University of Vaasa

Validating a Decision Making Method basing on Technology and Knowledge Priorities for Sustainable Strategies for Innovative Start-ups

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Technology and Knowledge (1)

Porter(1985):

- Technology T is **Driver** of competition
- It affects **competitive advantage CA and industry structure** (cluster, later industrial ecosystem)
- It has significant role in relative cost **positioning or differentiation**
- It is in **value chains** and affects competition by **operations** (resource utilization)

Technology and Knowledge (2)

- Knowledge K is Close to Technology; in Greek Tekne is Know How
- Barney et al (1991) introduced Sustainable Competitive Advantage SCA; unique resource, like T&K, that any competitor can't mimic. ***Nowadays we are happy when Strategy may last years not just months or days (hours)..☺***
- T&K intensive/driven businesses need innovations which creates growth (Post Schumperian 'wave', Bergman&Hagan 2006)

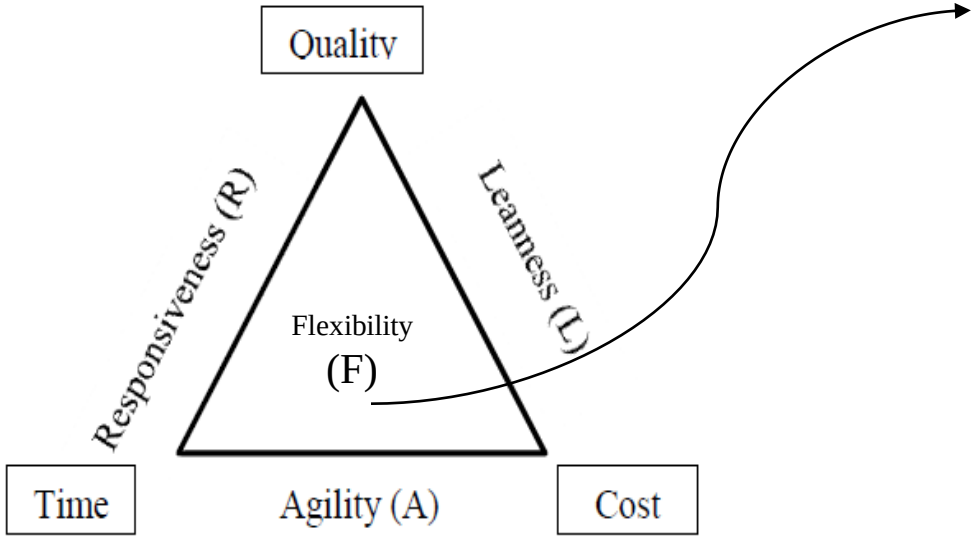
Sense and respond

Companies are moving from their traditional "make and sell" strategies towards "sense and respond" strategies that are faster and offer more real time information (Nolan and Bradley 1998). **S&R for resource (re)allocations!**

ATTRIBUTES	Scale: 1=low, 10 = high		Direction of development, expectations (future)			Direction of development, experiences (past)			Compared with competitors			Knowledge/technology requirement		
	Expectations (1-10)	Experience (1-10)	Worse	Same	Better	Worse	Same	Better	Worse	Same	Better	Basic %	Core %	Spearhead %
External structure														
Customer satisfaction	8	7			x		x			x		20 %	60 %	20 %
Customer loyalty	9	7		x				x		x		40 %	50 %	10 %
Brand	10	8		x			x				x	25 %	60 %	15 %

RAL model

- In order to integrate sense and respond method to Miles and snow typology, RAL model is used. RAL is abbreviated from responsiveness, agility and leanness.



Flexibility is a function of:

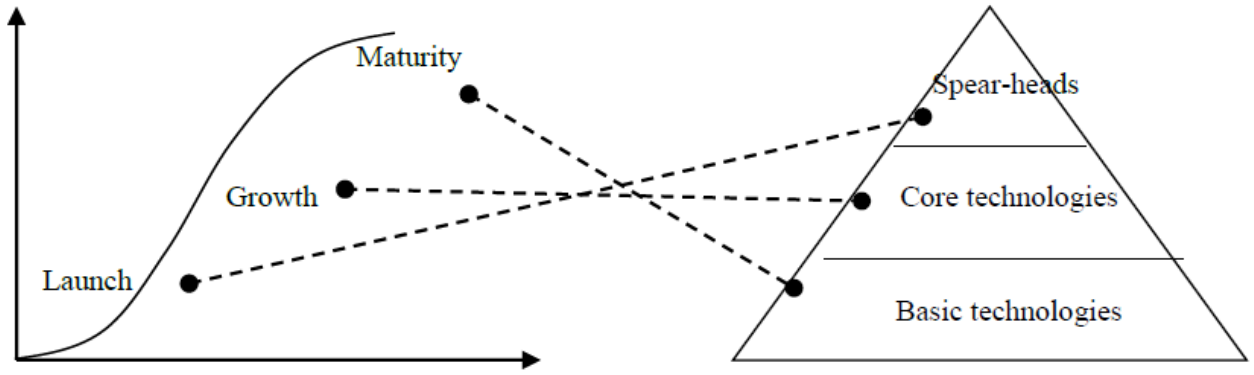
1. Volatility (capacity utilization rate)
2. Mix
3. Complexity in technology level and number of modules
4. Mix related to product life cycles

Knowledge and technology

- Knowledge and technology requirement section has been added to the Sense and Response (S&R) questionnaire to gather information about the companies' knowledge and technology rankings.
- Considering the effect of technology on resource allocation and critical factor indices, firms are facing with one important question: In which technology they need to invest to gain higher completive advantages, ***to win by taking sufficient risk***.

