Key Project Characteristics for Value Management Processes on Capital Facility Projects

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Abstract

Project value can be increased by implementing the most suitable one or more Value Management Processes (VMP). For the past decades, a variety of innovative management processes have been increasingly introduced into the construction industry. Each VMP is considered to be significantly beneficial for capital facility projects to proactively achieve one or more project value objectives. This paper covers the compilation of the 44 VMPs and provides their leveraging project characteristics that require the implementation of one or more VMPs. The results of data collection establish relative importance between the VMPs and the project characteristic factors in collaboration with 51 experts from both industry and academia. In the lack of industry awareness of both VMPs and their causal factors, the results of this study can facilitate the implementation of the VMPs and ultimately enhance the value of a particular capital project.

Keywords : Capital Project, Project Characteristics, Value Management, Value Management Process

1. Background

To achieve the optimum value of a project, a variety of innovative management processes, which are also interchangeably termed as *best practices, value improving practices,* and *value management,* are increasingly introduced into capital facility projects, thereby causing among project stakeholders great concern about which process to implement on a particular project (Cha, 2003). It has become nontrivial, however, to decide which one to choose for a particular capital project because varying circumstances or project characteristics determine their levels of suitability. There are dominant project characteristics that trigger or drive these processes. Any effort or processes that proactively pursue one or more value objectives are defined as Value Management Process (VMP) in this paper. Beginning with approximately 60 nominated processes, a rigorous screening process conducted by CII PT 184 resulted in 44 VMPs.

The complete list of all 44 VMPs with their purpose and objectives is provided in Appendix I.

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The main objectives of this paper include the following:

- Identify project characteristics that leverage the need for and benefits from one or more of the VMPs
- Assess the relative significance of these characteristics as drivers for VMP selection.

2. Literature Review

"Value" is defined as "that amount of some commodity, medium of exchange, etc. that is considered to be an equivalent for something else." (Oxford Dictionary 2003) In the construction industry, however, there is no single definition of value and its meaning is abstract or ambiguous. Most recent empirical study revealed various interpretations of value from project management' s perspective (Koga 2000). They include:

- The right mix of function, aesthetics, quality, time, and cost from the owner' s perspective
- Whether or not the owner' s expectations are met
- The assembly that meets the owner' s needs at a good level of quality without depriving the owner of any benefits

• The reflection of what owners want

From project managers' perspective, value is effectively defined as "a measure of how well the owner's objectives are met and is typically documented as a set of project objectives" (CII 2003). The owner's ability to understand, prioritize, and articulate project value objectives is critical to overall project success (Kerzner 1984). The right combination of project value objectives is that set of objectives which will provide optimum value to the owners. Therefore, the concept of value in the context of a capital project should be established by the project owner to reflect unique business goals, project objectives, need, and desires (Leung, et al. 2002).

Value management efforts are needed to achieve higher levels of performance pertaining to the owner's project value objectives which includes security/safety, cost effectiveness, schedule optimization, and risk containment. As such, value management can be referred to as the collection of processes or efforts by which organizations can proactively pursue one or more project value objectives. The organizations that most effectively implement VMPs on a routine basis are those that also have strong value management programs.

A rigorous effort conducted by CII Project Team 184 established the final set of 44 VMPs as provided in Table 1.

Table 1. 44 Value Management Processes

(1) Activity-Based Costing	(23) Peer Review
(2) Chartering Project Teams	(24) Planning for Startup
(3) Choosing by Advantages	(25) Post-Occupancy Evaluation
(4) Classes of Facility Quality	(26) Predictive Maintenance
(5) Constructability	(27) Pre-Project Planning
(6) Construction Simulation	(28) Process Simplification
(7) Design Effectiveness	(29) Project Delivery Methods
(8) Design for Maintainability	(30) Project Execution Plan
(9) Design to Capacity	(31) Quality Functional Deployment
(10) Design to Cost	(32) Risk-based Estimating
(11) Energy Optimization	(33) Risk Management
(12) FAST Diagramming	(34) Schedule Optimization
(13) Function Analysis Concept Development	(35) Six Sigma
(14) Individual Value Engineering	(36) Sourcing Strategies
(15) Knowledge Management/ Lessons Learned System	(37) Successive Estimating
(16) Lean Construction	(38) Sustainable Design & Construction
(17) Life-cycle Costing	(39) Technology Gatekeeper
(18) Mechanical Reliability Modeling	(40) Technology Selection
(19) Minimum Standards & Practices	(41) Total Quality Management
(20) Modularization/ Mass Customization	(42) VE Change Proposal
(21) Owner Values & Expectations	(43) Value Engineering
(22) Partnering	(44) Waste Minimization/ Pollution Prevention

In the beginning, the VMPs were nominated based on widely accepted innovative project management processes derived from various resources and rigorously screened using the following four criteria.

