement effectively conserves towards improving sustainability in the future (Mustapha, Manan & Wan Alwi, 2017). The management process can be integrated at different levels of implementation of the standard management system (Forslund, 2015).

2.3. Clauses of Integration Process

Ten clauses in Appendix MSS published ISO (scope, normative references, terminology and definitions, organizational context, leadership, planning, supporting, operations, performance evaluation, and improvement) makes it easy to integrate systems (Muzaimi, Boon & Hamid, 2016; Nagel-Picioruş, C.,Nagel-Picioruş,L. & Sârbu, 2016; Mourougan, 2015).

In this research only use eight clauses. The context of the organization be included in the clause's scope because of the scope of management system in considering external and internal problems, the stakeholders concerned and the products and services of the organization (Mourougan, 2015). Policy management integration as elements of the integration process is integrating policies, including grades, regulations, objectives, goals, vision, and mission of the organization which contained in the clauses of normative references and terminology and definitions.

2.4. Correlation Integration Process with Sustainability

Correlation between the components of the integration process (those clauses in the Appendix ISO: 2015) is the PDCA cycle in relations and supported by clause leadership and supporters of the process. The scope of that is a result of the elaboration of the organizational context clause, external and internal issues as well as expectations and needs of stakeholders. All these clauses in a systematic form synergy and integration process towards sustainable improvement (Mourougan, 2015) (see Fig. 1).

The integration process is impacted significantly to sustainability, especially in the aspect of balance economic, social, political, and environmental (Sadyrtdinov & Rodnyansk, 2015), zero complaints, decrease environmental impact (Foo & Tan, 2016), risk reduction of economic, social and environmental, organizing a good organization,

transparent and accountable (Silvius, et.al., 2017), optimization of resources (Klemes, Varbanov & Kravanja, 2013) and technological innovation (Porzio et.al., 2016) and application of the system of reward and punishment.

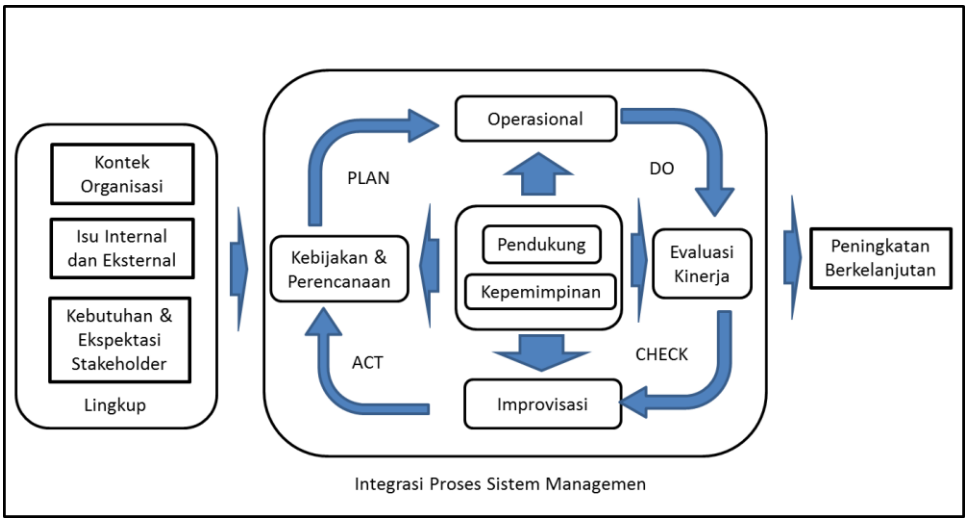

Figure 1. Model Integration processes (Mourougan, 2015 and refined authors)

3. Research Design

3.1. Conceptual model

The conceptual model in this research uses the approach of the synthesis between variables with the framework of the concept of assessing:

- The correlation between the concept of the integration process with a sustained improvement.
- The correlation between the clauses of the integration process with a sustained improvement.
- The correlation between the clauses of the integration process.

