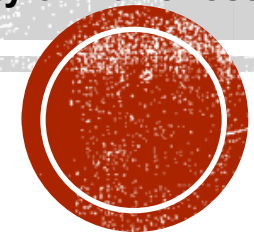
PERFORMANCE MEASUREMENT FOR CONSTRUCTION PROJECTS

Kejun Meng

University of Manchester



- **Position checking:**

  Performance measurement could constantly keep track of the procedure in every phase and evaluate the ongoing situation as position checking.

- **Position communicating:**

  Position communicating as another reason could notify clients and working staff the specific working performance evaluation results with an aim to improve the transparency and promote employee involvement.

- **Priorities confirmation:**

  Priorities confirmation means that performance measurement is beneficial to confirm the unified priorities and sequence of every activity and during the project life-cycle.

- **Progress compulsion:**

  Progress compulsion demonstrates that explicit performance measurement contributes to identify potential enhancement spaces and further promote performance advancement.

- **Expectations management**
- **Planning and control improvement**
- **Objectives realization**

PERFORMANCE MEASUREMENT

Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of actions.

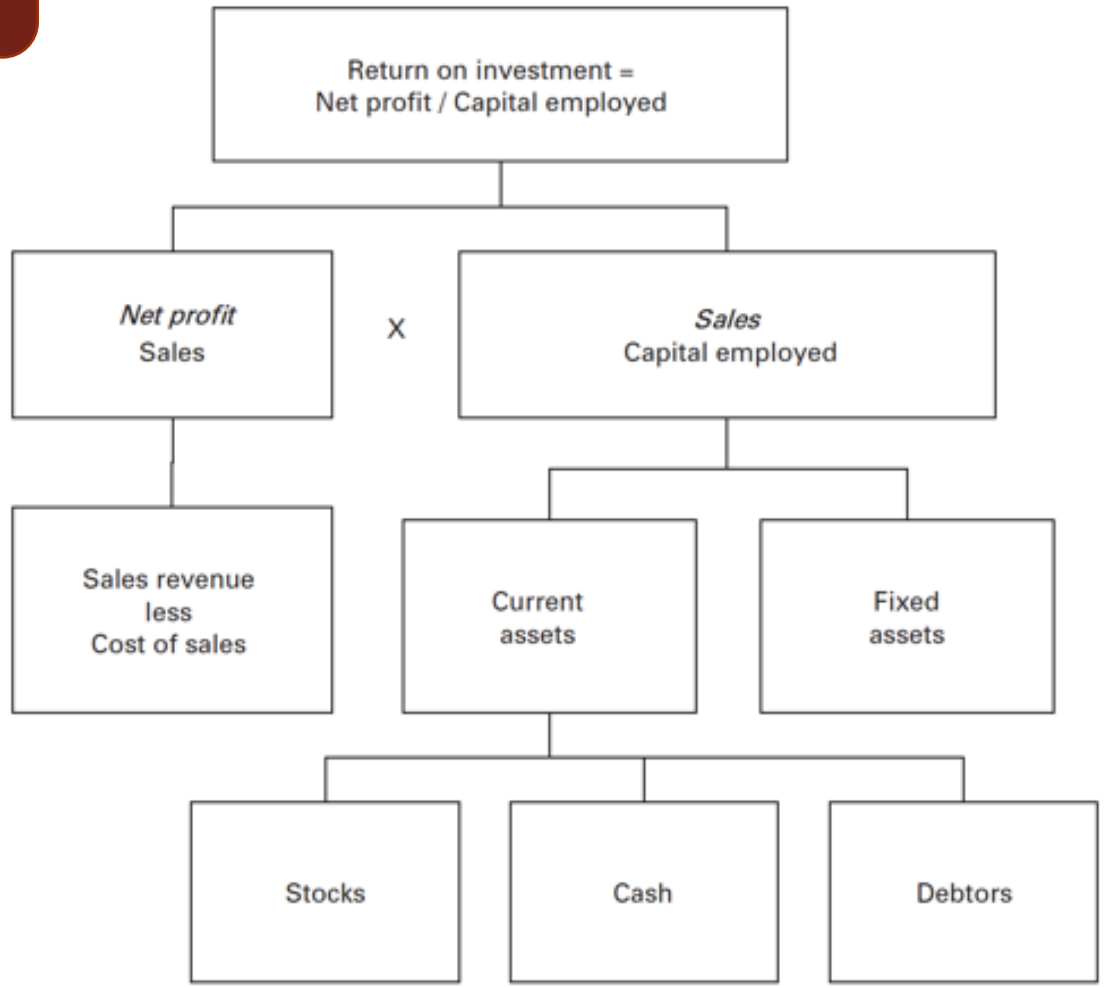
Performance measurement as a process for assessing how successful organisation or individuals have been realised their objectives.