• Non-conventional but innovative management process
• Optional, rather than basic, project management process
• Recognizable, well-established management process
• Significantly beneficial for capital facility projects

3. Research Methodology

3.1 Project Characteristics

Project characteristics can make a dramatic difference in obtaining the maximum benefit that may result from implementation of the VMPs. These characteristics are analogous to leveraging circumstances that trigger the usage of any VMPs on a particular project. The VMP project characteristics were identified based on an iterative approach in association with a rigorous literature review. The literature encompassed a comprehensive collection of both academia and professional publications, including sales-slanted type documents, which were available on internet websites.

As the result of identifying the VMP project characteristics, 149 factors were finalized and incorporated in the data collection as provided in Appendix I.

3.2 Influence Diagramming

To facilitate the identification of the VMP project characteristics, the Influence Diagram method was employed. This technique is an effective tool to identify significant variables and to graphically model their interrelationship (Clemen and Reilly 2001). The four steps followed in developing the individual Influence Diagrams are listed below:

1) Brainstorm advantages, disadvantages, and consequential events from the decision on implementing a VMP
2) Identify causal or driving factors relevant to advantages, disadvantages, and consequential events
3) Employ graphic network to illustrate relationships
4) Continue until comfortable with the level of detail

An example of Influence Diagram for Constructability VMP is illustrated in Figure 1.

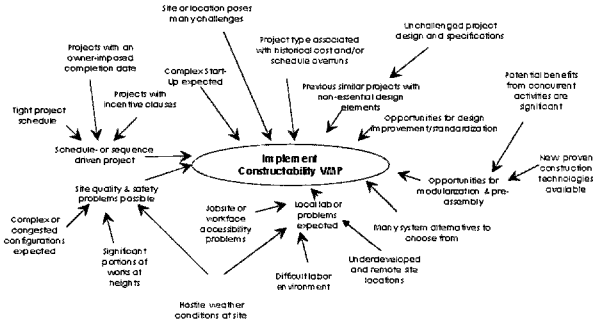

Figure 1. Influence Diagramming (Example)

3.3 Data Collection

Once the VMP project characteristic factors (or VMP usage drivers) were identified, the relative importance of each factor was established through a rigorous data collection process. In collaboration with VMP experts, data collection was performed from September 2002 through June 2003. A total of 51 respondents participated in the survey. As indicated in Table 2, these individuals represented four different organizations.

Table 2. Survey Participants

	Owner	Contractor	Institute /Association	University	Total
No. of Organiz-ations	12	4	4	8	24
No. of Organiz-ations	30	6	4	11	51

Through a weighting ballot system, the data collection process was facilitated and the key project characteristic factors were effectively identified. Figure 2 presents an example of the ballot for Constructability VMP used in the data collection. It is noteworthy;

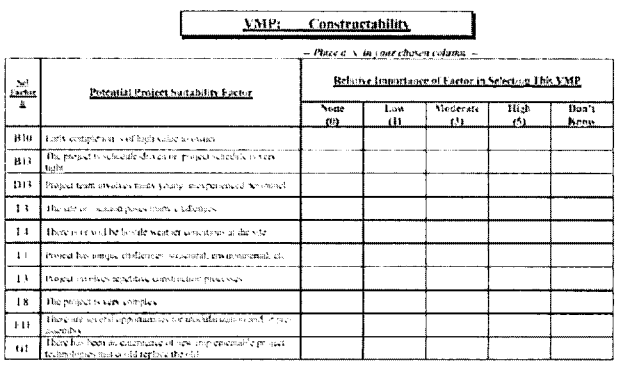

Figure 2. VMP Ballot (Example)

however, only relatively significant VMP factors (or candidate factors) were not included in each ballot because the 149 VMP factors were too large to allow any respondent to complete the survey in a reasonable amount of time.