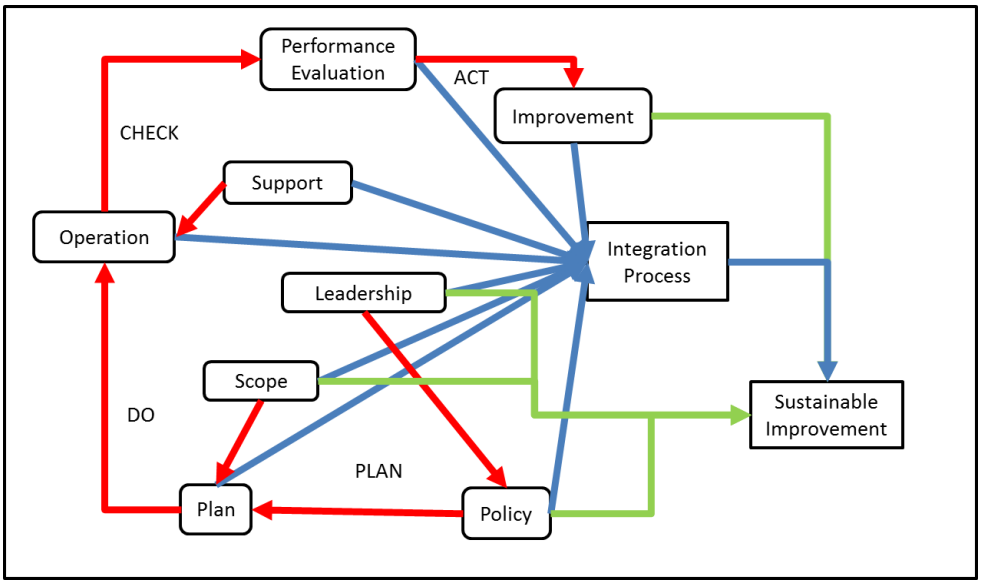

Figure 2. Complex of Integration Process Model

This research proposes the two concept models of the integration process that are relevant to the development of the implementation of the integrated management system.

- Complex of Integration Process Model (see Fig. 2)
  Correlations between interconnected variables that describe all the theories that exist. Correlations of 8 (eight) clauses that make up the process of plan-do-check-action (PDCA) before heading for the integration process and then leads to increased sustainable direct relationships plus a few clauses (scope, leadership, policy, operational and improvement) to achieve sustainable improvement. And Correlation all of 8 (eight) clauses to integration process.
- Systemic of Integration Process Model (see Fig. 3)
  Correlations of 8 (eight) clauses that make up the process of plan-do-check-action (PDCA) before heading for the integration process and then leads to increased sustainable direct relationships plus a few clauses (scope, leadership, policy, operational and improvement) to achieve sustainable improvement.

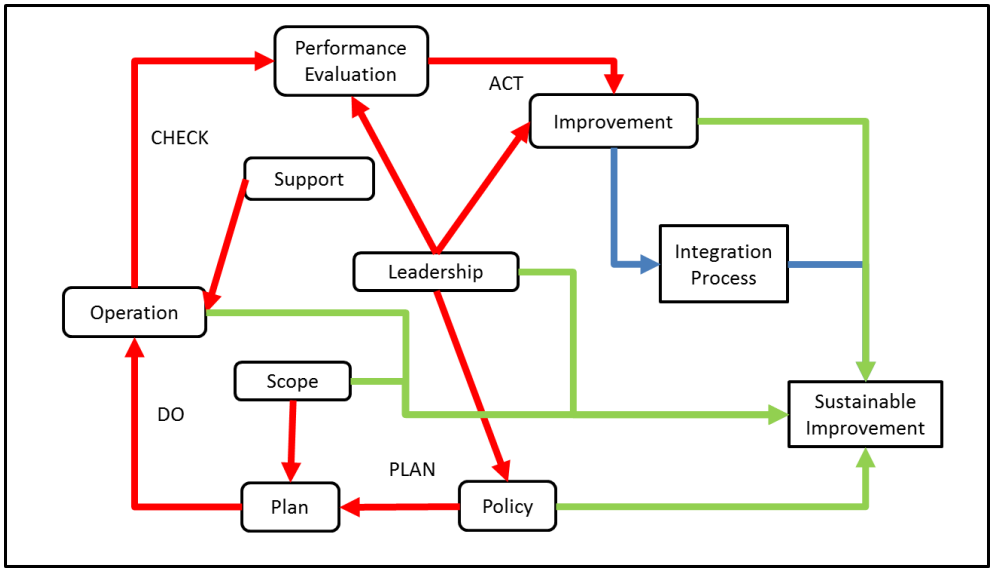

Figure 3. Systemic of Integration Process Model

3.2. Methodology

This research process using the following stages:

- Identification of the issues contained in the object of research. This Object of research is implementation management systems of quality, safety, occupation health and environment on construction project management.
- The outline of the issue as a question of research that further spelled out in the research objectives. This research question is developing integration process models to achieve sustainable improvement
- A study of literature on the phenomenon of the object of research.
- Variable assignment of research based on the study of literature.
- Validation of the construct and the content of the draft instrument using the delphi method by asking the opinions of nine experts in the field of implementation management systems of quality, safety, occupation health and environment on the management of construction project.
- Data collection of the pilot survey to ten respondent to find out whether the questionnaires made easy to understand respondent in final survey.
- Data collection of the final survey to 82 respondents from 61 construction companies and analyzed by PLS-SEM (Partial Least Squares – Structural Equation Model).
- Data collection of the final survey to 19 respondents from government companies of publict works construction and analyzed by AHP (Analytic Hierarchy Process).
- Finding the result of study and discusing te result.
- Determine research conclusions.

4. Finding the Result

The research phase of study literature against previous research generate variables and indicators of research as listed in the table below.

Table 1. Indicator/ Variable Measurement for PLS-SEM Analysis.

No	ID	Indicator/ Measurement Variable	Laten Variable
1	SPM01	Balance the interests of the economic, social, and environmental	Sustainability (SPM)
2	SPM02	Zero Complaints	Sustainability (SPM)
3	SPM03	Participation and involvement of stakeholders	Sustainability (SPM)
4	SPM04	Organizing a good organization, transparent and accountable	Sustainability (SPM)
5	SPM05	Technology innovation	Sustainability (SPM)
6	SPM06	Risk reduction	Sustainability (SPM)
7	SPM07	Control of Waste and environmental protection	Sustainability (SPM)
8	SPM08	Optimization of resources	Sustainability (SPM)
9	SPM09	Energy Savings	Sustainability (SPM)
10	SPM10	Application of reward and punishment	Sustainability (SPM)
11	IP01	Integrated business processes	Integration Process (IP)
12	IP02	Integrated documents (manuals, procedures, work instructions, and checklist)	Integration Process (IP)
13	IP03	Integrated organizational structure	Integration Process (IP)
14	IP04	The effectiveness of business integration	Integration Process (IP)
15	SC01	Certificate of integrated management system	Scope (SC)
16	SC02	Integrated Work Breakdown Structur (WBS)	Scope (SC)
17	SC03	The scope of considering the needs, hopes and expectations of the stakeholders as well as external and internal issues.	Scope (SC)
18	LS01	The commitment and involvement of top management.	Leadership (LS)
19	LS02	Competence of top management.	Leadership (LS)
20	LS03	Participation and involvement of workers.	Leadership (LS)
21	KM01	Commitment to the implementation of the integrated system.	Policy (KM)
22	KM02	The rules of the organization.	Policy (KM)
23	KM03	Change management policy	Policy (KM)
24	PR01	Planning risks and opportunities.	Planning (PR)
25	PR02	Planning the evaluation goals and objectives.	Planning (PR)
26	PR03	The planning system change	Planning (PR)
27	SP01	Certification of materials/tools/products	Support (SP)
28	SP02	Awareness for human resources	Support (SP)
29	SP03	Competence of human resources	Support (SP)
30	SP04	Communication Management.	Support (SP)
31	SP05	Information and communication technology.	Support (SP)
32	OP01	Implementation of risk management.	Operation (OP)
33	OP02	The requirement of the process, products, and services.	Operation (OP)
34	OP03	The performance of the providers of products and services.	Operation (OP)
35	OP04	Implementation of the results of the management review.	Operation (OP)
36	OP05	Management of emergency preparedness and respon.	Operation (OP)
37	PE01	Monitoring and evaluation.	Performance Evaluation (PE)
38	PE02	Procedure for reporting, investigation, repair incidence and follow-up.	Performance Evaluation (PE)
39	PE03	Audit Systems	Performance Evaluation (PE)
40	PE04	Management Review	Performance Evaluation (PE)
41	PE05	Lessons learn of follow-up results	Performance Evaluation (PE)
42	MJ01	Management of nonconformity	Improvement (MJ)
43	MJ02	Corrective action	Improvement (MJ)

No	ID	Indicator/ Measurement Variable	Laten Variable
44	MJ03	Continual improvement	Improvement (MJ)
45	MJ04	Improvement from initiatif of eksternal stakeholder and worker	Improvement (MJ)

4.1. PLS-SEM Analysis

Test validity and Reliability against measurable indicators/variables result variable that balance the interests of the economic, social and environment (SPM01), Zero Complaints (SPM02), stakeholder involvement and participation (SPM03), control waste and environmental protection (SPM07) and energy conservation (SPM09) is not quite reliable in describing the sustainability variables. The analysis results also show that the measured variable certification materials/tools/products (SP01) and concern human resources (SP03) not strong enough latent variables describing supporters of the process. For further analysis of the stage only a strong indicators describe their variable latency are analyzed using either PLS-SEM as well as AHP.

