DISCOVERING CORE AND PERIPHERY IN THE RESOURCE BUNDLE OF FIRM: A CASE STUDY OF IT BUSINESS VALUE

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1. Introduction

Firms often receive varying returns to IT investments despite inputting equal IT capital. A leading explanation is that they also need to co-invest in complementary resources for greater value. While mass evidence on what constitutes complementary resources have accumulated, the causality of IT business value is still elusive due to the complex interdependencies of complementarities. The traditional econometric based empirical methods are insufficient for this purpose [1].

Project Aim

•To propose a framework for analysing complex interdependencies among IT and its complementary organisational resources.

2. Framing The Question

The following causality theories from organisational design literature forms the basis for understanding interdependencies among IT and complementary resources.

•Complexity – resource bundle is viewed as a complex interdependent system exhibiting non-linearly dynamic influence on firm performance [2].

•Configuration – "fit" among resources is viewed as whole entity or "systems" [3].

•Contingency – "fit" between resources is viewed as "interactions" contingent on the states of other resources [4].

3. Causal Core Periphery Framework

We introduce the CCP framework which integrates the interactions and systems concepts of fit. This provides both the macro and micro level analyses of the complex structures of resource interdependencies. It also helps to abstract complexities through the notions of causal core in resource bundle:

- Systems core (macro view) – resource most frequently likely to appear on configurations leading to business value generation.
- Interactions core (micro view) – resource most frequently likely to be directly complementary with other resources.

Systems Fit Analysis

A new method called fuzzy set Qualitative Comparative Analysis (fsQCA) [5] is used to measure systems fit among resources.

E.g. the statement "*firms adopting resource A but not B are high performers*" means that the set of firms adopting resource A and not B is a subset of the set of firms that are high performers, i.e. $A \cdot\sim B \rightarrow Y$. To see if adopting resource combination $A \cdot\sim B$ leads to high business value generation, we consider how consistent are firms in the set $A \cdot\sim B$ are subset of the set Y:

$$Consist\ (X_i \leq Y_i) = \frac{\sum_i m_{xi \cap yi}}{\sum_i m_{xi}}$$

- X = causal conditions $A \cdot\sim B$.
- $m_{xi \cap yi}$ = membership score of a firm i in the intersection of sets X and Y.
- m_{xi} = membership score of a firm in the set X.

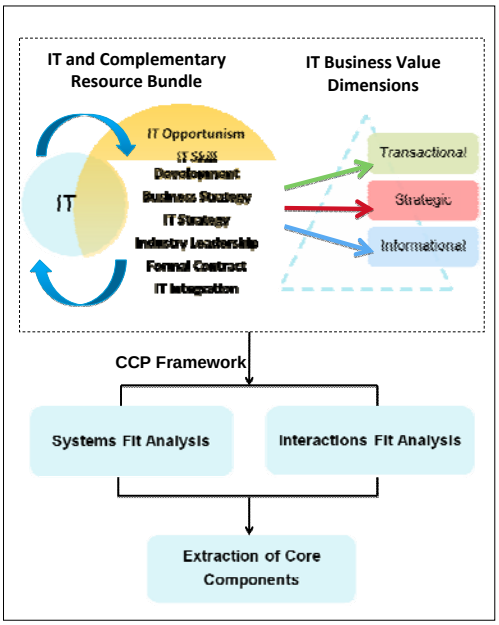

Figure 1 Research Model.

Interactions Fit Analysis

We apply a novel biologic interaction method based on probability theory [6].

$$P_{11} = P_{00} + (P_{10} - P_{00}) + (P_{01} - P_{00}) - \frac{(P_{10} - P_{00})(P_{01} - P_{00})}{(1 - P_{00})}$$

- P_{11} = probability of business value generation when resources A and B are adopted jointly.
- P_{00} = probability of business value generation when resources A and B are neither adopted.
- P_{10}, P_{01} = probability of business value generation when A or B is adopted in absence of the other.

Interaction Contrast = LHS – RHS

•$IC > 0$ – complementary contingent relationship.

•$IC < 0$ – substitutive contingent relationship.

•$IC = 0$ – no contingent relationship.

We formulate the Payoff function as follows:

$$(A, B \mid C = c) \rightarrow Y$$

•A, B = complementary resources.

•C = resources excluding A and B as contingence.

•Y = outcome of high business value generation.

4. Case Study: IT and Work Practices

We test the CCP framework on a resource bundle of IT and 7 complementary resources shown in figure 1. The empirical data is a cross-sectional survey of 1050 Australian firms from various industries and sizes, collected by [7] in 2004.

We found 23 configurations and 34 contingent complementarities. Highlights are given in figures 2, 3 and 4.

		Systems Fit: Core	Systems Fit: Periphery
Interactions Fit	Core	INDUSTLEAD ITINTEGRATE	INDUSTLEAD
Interactions Fit	Periphery	ITINTEGRATE IT ITINTEGRATE	All Others

Figure 2 CCP Results Summary, colour coded outcome measures: transactional, informational and strategic business value.

Transactional / Strategic / Informational Systems Core

Absence Presence "-" Don't Care

Resources	Alternate Configurations (freq = 5, consistency = 0.85)					
	1	2	3	4	5	6
IT	●	●	●	⊗	⊗	●
ITOPPT	●	⊗	●	⊗	●	●
ITSKILLDEV	●	●	●	●	●	●
BUSSTRAT	●	●	●	●	-	-
ITSTRAT	⊗	●	-	●	-	⊗
INDUSTLEAD	●	●	-	-	-	●
FORMALCON	-	-	-	●	●	⊗
ITINTEGRATE	●	●	●	●	●	●
Consistency	0.8585	0.8564	0.8838	0.8579	0.9272	0.9463
Significance++	0.002*	0.002*	0.000*	0.000*	0.008*	0.000*
Cases Covered+	401	438	556	624	742	626

Figure 2 Resource Configurations from Systems Fit Analysis, ++benchmark = 0.8, *p ≤ 0.01, +cases with ≥ 0 membership.

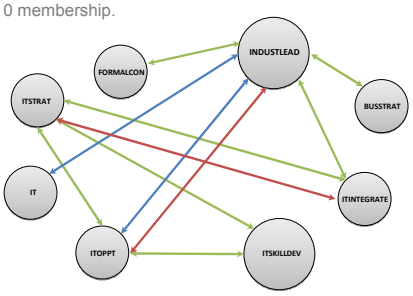

Figure 3 Relationships that complementary on all contingence at (α = 0.05) from Interactions Fit Analysis, core and periphery shown by node size.

5. Discussion and Limitations

By understanding the interdependencies among IT and complementary resources, greater insights on the causality of IT business value is gained. However, the question of causality in its own right is a very complex phenomenon. To better understand this issue, we hope to improve the CCP framework by incorporating feedbacks from a more recent longitudinal dataset.

6. Contributions

•For practitioners - the CCP framework helps to extract evidence based and fine-grained guidelines for IT investments decisions. Its purpose also extends to broader organisational design and strategic management domains.

•For researchers – it enables mid-range theories development on the causality of firm performance. Novel methods to analysing complex interdependencies from the macro and micro viewpoints are further proposed for IT business value study. An interactions fit software is also developed for the research community.

7. References

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