3.4 Data Analysis

Descriptive statistics such as means, variances, and ranges of the data collected were used to represent factor significance as drivers of the VMPs. Respondent outlier data points were eliminated from consideration in computing the factor weights. In addition, low-scored factors were eliminated from the analysis. The isolated data points were effectively determined by the frequency distribution of each factor within individual VMPs. However, when there was insufficient number of respondents (less than 5), any isolated data point was not regarded as an outlier.

4. Results and Analysis of VMP Factor Weights

4.1 Factor-Weighting Process

Once the data collection regarding the relative importance of each factor was completed from the expert survey, the following weighting process was used to determine the importace level (or weight) of each factor within a particular VMP.

1) Step I: For each VMP, compute the averaged "relative importance" (ranging from 0 to 5) of all candidate factors.
2) Step II: Compute the mean of the averaged values and compare the mean with the individual candidate factors in order to detect any substantial difference between two values.
3) Step III: Eliminate the less important candidate factors from the list and repeat the previsous steps until the target number (eight) of key VMP factors is reached.
4) Step IV: For all 44 VMPs, compute the weights of finalized VMP factors within each VMP

4.2 Factor Weights Results

Prior to finalizing the factor weights for all the 44 VMPs, a comprehensive analysis was undertaken to reduce any potential biases. By plotting both the average and range of the factor weights, the spread and the center of the factor weights were effectively determined. Through minor modification to the weights by adding or eliminating factors and then by recalculating the weights for the

select VMPs, the factor weights for all 44 VMPs were finalized.

The complete list of all the finalized factors and their corresponding weights are provided in Appendix II.

4.3 Key Project Characteristics

The most salient findings of this study is the key project characteristics that drive the need for VMP implementation. By summing up the final weights from all 44 VMPs, the top ranked key project characteristics are effectively determined. They include the following:

- Project objectives, functional requirements, and/or priorities are unclear or have not been agreed upon (B01).
- Reducing facility life cycle cost is an important objective (B07).
- Owner lacks in-house resources for project development and execution (A01).
- The project is very complex (F08).
- Owner objectives/expectations are often in conflict (B06).

The top 20 key project characteristics associated with their corresponding VMPs are provided in Table 3.

Table 3. Top 20 Project Characteristic Factors

Rank	Factor	Sum Weight	VMPs Affected(See Table 1)
1	B01	1.252	02, 04, 12, 13, 21, 22, 27, 31
2	B07	1.235	08, 09, 11, 14, 17, 18, 26, 28, 42, 44
3	A01	1.046	02, 14, 21, 22, 23, 27, 29, 30
4	F08	0.989	01, 05, 12, 13, 24, 30, 37, 42
5	B06	0.969	02, 03, 04, 12, 21, 31, 41
6	B11	0.886	07, 14, 16, 22, 24, 30, 34
7	B09	0.827	02, 04, 12, 21, 31, 41
8	B02	0.782	07, 15, 18, 23, 25, 27, 41
9	F05	0.777	15, 24, 27, 28, 30, 33, 40
10	L03	0.749	07, 15, 23, 25, 35, 41
11	B10	0.749	05, 20, 24, 29, 34, 36
12	B13	0.679	05, 06, 22, 29, 34
13	C08	0.674	01, 10, 19, 33, 37
14	F01	0.650	05, 07, 13, 23, 32, 42
15	B04	0.642	10, 19, 29, 36, 43
16	B08	0.637	04, 07, 21, 31, 41
17	C05	0.616	01, 32, 33, 37
18	B05	0.588	10, 16, 23, 36, 42
19	G02	0.557	11, 39, 40, 42
20	I11	0.548	18, 24, 26, 34, 41

5. Conclusions

The construction industry has evolved in an effort to maximize the magnitude of benefit in terms of project value objectives. Implementing VMPs has been is an important strategy to increase the value of a particular project. Since there are too many optional VMPs are available in the industry, it has not been a simple task to select the best or suitable VMPs for a project. Moreover, remarkably little research has been conducted on the subject of value management. This study has identified and prioritized project characteristics that drive the need for implementing one or more of the established 44 VMPs. Through a comprehensive data collection process, each factor weight was examined as the degrees of importance in implementing the 44 VMPs. The data analysis resulted in determining the key significant factors that drive the need for implementation. The results of this study, especially the VMP factor weights, provide guidance in selecting and utilizing the most suitable VMPs in the industry. Furthermore, the findings from this study are helpful to companies in deciding whether to adopt certain type of VMP options by evaluating the VMP factors in terms of how much the subject project is linked to the established VMP factors.