Technology and knowledge

- Different types of technology are defined depends on which stage a technology is in its life cycle.
- Basic technology is referring to the technology that is not the most critical for the business and could be out sourced. Core technologies include technologies that bring competitive advantages and enable the company to grow. And spearhead technology focuses mainly on future.

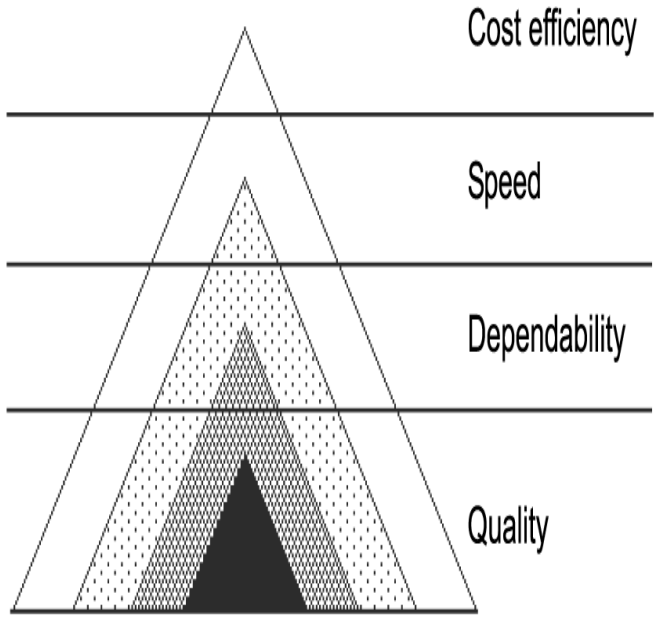


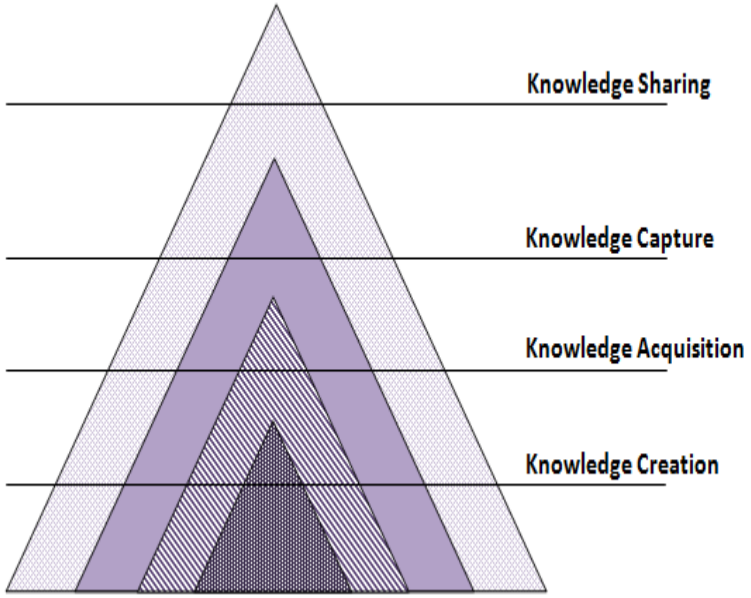
Knowledge/Technology Ranking

In K/T rankings technology and knowledge are put to categories: Basic (B), Core (C) and Spearhead (SH). And respondents are supposed to determined the share of each kind of technology for mentioned criteria when the sum is 100.

	Basic	Core	Spearhead
Performance 1			
Performance 2			
Performance 3			
Performance 4			

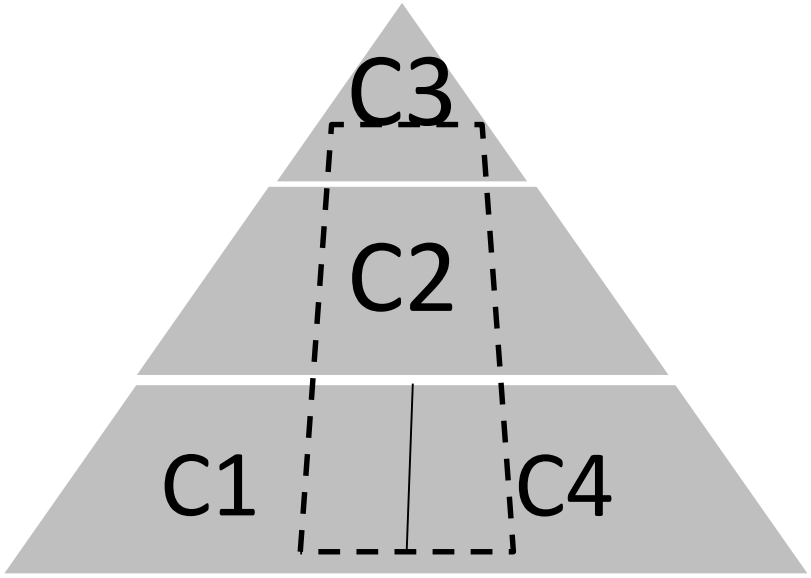
Sand Cone Theory and Example





Source: Ferdows and De Meyer (1990)

Sand Cone collapse



- *Challenge Is!* ---What we can't see is **how knowledge and technology affects in Sand Cone**

Questionnaire Form

- B+C+SH = 100% in each department and criterion -- In this example three departments Ai and four criteria Cj

	Basic			Core			Spearheaqd		
	Dept. A	Dept. B	Dept. C	Dept. A	Dept. B	Dept. C	Dept. A	Dept. B	Dept. C
C1	60 %	-	-	40 %	-	-	0 %	-	-
C2	-	60 %	-	-	30 %	-	-	10 %	-
C3	-	-	70 %	-	-	30 %	-	-	0 %
C4	15 %	-	-	65 %	-	-	30 %	-	-

Variability Coefficient (VarC)

$$VarC_{C1,C2,C3,C4} = \sqrt{\sum_{\substack{C1,(C2,C3,C4) \\ i=B,C,SH}} \left(\frac{std_i}{mean_i}\right)^2}$$

$VarC_{Ci}$ from B, C and SH, and for all the departments A, B and C.