Two models of the development of the integration process that is proposed in this study had characterized the relationship between clauses in the process of integration is not too much different. The characteristics of the two models that are found based on the analysis of PLS-SEM is as follows:

- Complex of Integration Process Model (see Fig. 4)
  This model describes the integrated management system which is already waking up so all the clauses/factors influence each other. Process an easier reach sustainable improvement. The application of the process integration management system in the company with management systems and infrastructure that are already formed with high effectiveness and good as well as developing in ' out of the box ".
- Systemic of Integration Process Model (see Fig. 5)
  Correlations of 8 (eight) clauses that make up the process of plan-do-check-action (PDCA) before heading for the integration process and then leads to increased sustainable direct relationships plus a few clauses (scope, leadership, policy, operational and improvement) to achieve sustainable improvement. The model integration process of systemic and bureaucratic, leadership involvement, which tend to start from the policy up to the process of improvisation necessary for the sustainable improvement process.

In Complex of Integration Process Model, there are things outside estimates of the influence of variable improvement towards the integration process as well as sustainability was not significant (hypothesis rejected) and the value of β =-0165 (see Fig. 4). While the influence of the variables increase against the integration process quite significantly on a second model with a value of $\beta = 0.598$ (see Fig. 5).

A second model shows the participation and the involvement of workers ($\beta = 0.853$) is more instrumental than the commitment and involvement of top management ($\beta = 0.850$) (see Fig. 5). While the model of complex process variable commitment and involvement of top management ($\beta = 0.851$) is not too different with variable participation and the involvement of workers ($\beta = 0.852$) (see Fig. 4).

The influence of integration processes in system management when the company implemented the second model only moderate ($R^2 = 0.357$) (see Fig. 5) as compared to the application of a more complex model of substantial (the value of $R^2 = 0.678$) (see Fig. 4).

