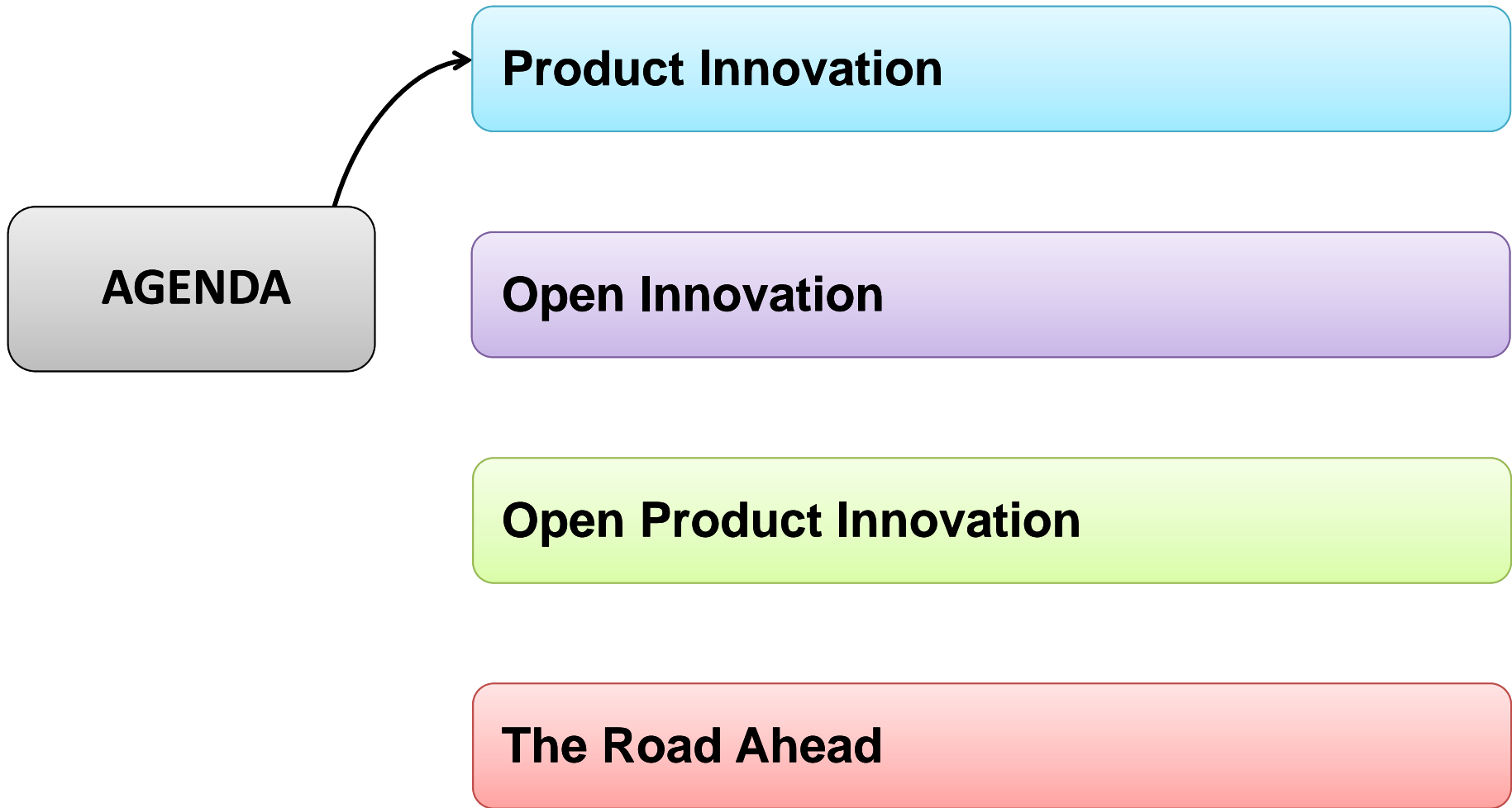


Open Product Innovation

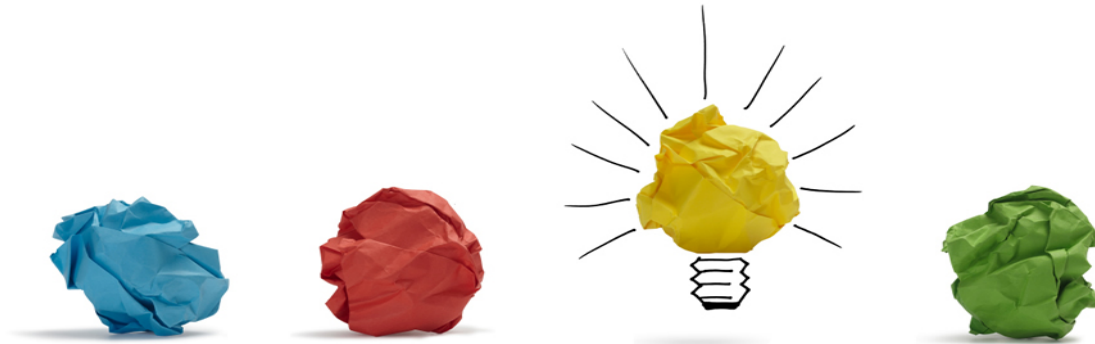
Guenther Ruhe
University of Calgary
ruhe@ucalgary.ca





Product Innovation – What do we Mean?

- A product innovation is a new technology or combination of technologies introduced commercially to meet a user or a market need (Utterback & Abernathy, 1975).
- Examples of product innovation might include
 - A new product's invention; technical specification and quality improvements made to a product; or