Technology and knowledge effect on risk (Development potential)

$$c_1: Quality\ , c_2: Time, c_3: Cost, c_4: Flexibility$$

$$\begin{cases} \boldsymbol{Total}\ \ TK\ \underset{c_1,c_2,c_3,c_4}{risk}\ (RMS) = \sqrt{\sum_{c_1,c_2,c_3,c_4}\left[\left(\sum_{b_1,c_1,sh} Coef.Var_i\right)^2\right]^2} \\ \boldsymbol{Partial} \begin{cases} TK\ \underset{c_1,c_2,c_3,c_4}{risk}\ Basic\ \ (RMS) = \sqrt{\sum_{c_1,c_2,c_3,c_4}\left[\sum_{b}\left(\frac{std_i}{mean_i}\right)^2\right]^2} \\ TK\ \underset{c_1,c_2,c_3,c_4}{risk}\ Core\ \ (RMS) = \sqrt{\sum_{c_1,c_2,c_3,c_4}\left[\sum_{core}\left(\frac{std_i}{mean_i}\right)^2\right]^2} \\ TK\ \underset{c_1,c_2,c_3,c_4}{risk}\ Sh\ \ (RMS) = \sqrt{\sum_{c_1,c_2,c_3,c_4}\left[\sum_{sh}\left(\frac{std_i}{mean_i}\right)^2\right]^2} \end{cases} \end{cases}$$

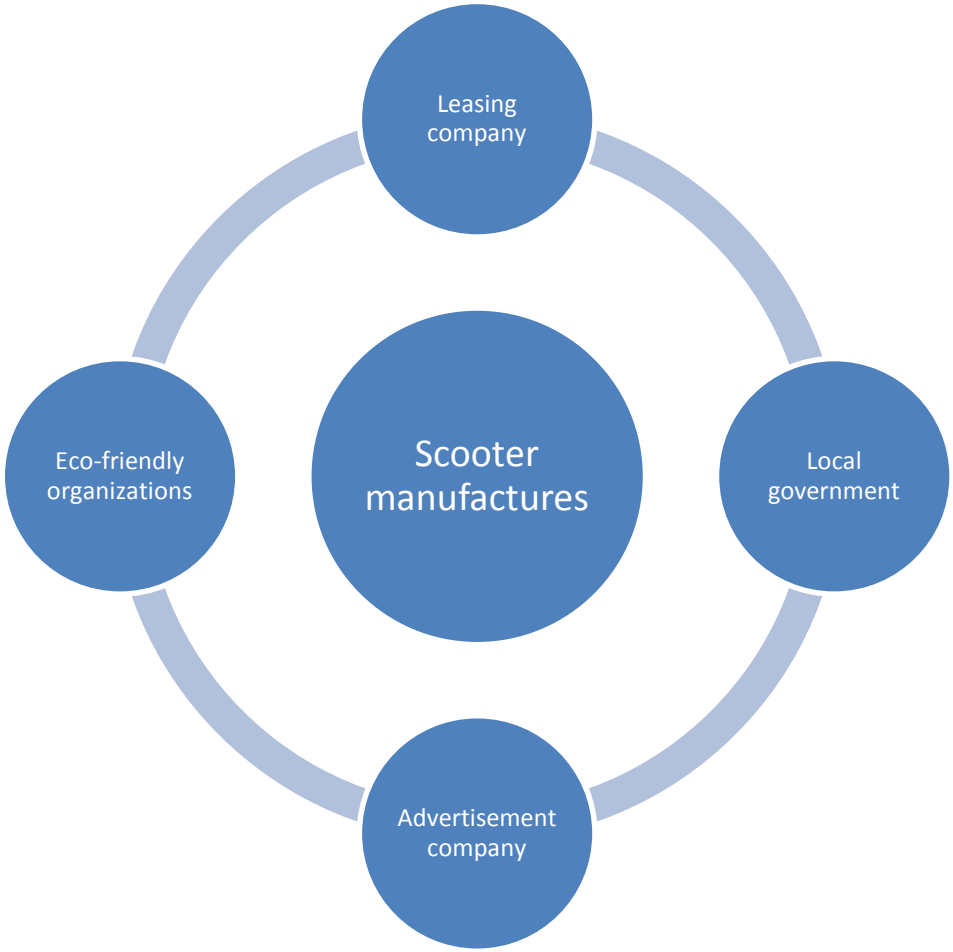
$$\boldsymbol{Total\ Risk(Geom) = [(1 - SCA)\ x\ TKrisk(RMS)]^{\frac{1}{2}}}$$

Results Case 1

- establishing a new transportation company based online scooter; Business Idea:

1. Using app to rent in station and leave anywhere
2. Easy access by location
3. Payment on the basis of minute and the first 3 minutes is free
4. No driving license is needed, only ID
5. Possibility to have a friend with you
6. Special subscription for long term uses

Starts up partners



RAL model priorities

- Mission:

Offer rental high quality scooter for a short period of time.