PROJECT IRON TRIANGLE

FUNCTIONAL ANALYSIS AND THEORETICAL FOUNDATION

- Accounting Perspective
- Marketing Perspective
- Operation Perspective
- The supply chain perspective

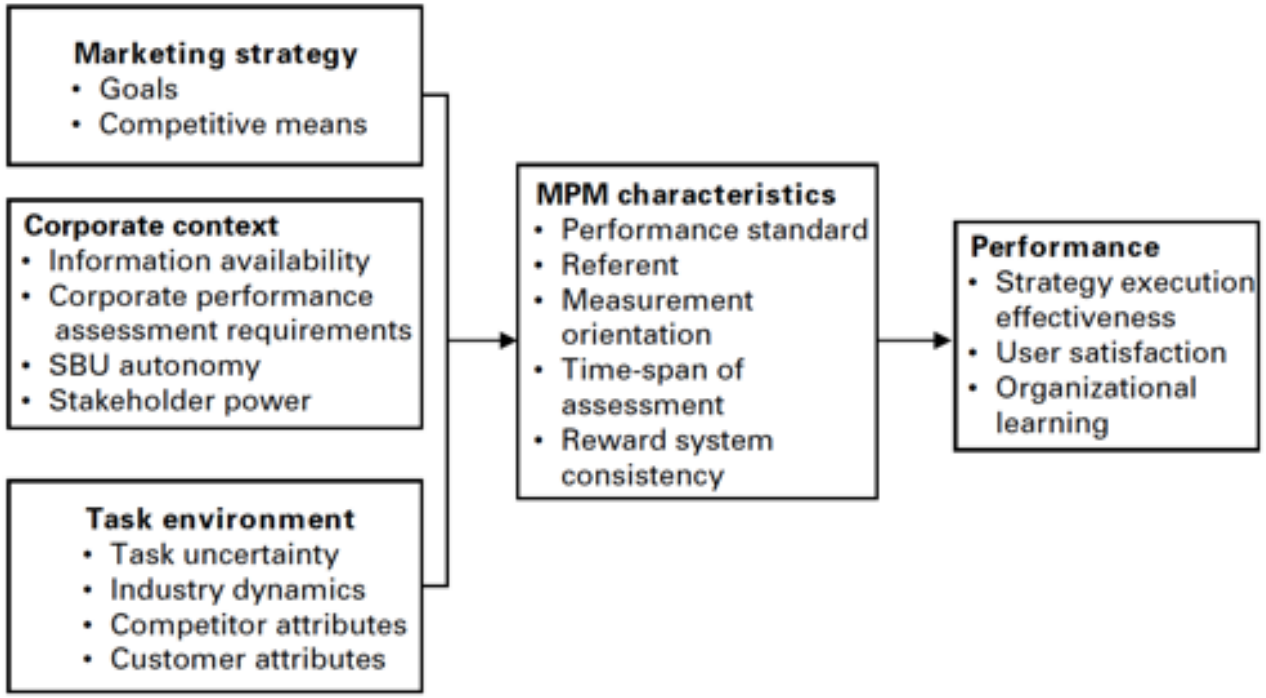
Accounting Perspective



The pyramid of financial ratios (David Otley, 1999)

FUNCTIONAL ANALYSIS AND THEORETICAL FOUNDATION

Marketing Perspective



A contextual framework for marketing performance measurement (MPM) systems
Source: Adapted from Morgan, Clark and Gooner (2002).