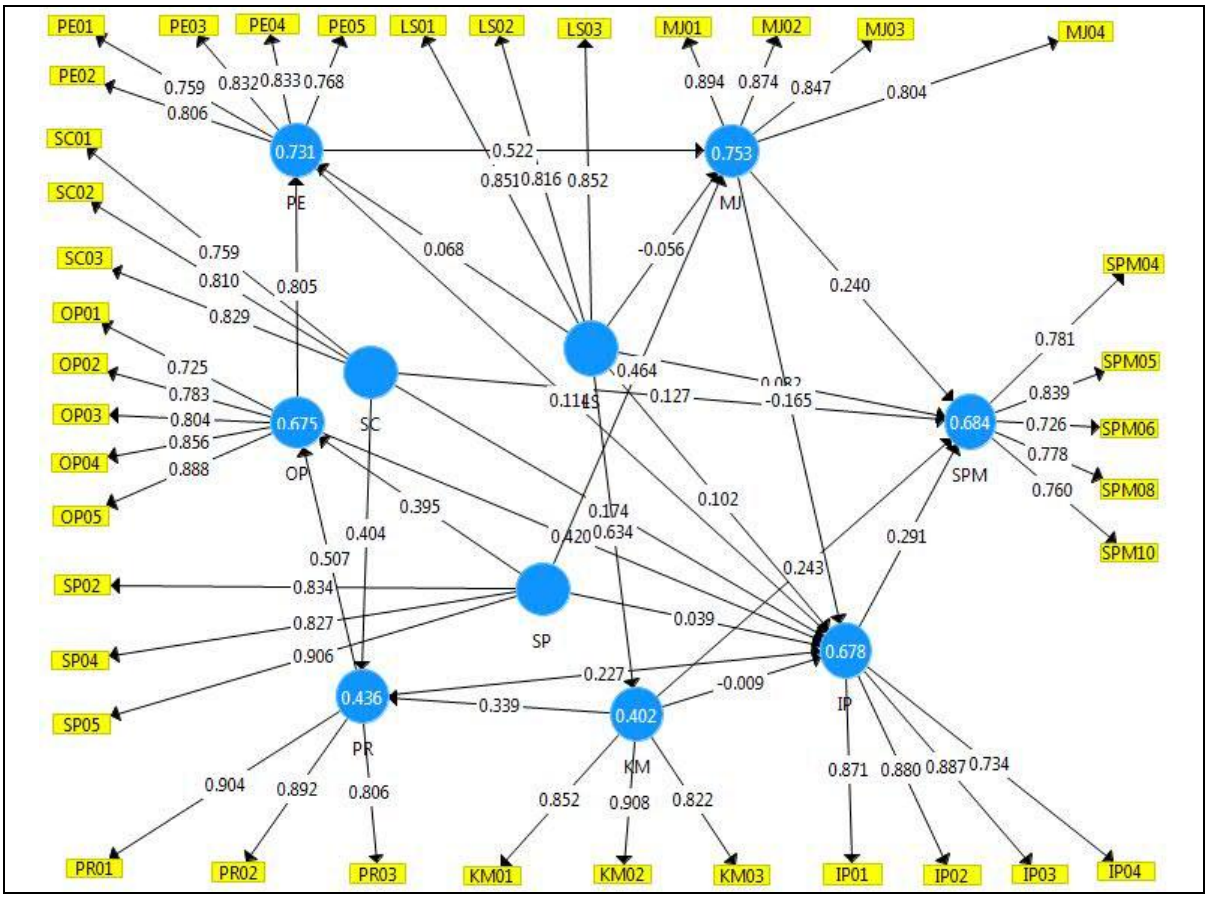

Figure 4. Run PLS Algoritm - Full Integration Process Model

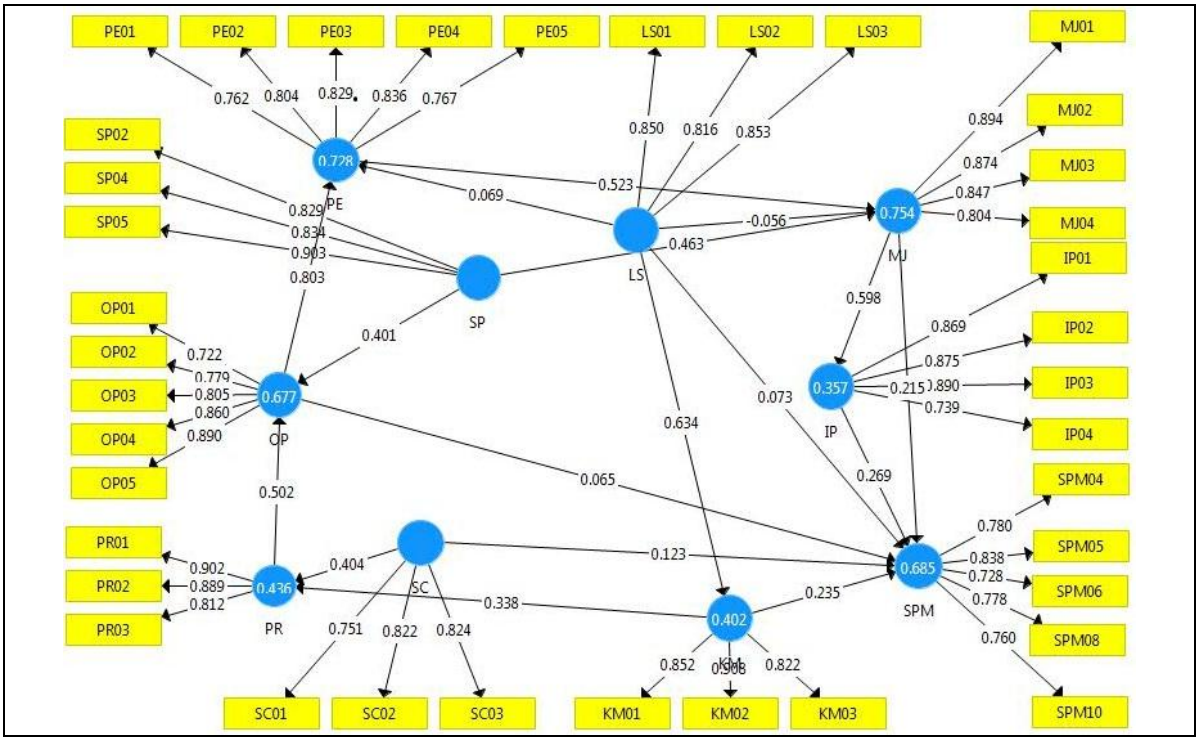

Figure 5. Run PLS Algoritm - Partial Integration Process Model

4.2. AHP Analysis

Leadership became the most important clause in the integration process towards sustainable improvement while the order of the other variables of integration process can be seen in table 2. Risk reduction being the highest in the order of indicators that describe sustainability improvement. Effectiveness of integrated business being top in describing the integration process followed by the integration of business processes. While the order of the other indicator of this model can be seen in table 2.

Table 2. AHP Analysis – Rank of Indicator.

Indicator	Weight	Rank	Variable	Weight	Rank
SPM04	1.000	2	SPM		
SPM05	0.446	5			
SPM06	1.043	1			
SPM08	0.632	3			
SPM10	0.507	4			
IP01	1.000	2	IP		
IP02	0.867	4			
IP03	0.898	3			
IP04	1.054	1			
SC01	1.000	3	SC	1.000	7
SC02	1.565	1			
SC03	1.356	2			
LS01	1.000	1	LS	1.747	1
LS02	0.566	2			
LS03	0.385	3			
KM01	1.000	1	KM	1.336	2
KM02	0.677	2			
KM03	0.535	3			
PR01	1.000	1	PR	1.204	3
PR02	0.784	2			
PR03	0.519	3			

Indicator	Weight	Rank	Variable	Weight	Rank
SP02	1.000	1	SP	0.833	8
SP04	0.921	2			
SP05	0.866	3			
OP01	1.000	1	OP	1.097	6
OP02	0.911	3			
OP03	0.715	5			
OP04	0.801	4			
OP05	0.953	2			
PE01	1.000	2	PE	1.165	5
PE02	0.761	5			
PE03	0.869	4			
PE04	1.033	1			
PE05	0.998	3			
MJ01	1.000	4	MJ	1.180	4
MJ02	1.246	1			
MJ03	1.145	2			
MJ04	1.086	3			

5. Discussion the Finding

5.1. Indicator of Integration Process

Based on observations of experts from the top level management company for public works construction, then the most important variable in the integration process is the integration of business processes of the company but now the effectiveness of integrated business is the most important indicator. The higher the level of integration of business process, then the higher level integrated performance management process (Forslund, 2015).

Integrated documents (manuals, procedures, work instructions, and checklist) are just as supports of the integration process. So in ISO:2015, documentation listed in clause support with the name of the information documented. Procedure for integrating the whole system is a key element of the sustainability of the system (Mustapha, Manan & Wan Alwi, 2017).