✓Competitive advantage priorities:

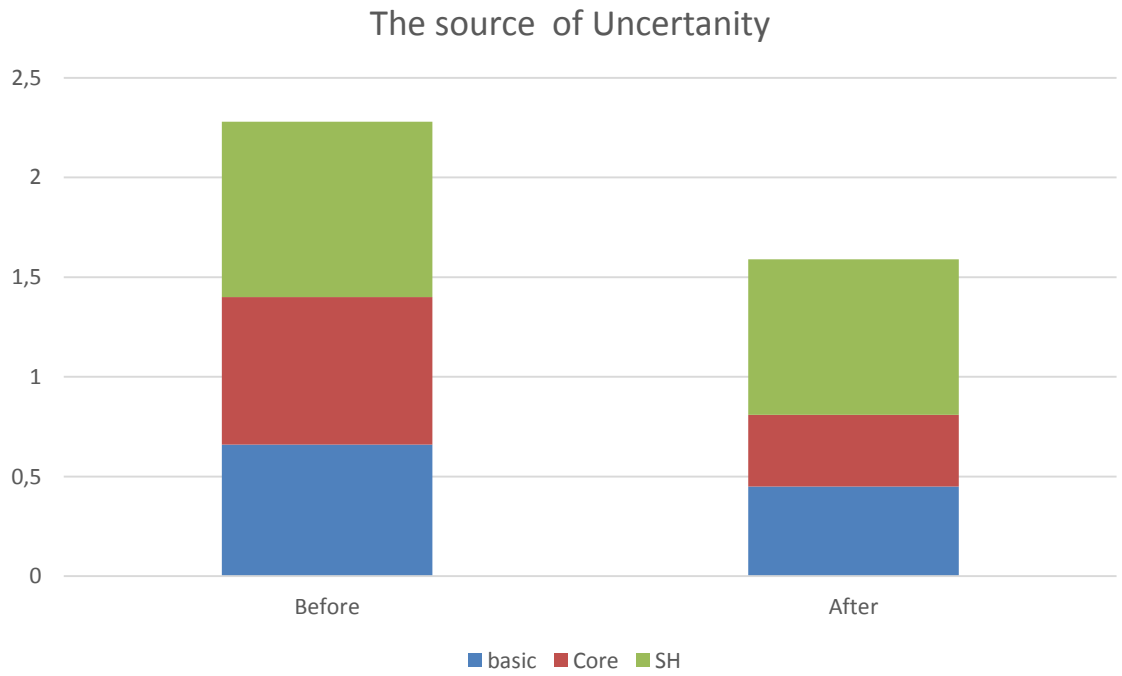
	Cost	Quality	Delivery	Flexibility	Inconsistency
Past	0.074	0.513	0.138	0.275	0.004
Future	0.275	0.513	0.138	0.074	0.004

Improvement plan to decrease uncertainties

1. locate ten rental stations in the city center containing five scooters at each
2. Customers could return the scooter at the station free of charge otherwise there is extra charge in case of leaving scooter somewhere else in the city
3. Constantly observe the availability and the location of demand and relocate station to more popular areas if needed.

Technology and knowledge uncertainty before/ after improvement

- After improvement plan, uncertainty decreases by 25%. While spearhead technology holds the biggest share of risk and uncertainties in past and after improvement plan.

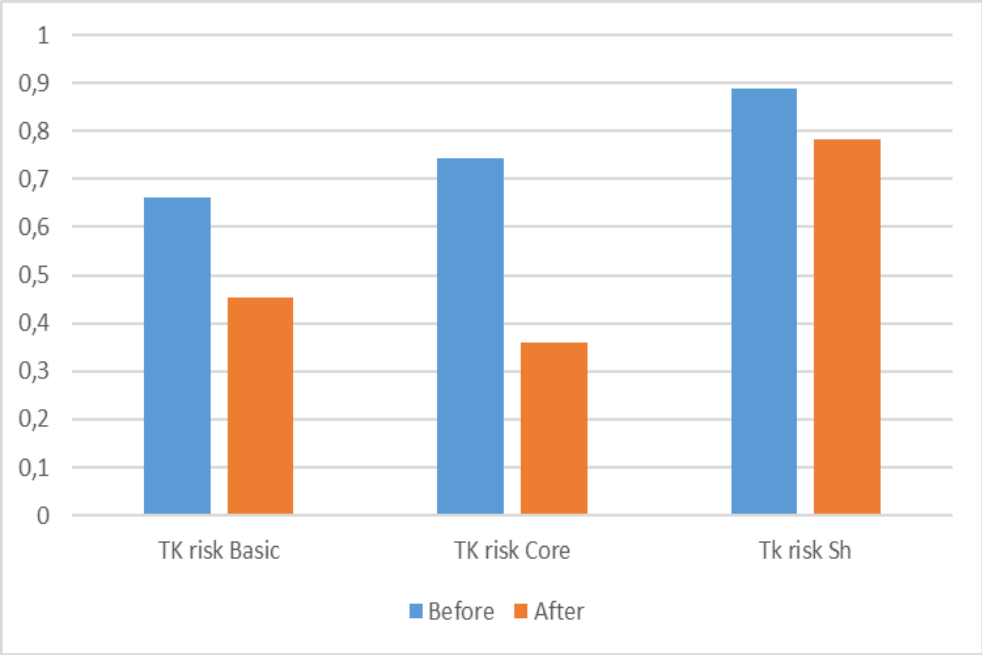


Technology risk level

Total Risk with SCA=0.9 (without T&K uncertainty)