FUNCTIONAL ANALYSIS AND THEORETICAL FOUNDATION

Operation Perspective

FUNCTIONAL ANALYSIS AND THEORETICAL FOUNDATION

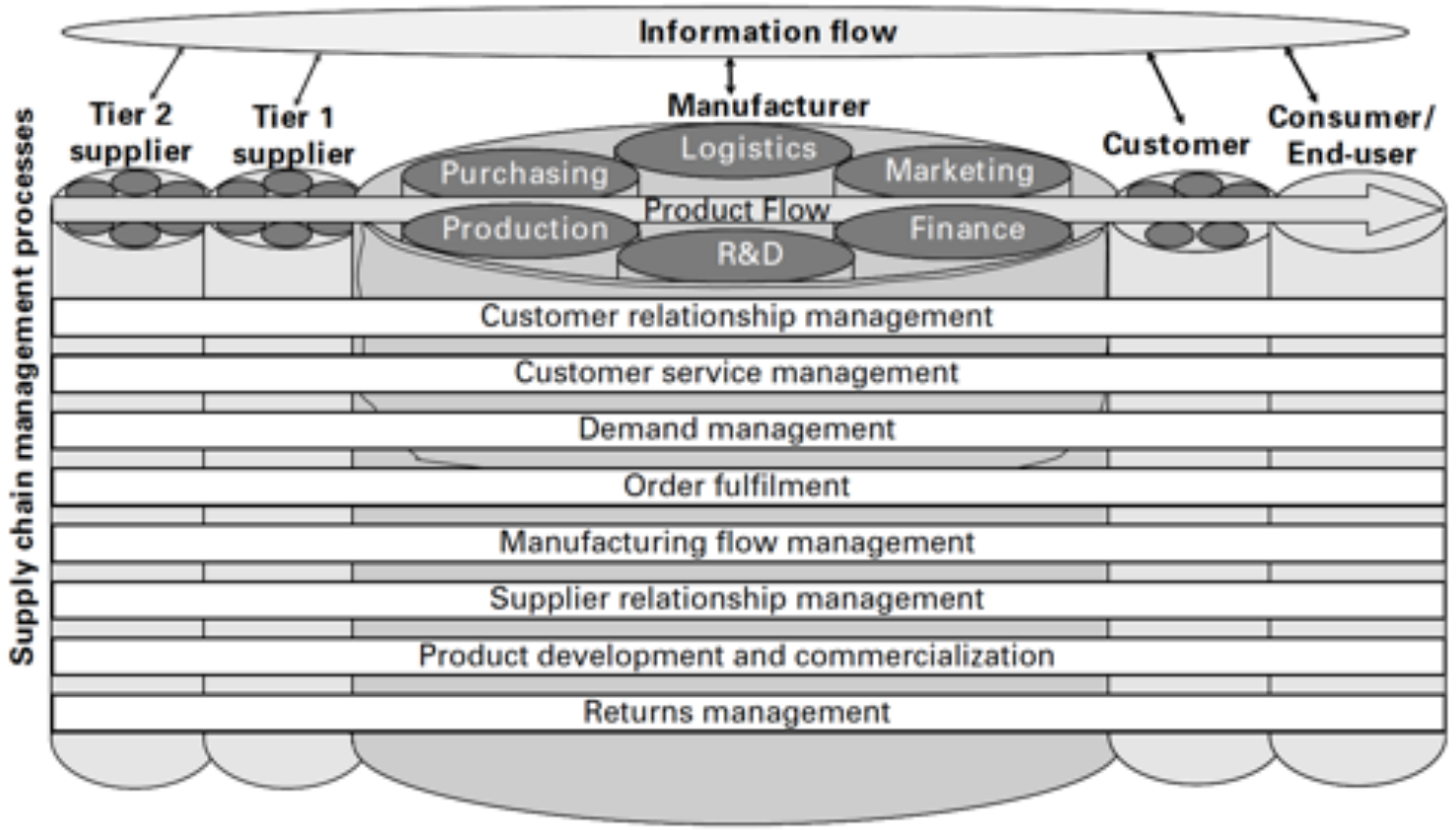
Quality	Dependability	Speed	Flexibility
Q1: Performance	D1: Schedule adherence	S1: Quote generation	F1: Material quality
Q2: Features	D2: Delivery performance	S2: Delivery speed	F2: Output quality
Q3: Reliability	D3: Price performance	S3: Delivery frequency	F3: New product
Q4: Conformance	D4: Ability to keep promises	S4: Production speed	F4: Modified product
Q5: Technical durability		S5: New product development speed	F5: Deliverability
Q6: Serviceability			F6: Volume
Q7: Aesthetics			F7: Mix
Q8: Perceived quality			F8: Resource mix
Q9: Value for money			

Cost

C1: Manufacturing cost
C2: Value added
C3: Selling price
C4: Running cost
C5: Service cost
C6: Profit