Base on PLS-SEM analysis, integrated organizational structure be indicators that best reflect the integration process (see Fig. 4). It shows that the first thing visible from the integration process is an integrated organizational structure, although that indicator is not the most important indicator (see Table 2).

5.2. Hierarchy of Clause in Integration Process

Hierarchies clause/factors that build the integration process for the order of 1-3, namely leadership, policy, and planning can be accepted by all experts, it is indicated that the third clause is the most important thing in the integration process (see Table 2).

The big three are the most visible sustainability indicators are as follows: 1. Risk reduction. 2. Conducting a good organization, transparent and accountable. 3. Optimization of resources (see Table 2). It indicated that risk reduction is important in a good organization, organization of transparent and accountable are done with the application of optimization of resources as well as for development must apply technological innovation for a sustainable system effectiveness.

The support and commitment of the top management level are a most important factor in all of stages of the integration process of initiation, operation, and maintenance to close of the project (Rebelo, Santos & Silva, 2014). Sequence indicator on variable indicator which makes the leadership, commitment and concern of top level management at the first rank followed by top level management competencies, it is indicated that the competence of top level management also becomes one of the problems in the implementation of the integrated management system in line with result research Banihashemi et.al. (2017), that knowledge about sustainability practices is lacking among the practitioners of the construction in developing countries because they are more focused on the target time and cost and backed by one of the experts in the validation stage results, i.e. with high competency level in top management commitment then focus more towards sustainable improvement.

5.3. Integration Process Model

Two models of the development of the integration process that is proposed in this study had characterized the relationship between clauses in the process of integration is not too much different. These process integration model are carried out depending on the level of the relevant application management system at each company. In the implementation of the proposed model is the two to do further studies on the organizational context (clause 4 in ISO: 2015). The management process can be integrated at different levels of implementation of the standard management system (Forslund, 2015).