6. Path Forward

The established 44 VMPs represent the current state-of-practice of value management in the construction industry. Value management is a continuous, ever-evolving aspect of management (Macedo 1978). Thus, VMPs that become assimilated into standard project management should be removed and new processes or efforts should be included in the collection of VMPs. In parallel with updating the VMP listings, data collection from VMP expert groups should be expanded and the degree of association (or the factor weights) should be updated and modified accordingly.

In future research, after-the-fact performance data, if tracked on, will further substatiate the established VMP factor weights. In addition, if synergistic effects from integrating two or more VMP efforts were investigated, the VMP benefits could better approach their full potential.

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Appendix I. VMP Project Characteristics

A. Owner Characteristics	
A01	Owner lacks in-house resources for project development and execution.
A02	This is a new client for this contractor.
A03	Owner sometimes gets a facility that it doesn' t want/need.
A04	Owner has strong commitment to sustainable/green design, construction, and operation.
B. Project Objectives/ Project Performance	
B01	Project objectives, functional requirements, and/or priorities are unclear or have not been agreed upon.
B02	Project type has a history of poor performance/liability.
B03	Project will have very high value to owner.
B04	Project is not schedule-driven, but is cost-driven.
B05	The project type is associated with historical cost overruns and/or disputes.
B06	Owner objectives/expectations are often in conflict.
B07	Reducing facility life cycle cost is an important objective.
B08	Owner' s quality expectations are often unclear or poorly articulated.
B09	Team alignment on the owner' s expectations is difficult yet critical to success.
B10	Early completion is of high value to owner.
B11	The project has an aggressive schedule with high opportunity costs associated with any delay.
B12	Poor environmental performance of project could have potentially adverse effects on public health and safety.
B13	The project is schedule-driven or project schedule is very tight.
B14	Project type has a history of schedule overruns and/or disputes.
B15	The contractor has had or will have difficulty in achieving planned field progress.
B16	Project has a long design life.
B17	Expected overall project life cycle is short.
B18	Project is part of an overall capital program.
C. Budget/ Cost/ Economics	
C01	Project budgetary objectives are not established early in the project cycle.
C02	The project budget is very tight and additional financing is not likely or possible.
C03	Conceptual cost estimates are too uncertain; Bases for cost estimate contain too many uncertainties; Need to reduce the uncertainty associated with cost estimate.
C04	The current cost forecast is significantly over budget.
C05	There is a need for a more accurate estimate of cost contingency.
C06	Traditional cost estimating techniques have been deficient for this project type.
C07	A reliable cost estimate is needed in short amount of time.
C08	Project economics are marginal and/or management has no tolerance for any cost over-run.
D. Contracts/ Organization	
D01	Conflicts or disputes may escalate; Litigation is likely.
D02	There' s difficulty in selecting the project execution strategy.
D03	Project will be Design-Build.
D04	Project participants have never worked together before.
D05	Major portions of the work are being or will be subcontracted to various parties.
D06	The project team lacks trust, teamwork, and/or an effective working relationship.
D07	One or more very large organizations is involved.
D08	Project involves geographically dispersed personnel.
D09	Contractor-bidders are pre-screened or of very high quality.
D10	No VE study team is available.
D11	It is usually difficult to get adequate planning input from facility operators.
D12	Owner has no formal project delivery/contract method selection process.
D13	Project team involves many young, inexperienced personnel.
D14	Several stakeholder organizations have never worked together before.
D15	Much Interest in training or becoming a learning organization.
D16	Key project stakeholders are not sure VE would work.
E. Site Conditions/ Existing Facility	
E01	The project is outside of U.S..
E02	The project involves uncertain pre-existing conditions.
E03	The site or location poses many challenges.
E04	There is or will be hostile weather conditions at the site.
E05	Local transport infrastructure is available.
E06	Existing plant contains "hidden" capacity.
E07	The existing plant has had a recent decrease in reliability or availability.
E08	For the existing plant there is a history of plant maintenance problems and costs.
E09	For an existing plant there' s been an increase in treatment, disposal or recycling costs.
E10	For existing plant there' s been an increasing frequency of unexpected equipment breakdowns.
E11	Existing plant has a history of difficulty in complying with certain governmental regulations.