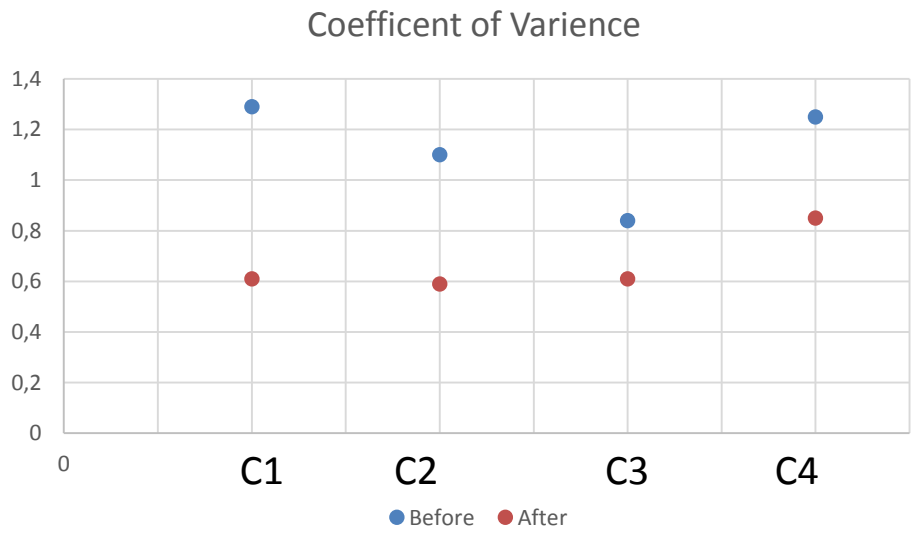
	Technology and Knowledge risk			Total T&K risk (RMS)	Total SCA risk level (Geom)
	Basic	Core	Spearhead		
Past	0.66	0.74	0.88	1.33	0.36
Future (after improvement plan)	0.45	0.35	0.78	0.97	0.31

Comparing the risk of Technology before and after improvement plan



Sand Cone Case 1

	Coefficent of Varience	
	Before	After
C1	1.29	0.61
C2	1.1	0.59
C3	0.84	0.61
C4	1.25	0.85



Results Case 2

- *establishing an entertainment start up based on portable escape room idea;* Portable car escape room which can reach customers.
- Target groups:

1. Wedding
2. Birthday
3. Parties
4. all sort of events which people needs to be entrained

Technology requirements

Spearhead technology : *holographic design*

Basic technology: *truck*

Core technology : *advertisement channel*

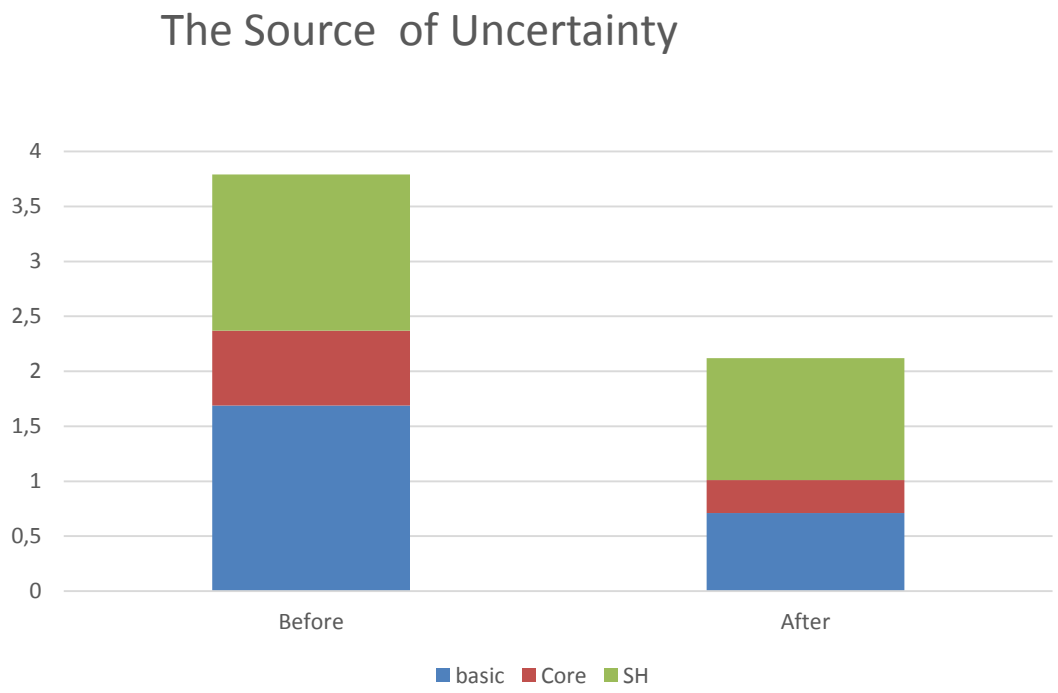
	Cost	Quality	Delivery	flexibility	Inconsistency
Past	0.057	0.499	0.284	0.160	0.004

Company competitive priorities in past (before improvement plan)

Improvement plan to decrease uncertainties

- Deploy mobile phone app
- Increase the truck numbers and projects at least one year
- Corporate with fuel company
- Offering bonus to customer in case of recommending the company to someone else
- Implement customer satisfaction survey constantly

