

Appendix A: PPMS characteristics extracted from the Structured Literature Review

This file provides supplementary information designed to complement the paper titled; "Process Performance Measurement System Characteristics: An Empirically Validated Framework", submitted to the 17th International Conference on Business Process Management (BPM 2019). The aim is to provide a summary overview of the 38 PPMS characteristics; depicting the supporting literature that each of these a priori characteristic was derived from. Column 1 depicts the Serial numbers (ID #) given to the 38 characteristics identified through the structured literature review (SLR) and Column 2 provides the description for each. Column 3 presents the number of sources (out of the 56 selected sources) mentioning this characteristic. The references of the 56 sources are listed at the end of this table prefixed with a Reference ID (as used in Column 4).

Table A1. PPMS characteristics extracted from the Structured Literature Review.

Column 1	Column 2	Column 3	Column 4
Serial No.	Characteristics	Number of papers	Reference ID (as indexed in the reference list)
C1	Performance measures should be clearly defined, with an explicit purpose. This characteristic relates mainly to defining the improvement areas, performance objectives, performance criteria, measurement criteria/ formula, the key performance indicators (KPIs) etc.	11	14, 15, 20, 21, 23, 28, 29, 44, 46, 52, 55
C2	Performance measures should be valid and reliable; the measures and the KPIs should measure the intended performance as precise as possible and recognize the true result of the process while maintaining consistency and accuracy of information.	7	1, 5, 29, 45, 49, 54, 55
C3	Performance measures should be relevant to the business process, the people who are accountable for the process; and the output of the process.	9	1, 6, 15, 20, 28, 29, 44, 49, 54
C4	Performance measures should be simple to use/implement, easy to understand and maintain, comprehensive and meaningful to employees including decision makers.	23	1, 5, 6, 12, 13, 14, 15, 16, 20, 24, 26, 27, 28, 30, 36, 39, 40, 43, 45, 46, 47, 52, 54
C5	Performance measures should continuously monitor performance. Mainly the process performance data and related KPIs should be monitored in order to maintain the momentum of the progress.	1	55
C6	The set of performance measures used should be few, but complete and critical and non-redundant.	7	11, 18, 20, 31, 46, 47, 48
C7	Performance measures should be continuously updated with regard to internal and external changes and re-evaluated and changed/re-prioritized on an ongoing basis to meet the changing requirements and maintain alignment.	16	3, 5, 9, 11, 12, 16, 17, 21, 22, 24, 29, 30, 35, 39, 54, 55
C8	Establishing targets or goals for performance measures should be based on research, rather than on arbitrary/ uninformed numbers. Realistic measures will improve acceptance.	1	11

C9	Performance measures should contain an all-inclusive/ balanced/ multi-dimensional set of measures; e.g. a combination of outcome and process measures; KPIs and measures for both: leading and lagging indicators; internal and external indicators; and efficiency and effectiveness related indicators.	16	7, 8, 9, 11, 15, 19, 20, 22, 29, 34, 38, 41, 42, 45, 46, 55
C10	Performance measures should take both long-term and short-term views into account.	6	21, 24, 40, 47, 54, 56
C11	Performance measures should be available to cover both Financial, non-financial/ Objective, subjective/ quantitative, qualitative performance measures. Most literature sources recommended the use of both types together to give a complete view of the performance.	28	Non-financial/ subjective/ qualitative – 16, 24, 27, 39, 43, 49, 55 Financial/ objective/ quantitative -5, 8, 20, 23, 27, 38, 44, 45, 46, 52, 55 Both - 2, 12, 14, 20, 22, 24, 26, 27, 31, 33, 34, 35, 37, 42, 49, 54
C12	Performance measures should include trend and ratio based performance measures, focusing on identifying the improving trends rather than snapshots and to calculate ratios rather than absolute numbers through measures.	7	16, 20, 23, 43, 44, 52, 55
C13	Performance measures should change dynamically and be consistent or coherent with the organizational strategy to support strategy realization. Thereby measures can be implemented as a means of articulating strategy, monitoring business results and communicating the organizational strategy.	24	5, 12, 13, 15, 17, 21, 24, 28, 30, 31, 34, 37, 38, 39, 42, 44, 45, 46, 47, 48, 49, 52, 53, 55
C14	Performance measures should be linked to targets, goals, and objectives and be mutually supportive and consistent/ congruent/ and aligned with the business's operating goals, objectives and targets.	17	2, 5, 8, 18, 19, 20, 22, 23, 24, 26, 29, 34, 40, 42, 44, 52, 55
C15	Performance measures should be linked to critical success factors and key business drivers and take into account the most important organizational factors influencing the productivity of the different processes.	8	5, 11, 18, 24, 26, 29, 45, 50
C16	Performance measures should take into account the stakeholders' (such as: customers, employees, shareholders, suppliers etc.) needs when developing performance measures. The measures should be reviewed and accepted to ensure their buy-in. The adoption can be increased by designing KPIs carefully with the involvement of the process stakeholders.	17	Stakeholders - 5, 11, 13, 15, 25, 41, 55 Customers - 11, 23, 24, 30, 37, 41, 44, 49, 52 Shareholders -11 Suppliers - 44, 52 Employees - 19, 23, 34, 41, 42,
C17	Performance measures should track the past and present performance to set targets for the future. This will enable the provision of information about past performance and facilitate future planning of the processes.	5	12, 14, 16, 46, 48
C18	Performance measures should be linked to the rewards/ incentive system to motivate employees to accept the introduced changes. The link between the rewarding mechanism and the performance results generated from the measurement system should be transparent.	7	11, 13, 19, 24, 46, 47, 53

