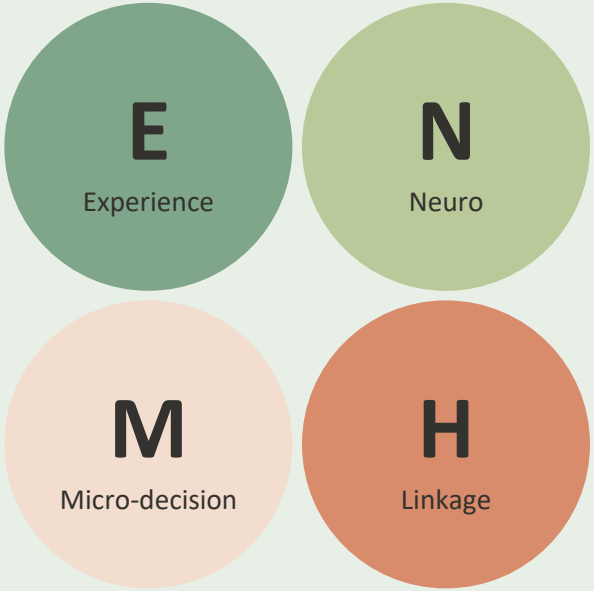
RESEARCH PRESENTATION

Transforming Uncertainty into Enterprise Innovative Development

The cumulative effect of micro-decisions and horizontal linkages

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Four contours → one index T of uncertainty transformation

From obstacle to raw material

Conventional view

Uncertainty is an external obstacle, overcome by strategic planning or large technology projects.

This chapter's view

Uncertainty is raw material: daily micro-decisions, amplified by horizontal linkages, turn signals into innovation.

1 Four interacting contours: experience, neuro, micro-decision, linkage

2 Hierarchical Mamdani-type fuzzy model with a final index T

3 Nonlinear, threshold synergy of micro-decisions and linkages

Conceptual, model-based work: no survey data; the numbers illustrate the inference logic.

The four-step transformation cycle

1

Sense

weak signals of the external environment

2

Decide

fast, reversible micro-decisions

3

Share

experience flows through horizontal linkages

4

Consolidate

new products, processes and practices

Risk vs uncertainty

Risk: probabilities known → calculate and insure.
Uncertainty: states and probabilities unknown → experiment, learn, adapt.

S uncertainty level
V experience signal
U uncertainty-absorption capacity
T final index of transformation

Sensing layer: experience and neuro

Experience economy

Value shifts from goods to memorable emotional experiences: what customers feel matters as much as what they buy.

Neuro toolkit

- EEG
- fMRI
- Eye tracking
- Facial coding

Signals feed micro-decisions

Ethical limits

Privacy, manipulation and fairness risks → only aggregated, depersonalised indicators.

Coffee stores (200 participants): atmosphere, service, quality and price shape experience, and experience shapes loyalty.

Fashion metaverses: immersive spaces provoke emotions that shape consumer motivation and experience outcomes.

Four propositions to test

A micro-decision: made by an executor, low cost of error, reversible, with fast feedback.

P1 **Micro-decisions alone** give local improvements that do not scale.

P2 **Linkages alone** stay empty channels with nothing to carry.

P3 **Both together** create a nonlinear, threshold synergy that exceeds the sum of isolated effects.

P4 **Uncertainty level** too low gives no incentive; too high polarises outcomes by absorption capacity.