Technology and knowledge uncertainty before/ after improvement



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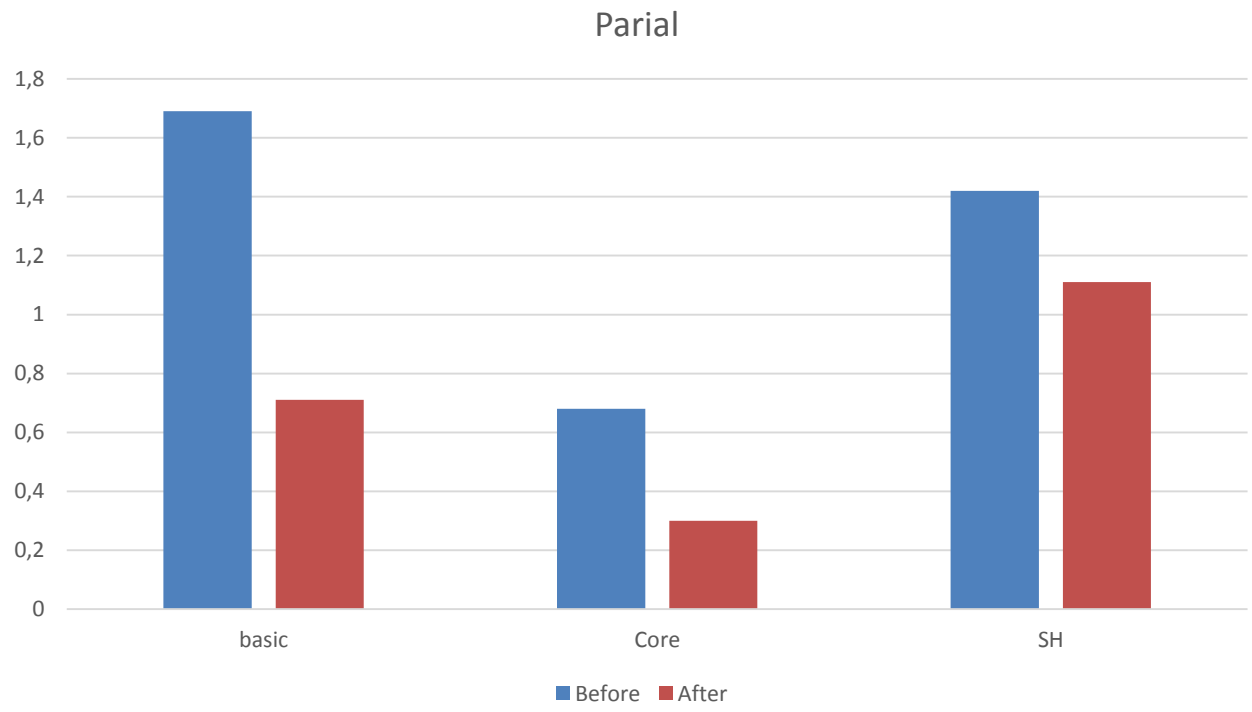


Technology risk level

Total Risk with SCA= 0.9 (without T&K uncertainty)

	Technology and Knowledge risk			Total T&K risk (RMS)	Total SCA risk level (Geom)
	Basic	Core	Spearhead		
Past	1.69	0.68	1.4	2.31	0.48
Future (after improvement plan)	0.71	0.30	1.11	1.35	0.37

Personal & Social Communication Case 3

Task: Model the K/T based uncertainty in personal & social communication from the consumer's point of view. Each group member answers individually to K/T questionnaire. Then the group combines all answers into the excel and calculates the variability coefficients. Lastly, the sand cone model is created and the source of uncertainty analyzed.

Basic: Mobile phone & SMS

Core: E-mail & Social media

Spearhead: Embedded virtual reality

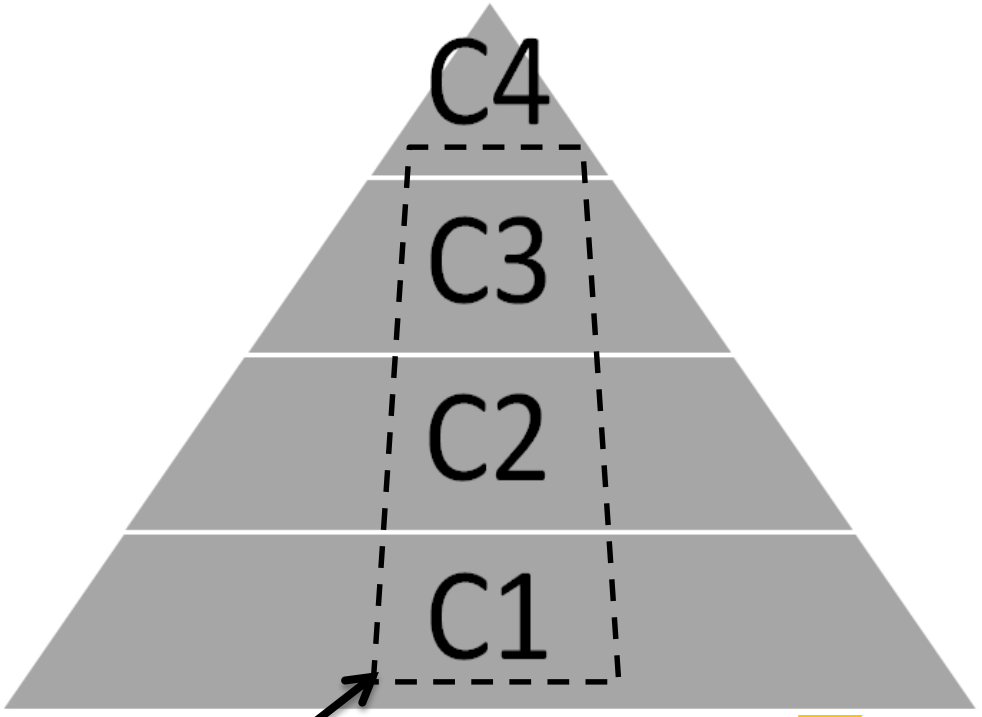
Personal & Social Communication Case (2/2)