C19	Performance measures should be integrated with process execution and connected to the KPI and the steps in the processes.	6	15, 17, 21, 54, 55, 56
C20	Performance measures should consider the organization as a whole, to minimize conflict. i.e. to minimize sub-optimization among the sub-groups/ divisions/ processes within the organization and achieve benefits from an overall company perspective. The design should recognize the trade-offs between different performance dimensions.	6	13, 21, 22, 27, 46, 48
C21	Performance measures should focus on processes and integration of functions. The measurement systems consider processes as well as the whole organization or organizational units for measurements. The cross-functional issues should be addressed. Further, measures of one process should be integrated with other processes and functions within the organization both vertically and horizontally.	11	3, 19, 27, 30, 33, 34, 41, 42, 54, 55, 56
C22	Users of the measures should have control over the performance measure by which they are measured. But the possibility for manipulations to the PPMS system, data or data collection process should be kept at a minimal level, to maintain the credibility of the information generated through the PPMS.	13	1, 16, 22, 23, 26, 27, 33, 40, 43, 44, 47, 52, 53
C23	Performance measures should be applied consistently throughout all levels of the organization and be part of a closed management loop. The corporate and business strategies should be translated consistently to all levels of the organization (strategic, tactical and operational). All relevant activities, functions, and departments along the process should be considered and measured at the individual or team level.	17	11, 12, 13, 19, 20, 22, 26, 27, 30, 34, 42, 44, 46, 52, 53, 55, 56
C24	Performance measures should be cost effective to use. The benefits created for the organization through the results generated by the performance measures should outweigh the cost of gathering information/data to generate those results.	6	20, 38, 40, 41, 46, 51
C25	Performance measures should extensively use automatically collected data and the existing sources of data to maintain the cost of having performance measurements at a minimum level. The output from some existing system can be used, or a new method with minimal investment should be considered before moving to much costlier options.	4	44, 52, 54, 55
C26	Employees should be formally trained on: using performance measures and analytical techniques for the generation of expected performance information. Training and infrastructure needed to perform the tasks (such as gathering data, analysis, interpreting, disseminating etc.) more effectively should be provided.	4	14, 19, 21, 55
C27	Performance measures should maintain consistency over time and in reporting. This will facilitate maintaining the reliability of the system.	3	5, 44, 53
C28	Performance measures should visually (e.g. through graphs) present the results of the performance being measured to the users as visuals can make more impact than numbers.	4	16, 36, 44, 53
C29	Performance measures should provide fast and timely feedback. The right information should be provided to the right people at the right/ necessary time (timely and fast feedback), to ensure its value for decision making is not lost.	11	1, 12, 15, 28, 37, 39, 43, 44, 50, 51, 52

C30	Performance measures should provide accurate feedback that provides a transparent representation of the situation to ensure the credibility of the measures and their results.	9	15, 20, 28, 38, 40, 44, 50, 52, 55
C31	Reports generated should be made in a simple, frequent and regular manner, available constantly for review/ use, and not used as a replacement for review meetings.	4	16, 20, 29, 44
C32	Performance measures should map the individual contributions to the overall achievements. i.e. performance information related to the individual employees, groups and departments against the overall organization's performance should be mapped, and communicated to all levels in the organization. Visibility, traceability, and transparency of the contributions will enable staff to understand how their decisions and activities influence the entire business and will encourage employee empowerment.	10	4, 14, 18, 32, 35, 36, 37, 49, 52, 55
C33	Performance measures should provide comprehensive information to users with easily identifiable and useful relationships between the activities measured; recognize the strengths and weaknesses of the implemented strategy, provide early warning signals to prevent errors; report on deviations and diagnose causes for the current situation or any deviations, provide new insights, be able to identify cause-and-effect relationships among measures, relationships between performance drivers and performance outcomes, and between leading and lagging indicators; and help identify mistakes and facilitate future initiatives.	11	2, 5, 10, 19, 38, 44, 46, 47, 48, 53, 55
C34	Performance measurement results should enable consistent benchmarking/ comparisons to ensure the appropriateness of the internal standards and encourage continuous improvement. Also, organizations should re-evaluate the criteria used for comparisons or benchmarking to maintain currency and effectiveness.	10	2, 8, 23, 27, 30, 36, 43, 45, 46, 49
C35	Performance measurement results should focus on improvements and inspire and permit employees to monitor, control and further improve the processes. Also, measures should facilitate and ensure that the achievements gained through improvement initiatives are maintained in the long term.	18	9, 15, 18, 21, 22, 25, 27, 28, 29, 30, 38, 39, 41, 43, 44, 49, 52, 55
C36	Performance measurement results should provide information for actionable results. Remedial action should be indicated by the measurement results, so measures can become a guide for corrective actions to be taken.	6	10, 12, 13, 20, 41, 55
C37	Performance measurement results should provide information for informed decision making, management, control and planning, and be a basis for performance management by facilitating planning, assessing, controlling, predicting future performance, etc.	12	5, 9, 12, 15, 20, 22, 25, 29, 38, 48, 50, 55
C38	Performance measurement results should not be used as a weapon/ tool for punishment. Measures should not be used <u>only</u> as an accountability tool and use to blame the employees and make them answerable to performance deviations only. They should monitor the behaviour of employees in a positive manner.	4	25, 35, 41, 49

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