E12	Local environmental activists have significant political and/or media influence.
E13	Site or existing plant is geographically isolated with limited availability of spare parts.
F. Facility Scope & Characteristics	
F01	Project has unique challenges: structural, environmental, etc..
F02	Project type is relatively new, at least for this owner.
F03	Project involves repetitive construction processes.
F04	Project is outside the organization's strongest experience.
F05	Project involves many new features, processes, or approaches.
F06	Project is regulatory- or permit-driven.
F07	Project involves potential liabilities with waste disposal.
F08	The project is very complex.
F09	Project involves numerous facility operating systems.
F10	Project involves maintenance-intensive equipment.
F11	There are several opportunities for modularization and/or pre-assembly.
F12	Plant capacity objectives are not understood or agreed upon.
F13	Scope definition is incomplete.
F14	There' s a high likelihood of changes during project.
F15	Plant involves multiple feed stocks and products with many repeating elements.
F16	Project risks are not understood.
F17	Recent significant turnover in owner organization.
F18	Project type is either building or light industrial.
G. Technologies/ Manufacturing Process	
G01	There has been an emergence of new implementable project technologies that could replace the old.
G02	The project could benefit from new technologies.
G03	Project involves a new manufacturing technology.
G04	Project construction methods may involve or benefit from recent innovations.
G05	Project type will be significantly affected by technological change.
G06	There is no apparent leading technology, but several alternatives from which to choose.
G07	There has been no recent research & review of technology alternatives.
G08	There is difficulty in selecting the most appropriate technology.
G09	Only a few technologies are usually considered.
G10	Technology transfer is too often unsuccessful.
G11	The mature manufacturing process has not been rigorously challenged.
G12	The relatively new manufacturing process has not been optimized.
G13	The manufacturing process has evolved incrementally.
G14	New potentially beneficial equipment monitoring technologies have become available.
G15	A high degree of process reliability is required.
G16	Project involves mutually exclusive alternatives.
G17	The project involves repetitive processes.
H. Project Design	
H01	There are many system alternatives from which to choose.
H02	Equipment sizing parameters are somewhat uncertain.
H03	Design is largely driven by safety-factor.
H04	Designers are too distant from relevant cost data & cost feedback.
H05	Designers need feedback on quality of service/product.
H06	Relationships between equipment cost and capacities are not well understood.
H07	There are additional opportunities for design standardization.
H08	Design process has not emphasized functional need.
H09	Designs are often gold-plated or contain excessive redundancy.
H10	Project involves performance-based specifications.
H11	The project solution is very conventional.
H12	Project involves some new/untried materials and/or construction methods.
H13	Project involves many highly congested configurations.
H14	There is a lack of standardization in plant components.
H15	There is excessive variation in spare parts needed.
H16	There is a high degree of, or opportunity for design repetition.
H17	Feedstock & product logistics are very complex.
H18	Front-end or Design phases will be or have been rushed.
H19	Contractor preferences regarding materials/methods may result in significant cost savings.
I. Facility Operations/ Maintenance	
I01	Project involves costly equipment monitoring technologies.
I02	Plant preferences are highly variable or inconsistent.
I03	Plant reliability is too uncertain.
I04	The project must have very high availability.
I05	Facility has very high energy consumption.
I06	Plant produces an excessive amount of waste material.
I07	Facility is very expensive to operate.
I08	Project O/M costs will be very high and cost-saving innovations could be significant.
I09	Facility type involves frequent maintenance or repairs.
I10	Major contributors to forced plant downtime are not understood.
I11	The production unit is highly profitable with very costly downtime (opportunity cost).
I12	Accessibility for maintenance is/will be limited or difficult.
I13	Waste disposal or recycling capacity is very limited.
I14	Facility has symptoms of underperformance, such as occupant dissatisfaction or excessive energy consumption.
I15	Suspect that there are opportunities for maintainability efficiency improvements.
I16	There is a lack of agreed upon and reliable facility performance indicators.
I17	There is no effective process for identifying where and when a facility component needs upgrading or replacing.
J. Materials/ Equipment/ Procurement/ Supply Chain	
J01	Inventory and/or backlog levels are excessively high.
J02	There are or will be large fluctuations in the daily demand for resources.
J03	Timing of delivery of fabricated components is often unreliable.
J04	Economic conditions limit resource availability.
K. Site Labor	
K01	Local skilled labor is or will be scarce.
K02	Local labor productivity is relatively or often low.
K03	Labor productivity is highly variable.
K04	Local labor wage rates are relatively high.
L. Procedures & Communications	
L01	Some key players lack communication skills.
L02	Successful innovations are seldom repeated or re-used.
L03	Mistakes or errors are repeated too often.
L04	Feedback on designer/contractor performance is rarely provided.
L05	A key work process is inefficient, performing below specification or with unacceptable variation in quality.
L06	A key work process has long cycle time or excessive cost.
L07	There has been no recent, thorough review of specification, standards and/or industry practices.
L08	Project team has no established comprehensive Start-up planning procedures.
L09	There is no established procedure for integrating maintenance planning into planning, design, or construction.
L10	Need quick turn-around on VE recommendations.