Case Micro-Decision Strategy Pivot

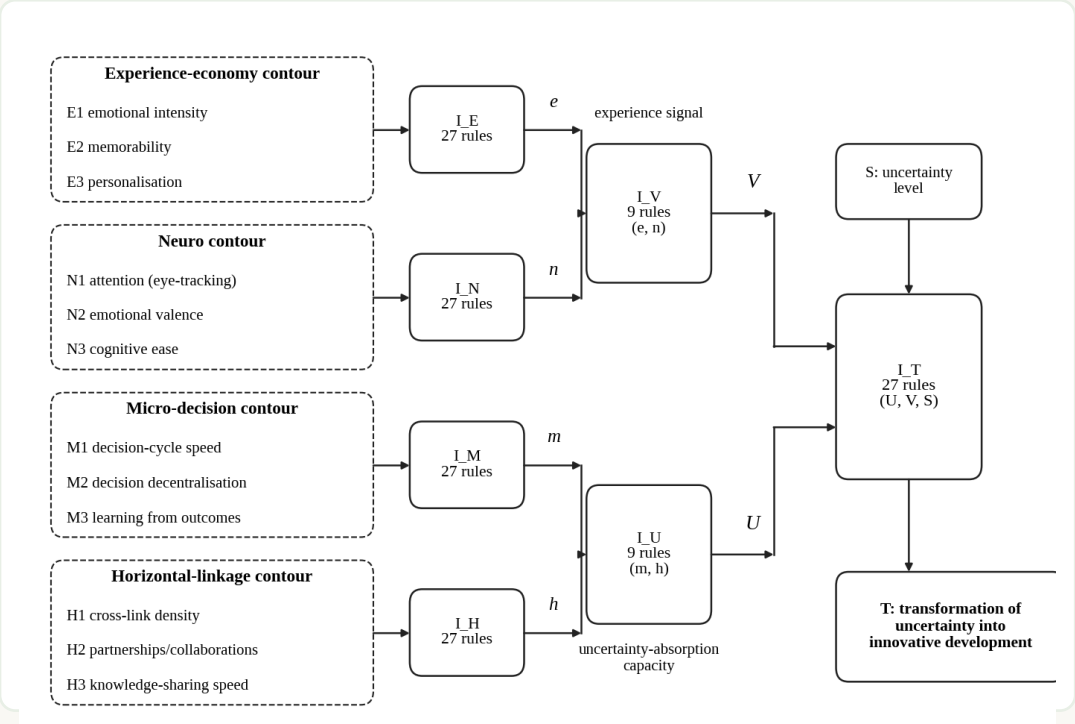
•**Micro-Decision.**
•Installing a gas-station recognition AI module onto a standard surveillance drone.

•**Strategic Shift.**
•Instantly transforms basic flight operations into intelligent asset mapping and infrastructure analytics.

•**Core Takeaway.**
•A small localized technical upgrade can completely rewrite macro-strategy and unlock new market value.



Model architecture



Level 1 Four contours, 3 indicators each → e, n, m, h (27 rules per block)

Level 2 (e, n) → experience signal V; (m, h) → absorption capacity U (9 rules)

Level 3 V, U and uncertainty S → final index T (27 rules)

All variables are scored 0–10. Fig. 1a

Indicators and measurement tools

Contour	Indicators (inputs, 0–10)	Measurement tools
E Experience	E1 emotional intensity · E2 memorability · E3 personalisation	Perception experiments, recall tests, review analysis
N Neuro	N1 attention · N2 emotional valence · N3 cognitive ease	Eye tracking, GSR, facial coding, EEG (with consent and ethics)
M Micro-decisions	M1 cycle speed · M2 decentralisation · M3 learning from outcomes	Decision log, time from signal to action, retrospectives
H Linkages	H1 cross-functional density · H2 partnerships · H3 knowledge-sharing speed	Network analysis, partnership register
S Uncertainty	Volatility of demand and prices, regulatory change, technological turbulence	Time series of enterprise indicators, expert assessment
T Final index	Computed from e, n, m, h, V, U and S	Validation: revenue share of new products, time to market

Table 1. Every input is fuzzified as low, medium or high.

Fuzzification and rule base

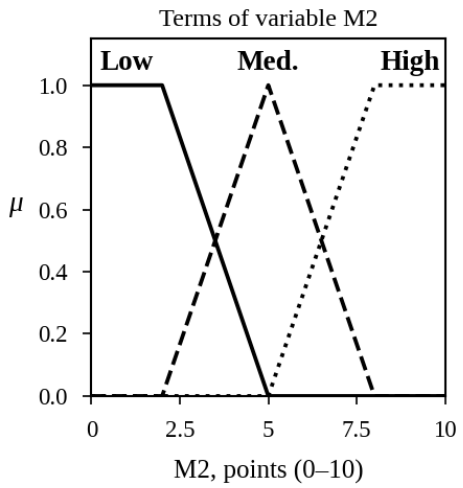


Fig. 1b. Terms L, M, H of variable M2

Fuzzification Each input has three trapezoidal terms (L, M, H); outputs of levels 2 and 3 use five terms.

Rule base Monotone and complementary: output term follows the sum of input term indices; S corrects level 3 (low S caps T, high S shifts weak outputs down).

Inference Mamdani: min implication, max aggregation, centroid defuzzification; implemented in Python with NumPy.

Five hypothetical enterprise profiles

Profile	*e*	*n*	*m*	*h*	*V*	*U*	*S*	*T*	Term of T
S1 Weak contours	3.12	2.04	2.04	2.04	2.08	1.04	7	**1.06**	very low
S2 Experience without linkages	7.96	6.88	3.12	2.04	7.92	2.08	7	**3.52**	low
S3 Linkages without experience	3.12	3.12	5.89	7.96	3.21	7.55	7	**4.66**	medium
S4 Balanced	7.96	6.88	7.96	8.15	7.92	9.10	7	**8.94**	very high
S5 Balanced, low S	7.96	6.88	7.96	8.15	7.92	9.10	2	**5.00**	medium

Table 2. Points 0–10, computed by the model; not empirical data.