C1 = Information safety *(including information security)*

C2 = Availability performance *(including reliability and connectivity)*

C3 = Performance on application level *(including e.g. user friendliness, life cycle costs etc.)*

C4= Product price



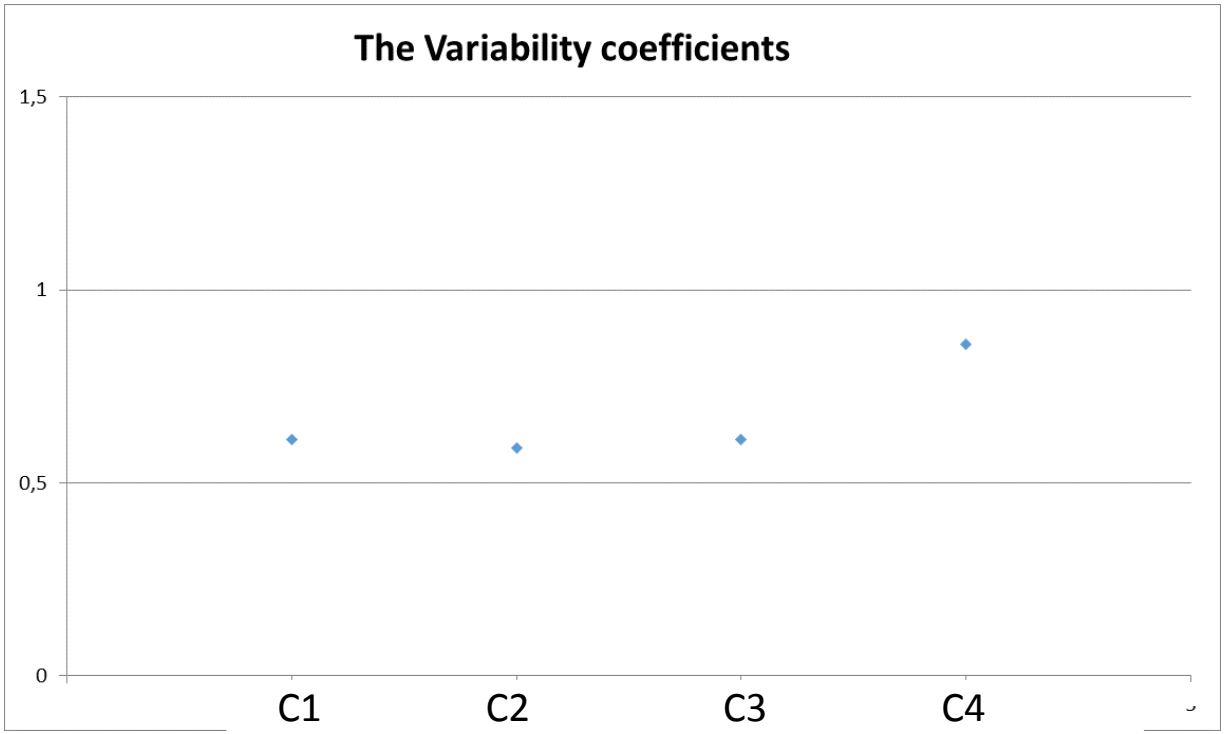
Determine the possible uncertainties in your group by calculating variability coefficients based on K/T rankings.

K/T Questionnaire

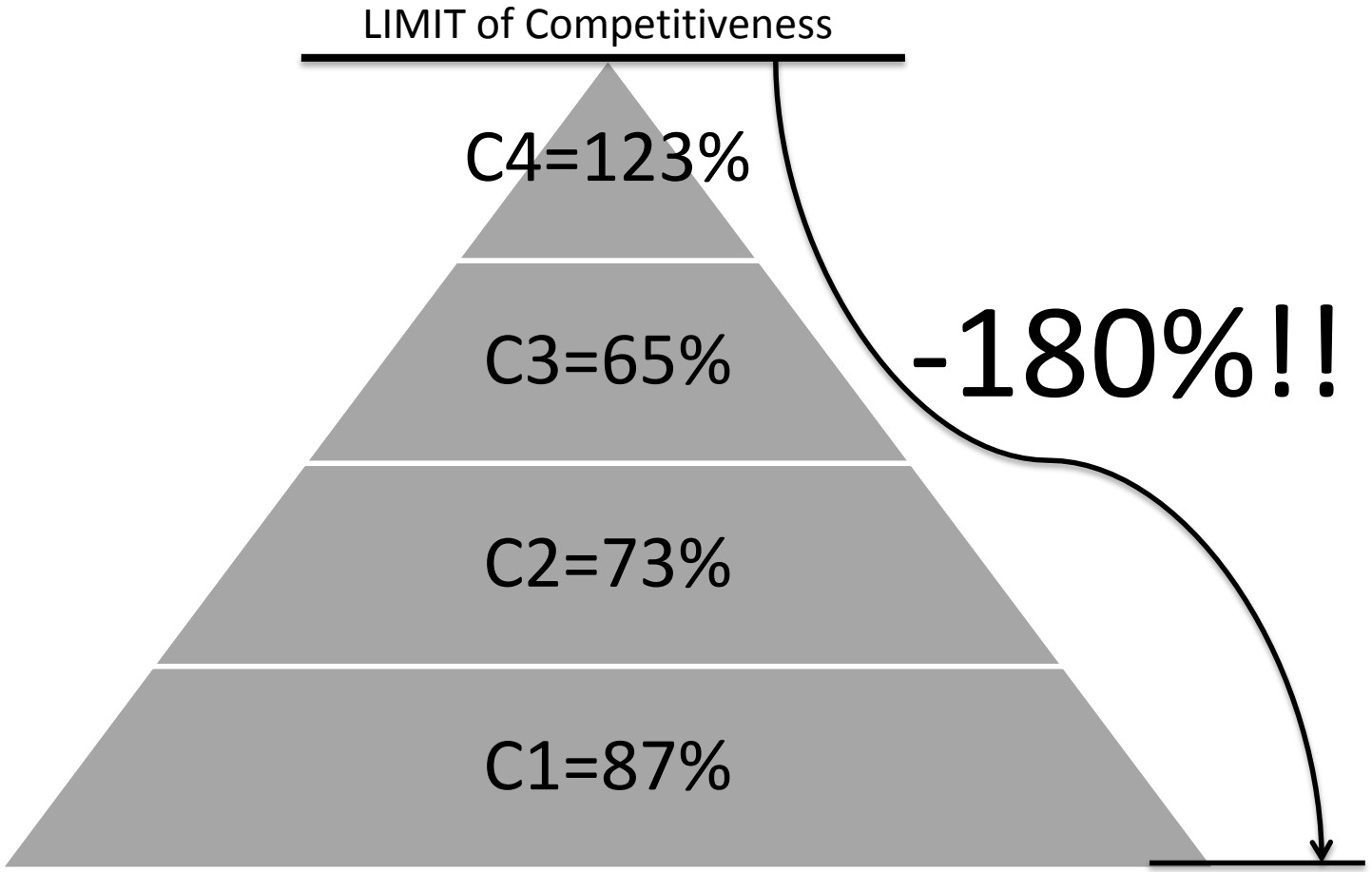
	Basic	Core	Spearhead
C1			
C2			
C3			
C4			