Appendix II. VMP Factors and Weights

VMP	Factor	Weight
01	C03	0.15
	C05	0.20
	C06	0.15
	C08	0.17
	D01	0.15
	F08	0.17
02	A01	0.11
	A02	0.11
	B01	0.15
	B06	0.14
	B09	0.15
	D06	0.12
	D08	0.12
	D13	0.11
03	B06	0.16
	G06	0.19
	G08	0.19
	G16	0.16
	H01	0.19
	L10	0.11
04	A02	0.16
	A03	0.14
	B01	0.19
	B06	0.18
	B08	0.16
	B09	0.16
05	B10	0.09
	B13	0.10
	E03	0.09
	E04	0.10
	F01	0.07
	F03	0.07
	F08	0.09
	F11	0.09
	H12	0.09
	H13	0.11
	K01	0.09
06	B13	0.13
	B15	0.15
	F03	0.17
	G17	0.15
	H12	0.12
	H16	0.11
	J05	0.17
07	B02	0.11
	B08	0.11
	B11	0.11
	F01	0.11
	H05	0.11
	H12	0.11
	H18	0.11
	L03	0.11
	L04	0.11
08	B07	0.11
	E08	0.10
	F10	0.11
	H15	0.11
	I04	0.11
	I09	0.11
	I12	0.13
	I15	0.10
	L09	0.13
09	A03	0.12
	B07	0.14
	E06	0.16
	F12	0.18
	H02	0.16
	H03	0.12
	H06	0.14
10	B04	0.16
	B05	0.15
	C02	0.16
	C04	0.15
	C08	0.15
	H04	0.11
	H09	0.13
11	B07	0.18
	E12	0.11
	G02	0.14
	I05	0.18
	I07	0.16
	I08	0.12
	I14	0.12
12	B01	0.22
	B09	0.16
	F08	0.19
	F13	0.15
	H08	0.18
	L05	0.11
13	B01	0.18
	B06	0.15
	F01	0.13
	F08	0.13
	F13	0.13
	F14	0.15
	H08	0.13
14	A01	0.16
	B07	0.11
	B11	0.12
	D10	0.21
	D16	0.14
	H18	0.10
	L10	0.17
15	B02	0.13
	D07	0.08
	D08	0.09
	D13	0.15
	D15	0.13
	F05	0.09
	L02	0.16
	L03	0.17
16	B05	0.10
	B11	0.15
	B14	0.12
	B15	0.16
	J01	0.12
	J03	0.12
	K03	0.12
	L01	0.11
17	B03	0.09
	B07	0.16
	F09	0.10
	F10	0.13
	H01	0.11
	I05	0.14
	I07	0.14
	I09	0.13
18	B02	0.11
	B03	0.12
	B07	0.11
	E08	0.11
	I03	0.12
	I04	0.12
	I09	0.09
	I10	0.11
	I11	0.12
19	B04	0.12
	C08	0.12
	H09	0.14
	H14	0.10
	H15	0.10
	H19	0.12
	I02	0.14
	L07	0.14
20	B10	0.10
	B15	0.10
	E04	0.11
	E05	0.09
	F03	0.10
	F11	0.11
	H16	0.09
	K01	0.11
	K02	0.11
	K04	0.10
21	A01	0.14
	B01	0.14
	B06	0.14
	B08	0.13
	B09	0.11
	F02	0.11
	F12	0.11
	F13	0.11
22	A01	0.17
	B01	0.13
	B11	0.15
	B13	0.14
	D01	0.14
	D04	0.13
	D06	0.15
23	A01	0.12
	B02	0.09
	B05	0.09
	B14	0.09
	D13	0.13
	F01	0.10
	F02	0.09