The multiple dimensions of the five operations performance objectives

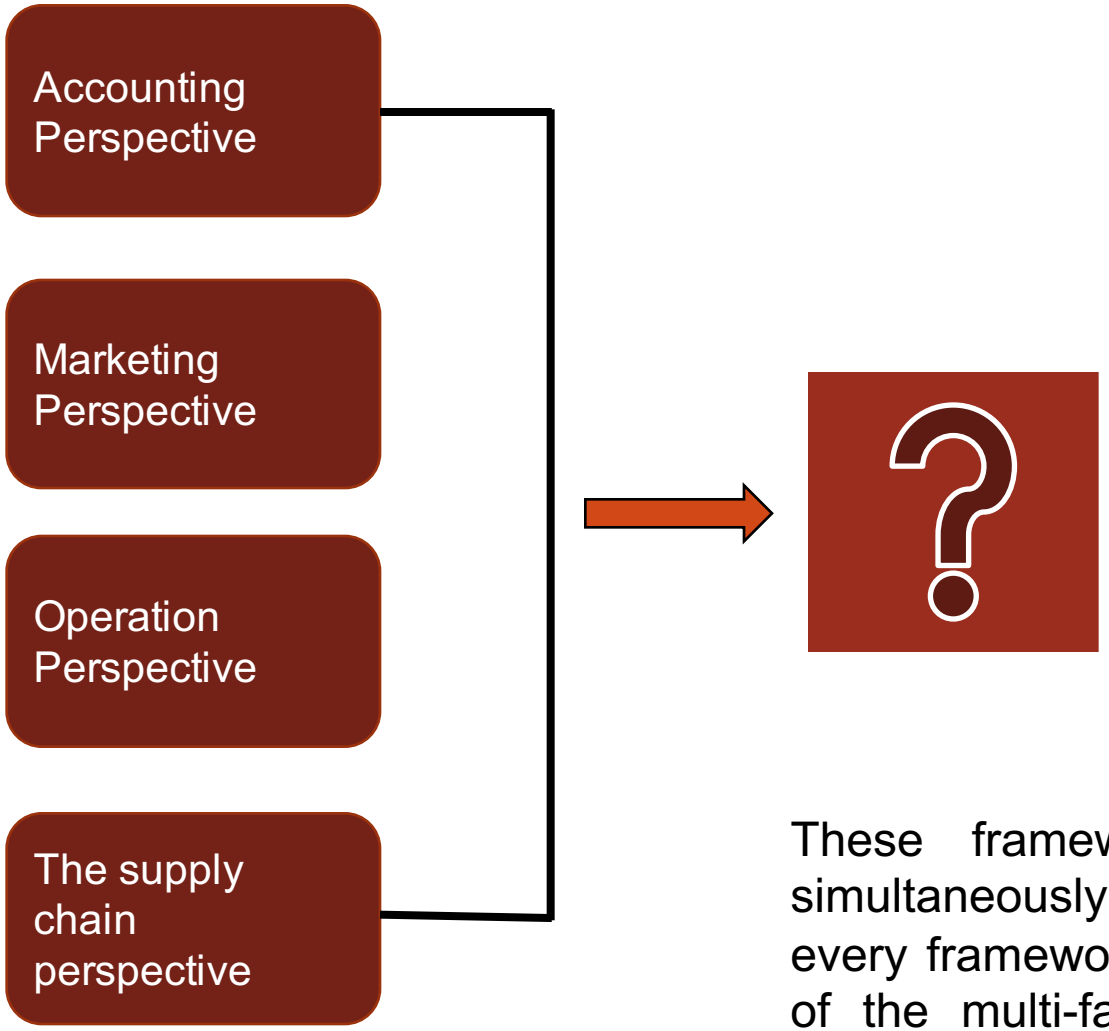
The supply chain perspective



Supply chain management: integrating and managing business processes across the supply chain
Source: Lambert (2006, 3).

FUNCTIONAL ANALYSIS AND THEORETICAL FOUNDATION

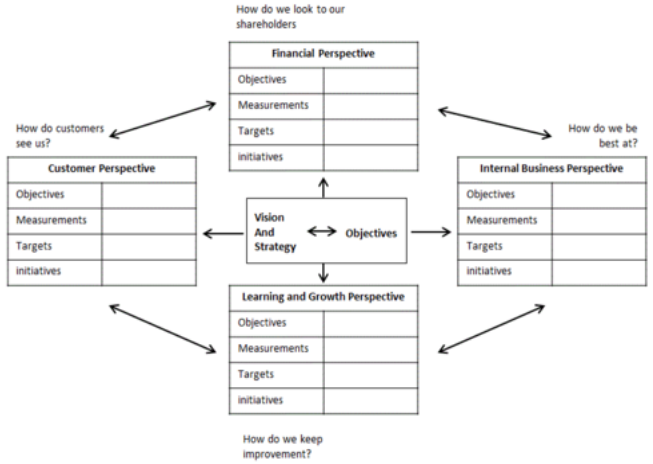
Functional Analysis and Theoretical Foundation