S1
Weak contours collapse under high uncertainty: T = 1.06.

S2 vs S3
Sensing alone gives T = 3.52; organisation alone gives T = 4.66.

S4 vs S5
Same contours: T = 8.94 at S = 7, but only 5.00 at S = 2.

The cumulative synergy effect

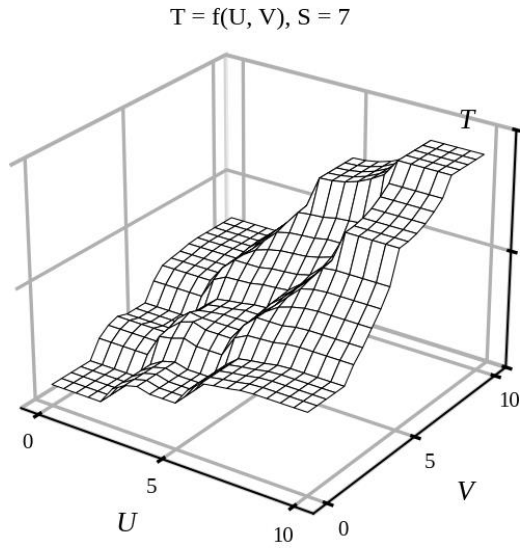


Fig. 1c. Response surface T = f(U, V), S = 7

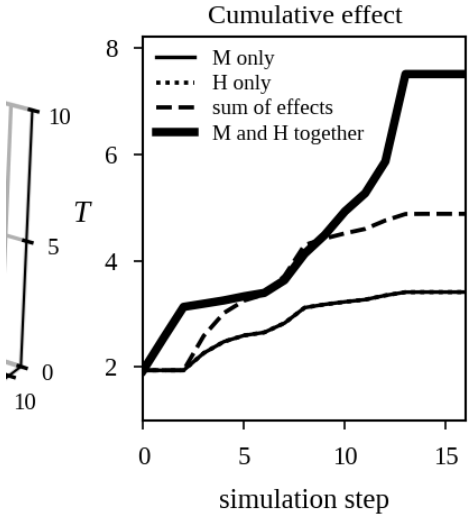


Fig. 1d. Trajectories of T over 16 steps

3.41

one contour alone, from $T_0 = 1.94$

7.50

M and H together, threshold jump at step 13

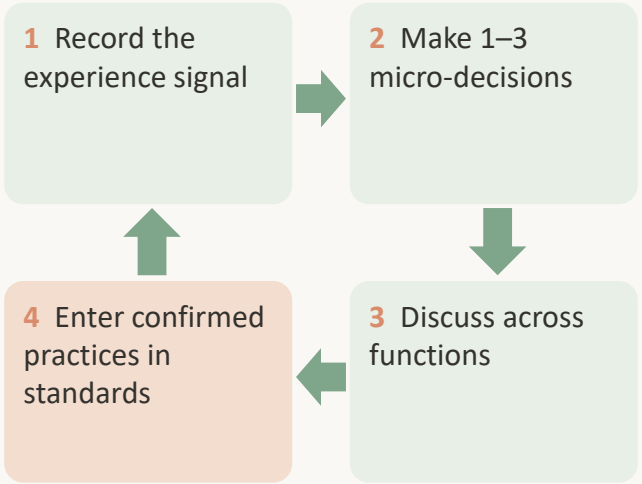
+2.62

above the sum of isolated gains (≈54%)

Managerial implications

1. **Delegation and feedback.** Clear list of decisions an executor may take, reversible and logged (M1–M3).
2. **Linkage infrastructure.** Digital channels for knowledge exchange; density amplifies the effect (H1–H3).
3. **Neuro tools as a sensor.** Aggregated indicators only; respect privacy and avoid manipulation.
4. **Uncertainty as a test.** Build the contours to the threshold level before uncertainty rises.

Weekly cycle



Implications are hypotheses for empirical testing.

Conclusions and next steps

Isolated development lifts T only to 3.41 out of 10; **joint development lifts it to 7.50.**

Main conclusions

- Uncertainty becomes raw material when micro-decisions and linkages work together
- High uncertainty polarises: weak profiles lose, balanced ones gain
- Twelve measurable indicators and a sense–decide–share–consolidate cycle

Limits and validation

- Expert-set rules, hypothetical profiles, type-1 fuzzy sets
- Next: measure the 12 indicators and compare T with new-product revenue share and time to market
- Then calibrate with neuro-fuzzy methods; extend to type-2