VMP	Factor	Weight
	F04	0.09
	H09	0.09
	L03	0.11
24	B03	0.11
	B10	0.11
	B11	0.09
	D11	0.09
	F05	0.11
	F08	0.09
	F09	0.10
	G03	0.11
	I11	0.10
	L08	0.11
25	B02	0.12
	H05	0.15
	H10	0.12
	H12	0.11
	I14	0.14
	L02	0.11
	L03	0.11
	L04	0.14
26	B07	0.10
	E07	0.10
	E10	0.10
	F10	0.10
	G14	0.11
	H10	0.09
	I01	0.10
	I04	0.10
	I09	0.10
	I11	0.11
27	A01	0.12
	B01	0.15
	B02	0.13
	C03	0.12
	E03	0.13
	F02	0.12
	F05	0.13
	F16	0.12
28	B07	0.09
	F05	0.12
	F15	0.13
	G11	0.12
	G12	0.13

VMP	Factor	Weight
	G13	0.13
	H09	0.09
	H17	0.11
	I07	0.09
29	A01	0.13
	B04	0.13
	B10	0.17
	B13	0.14
	B14	0.10
	D12	0.11
	F14	0.11
	J04	0.10
30	A01	0.11
	B11	0.11
	D02	0.13
	D08	0.10
	D12	0.11
	D13	0.10
	F02	0.11
	F05	0.11
	F08	0.13
31	B01	0.09
	B06	0.11
	B08	0.13
	B09	0.15
	D04	0.09
	D06	0.11
	G01	0.09
	H01	0.15
	I02	0.09
32	B12	0.18
	C05	0.16
	E02	0.16
	F01	0.15
	F16	0.20
	G05	0.15
33	C03	0.13
	C05	0.14
	C06	0.13
	C07	0.09
	C08	0.12
	D01	0.11
	F05	0.12
	F16	0.16

VMP	Factor	Weight
34	B10	0.15
	B11	0.16
	B13	0.16
	B14	0.13
	I11	0.13
	J02	0.09
	J03	0.09
	K01	0.09
35	E07	0.13
	E10	0.13
	I10	0.12
	J01	0.12
	J03	0.12
	L03	0.13
	L05	0.14
	L06	0.11
36	B03	0.12
	B04	0.11
	B05	0.15
	B10	0.12
	C02	0.11
	D02	0.12
	D12	0.14
	J03	0.12
37	C03	0.14
	C05	0.14
	C06	0.17
	C07	0.17
	C08	0.12
	F08	0.09
	F13	0.09
	F16	0.09
38	A04	0.19
	B12	0.15
	E09	0.13
	E12	0.11
	F07	0.13
	I05	0.17
	I06	0.13
39	G01	0.21
	G02	0.18
	G04	0.15
	G05	0.15
	G07	0.18

VMP	Factor	Weight
	G09	0.13
40	F05	0.10
	G01	0.13
	G02	0.13
	G03	0.12
	G05	0.13
	G06	0.13
	G07	0.12
	G08	0.12
41	B02	0.09
	B03	0.09
	B06	0.09
	B08	0.10
	B09	0.09
	G15	0.09
	I11	0.09
	L02	0.11
	L03	0.13
	L05	0.10
42	B05	0.10
	B07	0.14
	C02	0.12
	C04	0.12
	F01	0.12
	F08	0.10
	G02	0.10
	H01	0.10
	H04	0.10
43	B04	0.12
	C04	0.14
	G04	0.16
	H04	0.08
	H08	0.09
	H18	0.12
	H19	0.14
	I08	0.16
44	B07	0.11
	B12	0.12
	E09	0.13
	E11	0.13
	E12	0.10
	F07	0.15
	I06	0.14
	I13	0.14