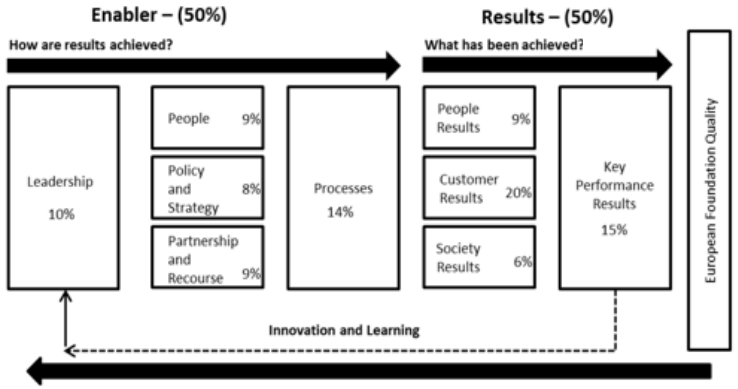
These frameworks could coexist simultaneously on the grounds that every framework merely studies one of the multi-facets of performance from a peculiar perspective and utilizes obscure classification principle (Jin et al., 2013).

MULTI-DIMENTIONAL PERFORMANCE MEASUREMENT FRAMEWORKS

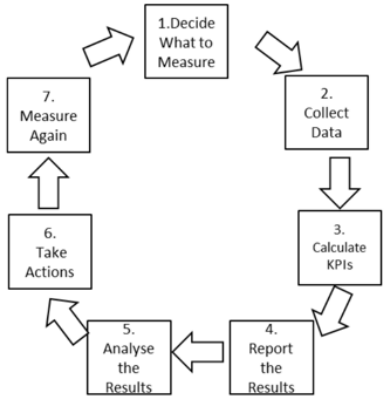
- Balanced Scorecard



- EFQM Excellence Model



- Key Performance Indicators Framework



PURPOSE

- The purpose of this research is to develop a hierarchical performance measurement model (HPMMCP) for construction projects from the contractor perspective. An integrated performance measurement system and the unified project performance index need to be developed and expanded (Nassar and AbouRizk, 2014).

GAPS

- Frameworks could coexist simultaneously on the grounds that every framework merely studies one of the multi-facets of performance from a peculiar perspective and utilizes obscure classification principle (Jin et al., 2013). According to Neely et al. (2002) and Bassioni et al. (2004), **the need for a comprehensive model and realize performance benchmarking generalization is a considerable gap.**

- Construction project performance is difficult to precisely compare among different projects. Researchers and practitioners encounter obstacles to compare the performance of different projects because of the shortage of universal and feasible measurement method, model and index, which could be transferred to use in every construction project and resolve contradictions among the various performance indices.

- Formative factors (determinants) or Reflective factors (result-oriented factors) (Spekle and Verbeeten, 2009)
- Safety and Quality as two prerequisites

CONTRIBUTIONS

- **Link reflective performance indicators and construction project objectives**

- HPMMCP comprehensively measures construction performance covering different aspects and maintain the generalization utilizing a large sample size, which effectively realizes the **performance comparison among diverse construction projects**. Managers could assess their project with other competitors to improve management and show stronger successful performance evidence in bidding conference.

- it is approached in setting up two prerequisites (quality and safety) that model not only **assesses the project process but also guarantees project product**. On the basis of **implementing project delivery and providing qualified final outputs,** project performance status and developmental potential will be measured by a hierarchical composition of reflective measurement indicators.

QUANTITATIVE METHOD

The quantitative method is proper to research this topic, because, firstly performance measurement models are already developed for several decades to build a theory (Neely, 2005). It is informed and sensible to proceed theory testing underpinned by a thorough device set of epistemological foundation from previous qualitative research.

Secondly, building a performance measurement model needs to make sure the generalization and broad applicability for different construction projects. A quantitative method possesses a greater advantage than qualitative analysis to maintain model standardization and utilize a large sample size (Creswell and Creswell, 2017).

Thirdly, quantitative philosophy could be regarded as an extreme of empiricism (Amaratunga et al., 2002), therefore, it is close to reality (Lewin, 1947), propose mathematical solutions of the current problem (Will M. Bertrand and Fransoo, 2002), and increase highly feasibility and practicability (Davies and Hughes, 2014).