The integration process is impacted significantly to sustainability, especially in the aspect of balance economic, social, political, and environmental (Sadyrtdinov & Rodnyansk, 2015) and decrease environmental impact (Foo & Tan, 2016) through a process of risk reduction of economic, social and environmental. The positive impact of the integration process toward sustainability in the aspect of organizing a good organization, transparent and accountable (Silvius, et.al, 2017), optimization of resources (Klemes, Varbanov & Kravanja, 2013) and technological innovation (Porzio dkk., 2016). Sustainable integrated management system will not run without the application of the system of reward and punishment.

Continuous improvement is significantly influential for sustainability (Rebelo, Santos & Silva, 2014) in the stage of system achieve the effective systems. When the management system has been integrated with the effectiveness and a good infrastructure of support improvement is not significant influence for sustainability, but that more significant influential is an integration process for sustainability. In that condition, every correlations between clauses are not influential significant.

Ten clauses in Appendix MSS published ISO (scope, normative references, terminology and definitions, organizational context, leadership, planning, supporting, operations, performance evaluation, and improvement) makes it easy to integrate systems (Muzaimi, Boon & Hamid, 2016; Nagel-Picioruş, C.,Nagel-Picioruş,L. & Sârbu, 2016; Mourougan, 2015) especially influential operational phase significantly in the integration process.

The correlation between the clauses in the integration process embraced the approach of plan-do-check-act (PDCA) starting from the policy of the leadership system in the planning stages leading to "plan", supporting processes and operations in the state of "do" performance evaluation, through audit and management review at the stage of "check" and stage “act” through continuous improvement. The input of the planning process in the integration management system is the needs and expectations of stakeholders as well as internal and external issues related organizations

goals and objectives of the organization (Mourougan, 2015). The planning stage is an important and influential factor significantly to the success of the implementation of the integration process (Rebelo, Santos & Silva, 2014). The integration of planning and scheduling to the verification process performance evaluations (Dai, Tan, Su & Li, 2015). Synergies and coherent between scope, planning and operational systems are important in the integration process (Rebelo, Santos & Silva, 2014). Establishment of integrated resources required in the establishment, implementation, maintenance, and continuous improvement (Muzaimi, Boon & Hamid, 2016). The audit must be scheduled on a regular basis, taking into account the business risks to assess the level of compliance and implementation of Integrated Management Systems, its evolution, its effectiveness and possible identification of corrections and improvements is necessary, which must be attached and prioritized in the evaluation and implementation (Rebelo, Santos & Silva, 2014). Systems integration makes the review of management (performance evaluation indicators) for each component within a single management system are planned to ensure the ongoing suitability, adequacy, and effectiveness in the continuous improvement (Muzaimi, Boon & Hamid, 2016).

6. Conclusions

The process of integration of management systems with the model proposed in this research can be applied at the level of implementation of different management systems standards. The integration of process management system has a positive impact for sustainability. Component/clauses contained in the annex to ISO: 2015 is an effective way for the integration of the system, especially influential operational phase significantly in the integration process. Improvement is component towards sustainability. Leadership became the most important clause in the integration process towards sustainable improvement. Sustainability in the management of the construction project are reduced risk of economic, social and environmental, organizing a good organization and the optimization of the use of resources.

References

Rebelo, M.F., Santos, G. & Silva, R., A Metodology to Develop the Integration of the Environmental Management System with Other Standardized Management Systems, *Scientific Research Publishing Inc*, vol. 3, pp. 170-181, 2014.

Bernardo, M. et.al., Benefits of management systems integration: a literature review, *Journal of Cleaner Production*, vol. 94, pp. 260–267, 2015.

Calcedo, J.G.S. et.al., Analysis on Integrated management of quality, environment, and safety on industrial project, *Procedia Engineering*, vol. 132, pp. 140–145, 2015.

Muzaimi, H. Boon C.C. & Hamid, S.R., Integrated management system: The integration of ISO 9001, ISO 14001, OHSAS 18001 and ISO 31000, *Engineering International Conference (EIC)*, vol. 1818, pp. 020034-1 – 020034-14., 2016.

Vadastreanu, A.M. et.al., Quality, Environment, and Health Integrated System : A Literature Review, *Journal of Investment and Management*, vol. 4(6), pp. 348–356, 2015.