Uncertainty in Comms sand con

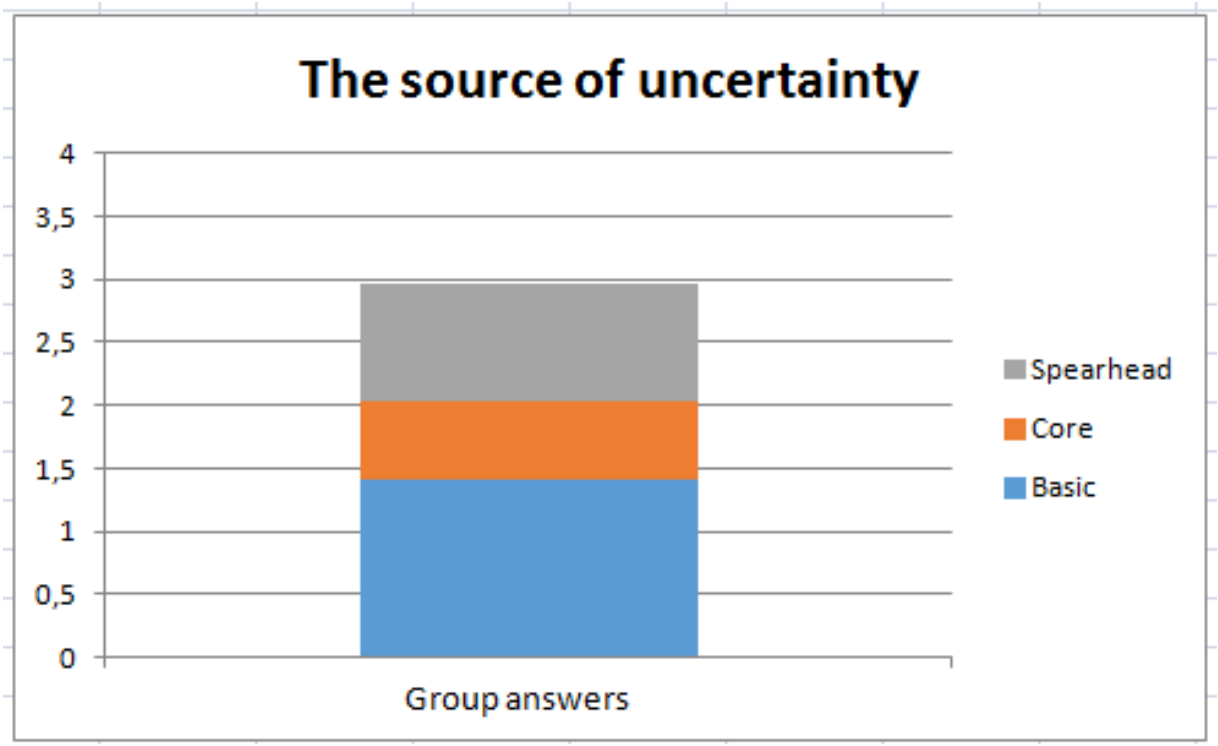
- **C1** *(information safety*),
- **C2** (*availability performance*) values below 1 – similar opinions in group
- **C3** (*performance on application level*)
- **C4** (*product price*) values above 1 – different opinions



Uncertainty Collapse in Comms sand cone



Communication uncertainties



Discussion

- This presentation demonstrates a new decision making to evaluate the technology priorities considering business strategy.
- Cases are chosen from high tech start-ups. In both, spearhead technology plays major role in creating uncertainties
- The proposed model in this study is a suitable tool for decision makers in showing firms' strengths and weaknesses and also in detecting the focus area towards gaining sustainable competitive advantage.

Conclusion

- A new model for **evaluating and utilizing technology and knowledge requirements** for Sustainable Competitive Advantages has been proposed especially for new technology and knowledge driven business creations (start ups).
- This model has been **validated in preliminarily** e.g. in university start-ups.