RESEARCH DESIGN AND METHODOLOGY

Step One: Framework Development

Method:
Review of Literatures
Review of Theories

Factors Identification
Theoretical Development
Model Specification

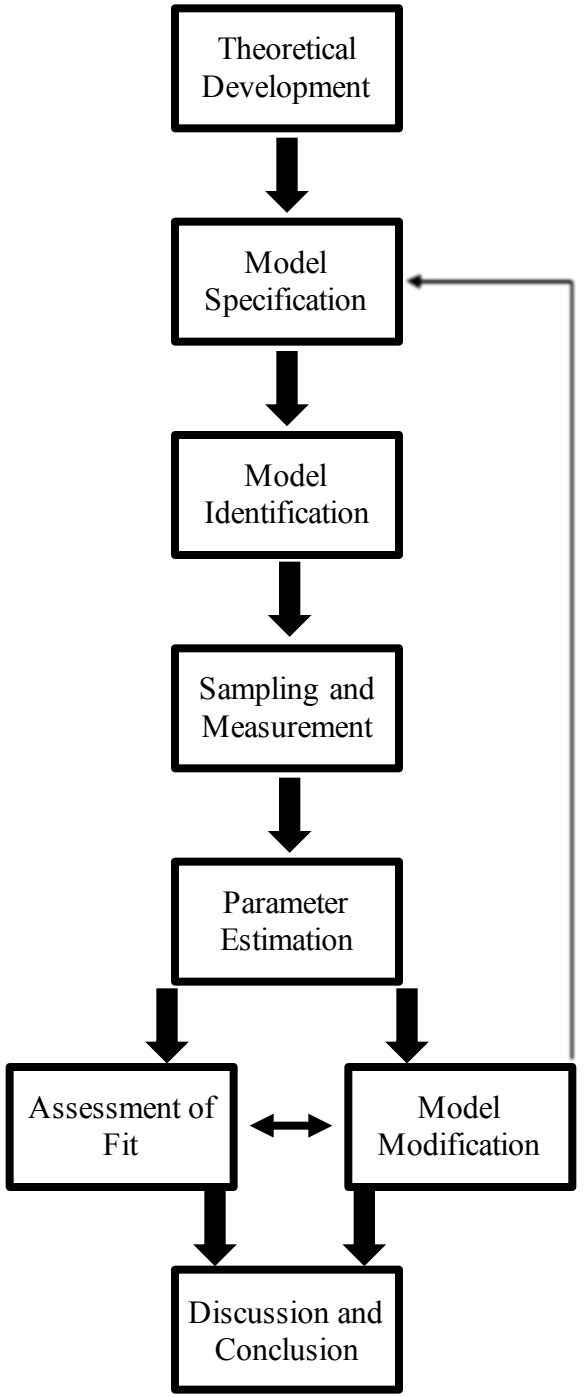
Step Two: Weights Calculation

Method:
Quantitative analysis

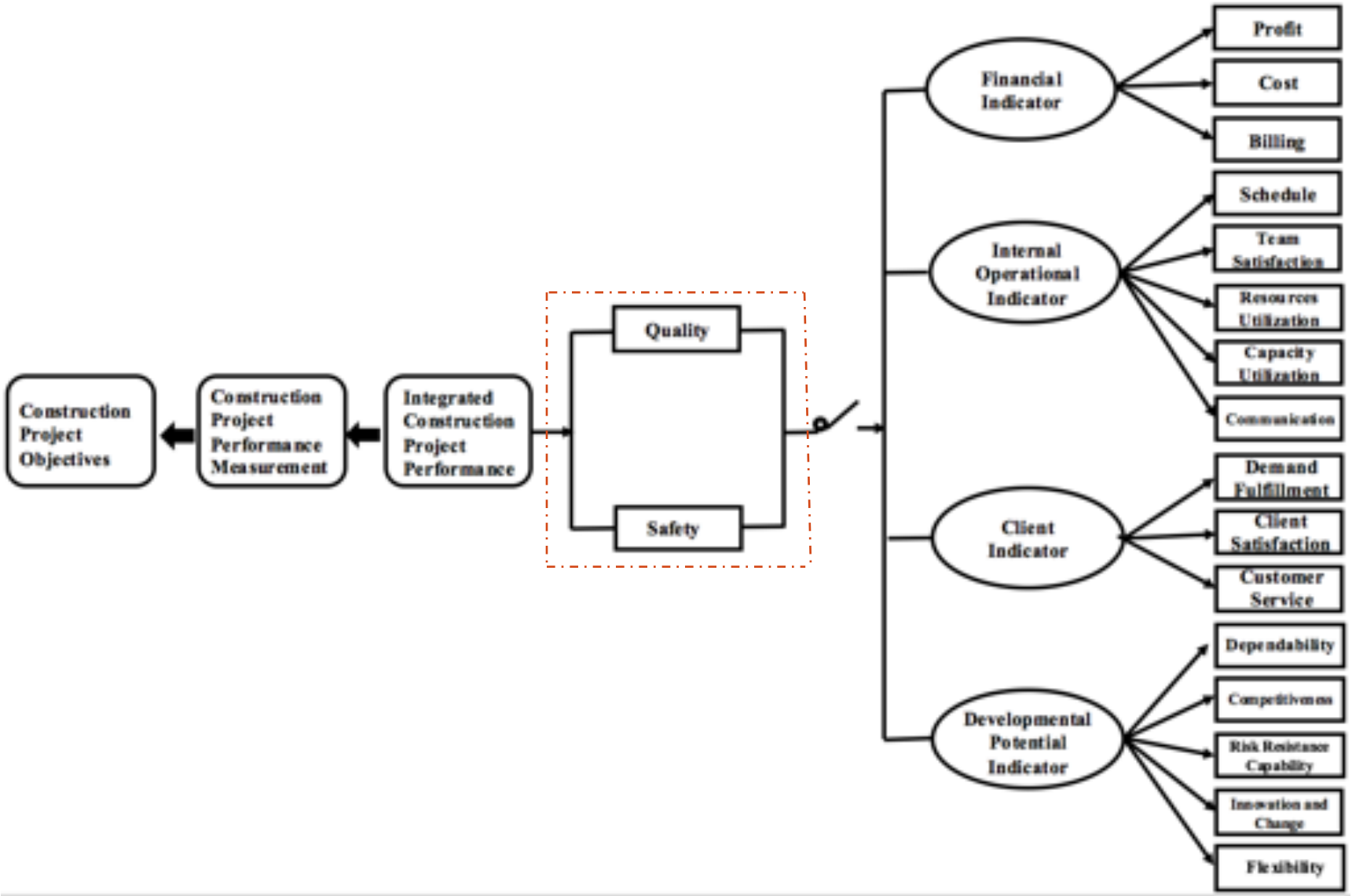
Data Collection (a five-point Likert scale questionnaires)
Weights Calculation (Structural Equation Modelling: Hierarchical Confirmatory Factor Analysis (HCFA))