Oxtavianus, A., Pembangunan Berkelanjutan dan Hubungannya dengan Modal Sosial di Indonesia, *Sekolah Pascasarjana Institut Pertanian Bogor, Bogor, Indonesia*, 2014. http://repository.ipb.ac.id/handle/123456789/69976, Sept 4, 2017.

Banihashemi, S. et.al., Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries, *International Journal of Project Management*, vol. 35, pp. 1103–1119, 2017.

Afzal, F., Lim, B. & Prasad, D., An investigation of corporate approaches to sustainability in the construction industry, *Procedia Engineering*, vol. 180, pp. 202–210, 2017.

National Center of Sustainability Reporting 2016. *Sustainability Reporting Award* . http://sra.ncsr-id.org/category/sustainability-reports, Sept 16, 2017.

Klute-Wenig, S. & Refflinghaus, R., Integrating sustainability aspects into an integrated management system, *The Total Quality Management Journal*, vol. 27(3), pp. 303 – 315, 2015.

Bernardo, M., Integration of management systems as an innovation: a proposal for a new model, *Journal of Cleaner Production*, vol. 82, pp. 132-142, 2014.

Sadyrtdinov, R. & Rodnyansk, D., Integration Processes as A Factor of Regional Development, *Procedia Economics and Finance*, vol. 23, pp. 772–777, 2015.

Foo, D.C.Y. & Tan R.R., A review on process integration techniques forcarbon emissions and environmental footprint problems, *Process Safety and Environmental Protection*, vol. 103, pp. 291–307, 2016.

Klemes, J.J., Varbanov, P.S. & Kravanja, Z., Recent developments in Process Integration, *Chemical Engineering Research and Design*, vol. 91, pp. 2037-2053, 2013.

Nagel-Picioruş, C.,Nagel-Picioruş,L. & Sârbu, R., Milestones in Implementation of an Integrated Management System in the Health Sector. Case Study Radiologische Netzwerk Rheinland. *Amfiteatru Economic*, vol. 18(42), pp. 432-445, 2016.

Forslund, H., Performance management process integration in retail supply chains. *International Journal of Retail & Distribution Management*, vol. 43(7), pp. 652 – 670, 2015.

Mežinska, I., Lapiņa I., & Mazais, J., Integrated management systems towards sustainable and socially responsible organization, *Total Quality Management & Business Excellence*, vol. 26(5-6), pp. 469-481, 2015.

Paraschivescu, O.A., The Advantages of the Process of Integrating Quality Management System, *Economy Transdisciplinarity Cognition*, vol. 19(2), pp. 48–55. 2016.

Mustapha, M.A., Manan, Z.A. & Wan Alwi, S.R., Sustainable Green Management System (SGMS) An integrated approach towards organisational sustainability, *Journal of Cleaner Production*, vol. 146, pp. 158 – 172, 2017.

Mourougan, S., Auditing Integrated Management System for Continuing Suitability, Sustainability and Improvement, *IOSR Journal of Business and Management (IOSR-JBM).* Vol. 17(10). pp 1-14 (2015).

Amalnick, M.S. & Zarrin, M., Performance assessment of human resource by integration of HSE and ergonomics and EFQM management system: A fuzzy-based approach, *International Journal of Health Care Quality Assurance*, vol. 30(2), pp. 160 – 174, 2017.

Dai Min, Tan Dunbing, Su Yuchun & Li Weidong, Energy-aware integrated process planning and scheduling for job shops, *Journals Engineering Manufacture*, vol. 229(S1), pp. 13–26, 2015.

Silvius, A.J.G. et.al. Considering sustainability in project management decision making; An investigation using Q-methodology, *International Journal of Project Management*, vol. 35, pp. 1133–1150, 2017.

Martens, M.L. & Carvalho, M.M., Key factors of sustainability in project management context: A survey exploring the project managers' perspective, *International Journal of Project Management*, vol. 35, pp. 1084–1102, 2017.

El-Halwagi, M.M., A return on investment metric for incorporating sustainability in process integration and improvement projects, *Clean Techn Environ Policy*, vol. 19, pp. 611–617, 2017.

Porzio, G.F., et.al., Process integration analysis and some economic-environmental implications for an innovative environmentally friendly recovery and pre-treatment of steel scrap, *Applied Energy*, vol. 161, pp. 656–672, 2016.

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