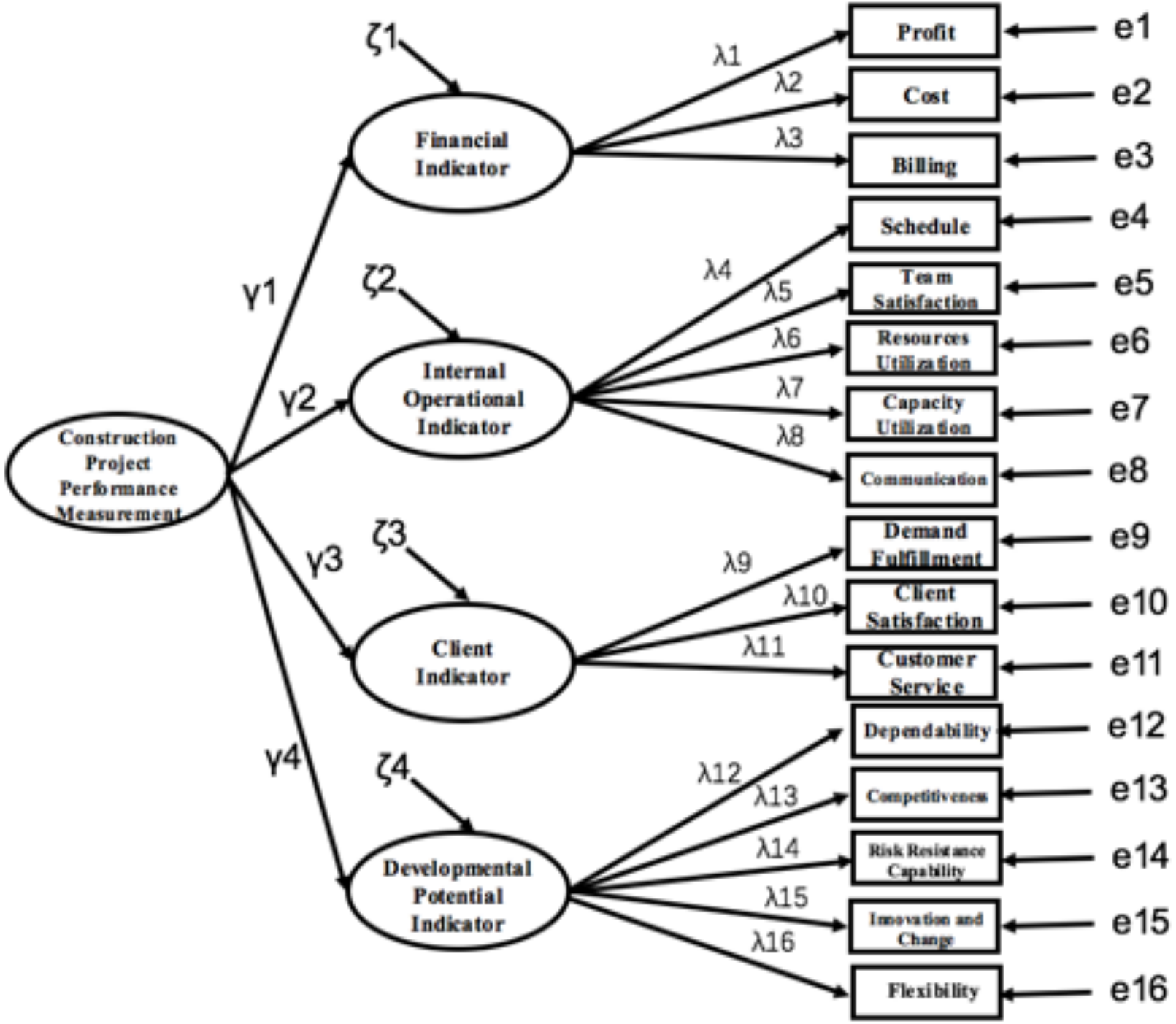
Step Three: Model Testing

Method:
Parameter Estimation
Assessment of Fit
Model Modification



HIERARCHICAL FRAMEWORK FOR CONSTRUCTION PROJECT PERFORMANCE MEASUREMENT





HIERARCHICAL MEASUREMENT MODEL

HIERARCHICAL CONFIRMATORY FACTOR ANALYSIS (HCFA)

REFERENCES

Ali, H. A. E. M., Al-Sulaihi, I. A. & Al-Gahtani, K. S. (2013). Indicators for measuring performance of building construction companies in Kingdom of Saudi Arabia. *Journal of King Saud University-Engineering Sciences,* 25(2), 125-134.

Amaratunga, D., Baldry, D., Sarshar, M. & Newton, R. (2002). Quantitative and qualitative research in the built environment: application of "mixed" research approach. *Work study,* 51(1), 17-31.

Anderson, K. & McAdam, R. (2004). A critique of benchmarking and performance measurement: lead or lag? *Benchmarking: an international Journal,* 11(5), 465-483.

Bassioni, H. A., Price, A. D. & Hassan, T. M. (2004). Performance measurement in construction. *Journal of management in engineering,* 20(2), 42-50.

Beatham, S., Anumba, C., Thorpe, T. & Hedges, I. (2004). KPIs: a critical appraisal of their use in construction. *Benchmarking: an international journal,* 11(1), 93-117.

Chan, A. P. & Chan, A. P. (2004). Key performance indicators for measuring construction success. *Benchmarking: an international journal,* 11(2), 203-221.

Creswell, J. W. & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

Davies, M. B. & Hughes, N. (2014). *Doing a successful research project: Using qualitative or quantitative methods*: Macmillan International Higher Education.

Jin, Z., Deng, F., Li, H. & Skitmore, M. (2013). Practical framework for measuring performance of international construction firms. *Journal of Construction Engineering and Management,* 139(9), 1154-1167.

REFERENCES

Kline, R. B. (2015). *Principles and practice of structural equation modeling*: Guilford publications.

Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; social equilibria and social change. *Human relations,* 1(1), 5-41.

Mbugua, L., Harris, P., Holt, G. & Olomolaiye, P. (Year). A framework for determining critical success factors influencing construction business performance. *In:* Proceedings of the Association of Researchers in Construction Management 15th Annual Conference, 1999. 255-64.

Neely, A. (2005). The evolution of performance measurement research: developments in the last decade and a research agenda for the next. *International Journal of Operations & Production Management,* 25(12), 1264-1277.

Neely, A., Richards, H., Mills, J., Platts, K. & Bourne, M. (1997). Designing performance measures: a structured approach. *International journal of operations & Production management,* 17(11), 1131-1152.

Neely, A. D., Adams, C. & Kennerley, M. (2002). *The performance prism: The scorecard for measuring and managing business success*: Prentice Hall Financial Times London.

Spekle, R. & Verbeeten, F. (2009). The use of performance measurement systems in the public sector: Effects on performance.

Swan, W. & Kyng, E. (2004). An introduction to key performance indicators. *Center for Construction Innovation.–2004*.

Will M. Bertrand, J. & Fransoo, J. C. (2002). Operations management research methodologies using quantitative modeling. *International Journal of Operations & Production Management,* 22(2), 241-264.

THANK YOU