 - the inclusion of new components, materials or desirable functions into an existing product.



Product Innovation = Following AND Anticipating Customer Needs

- You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new.” (Steve Jobs)
- **A product innovation is a new technology or combination of technologies introduced commercially to meet a stated or unstated user or market need.**



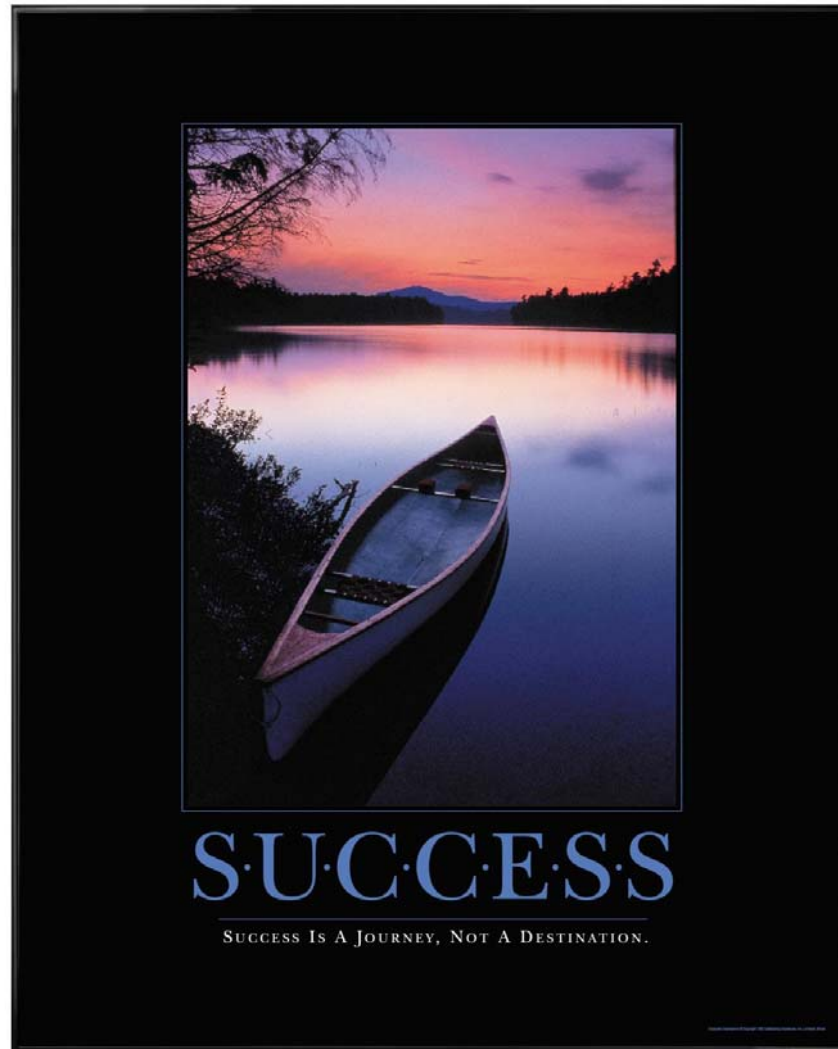
<http://www.businessdictionary.com>

The Many Facets of “Being New”

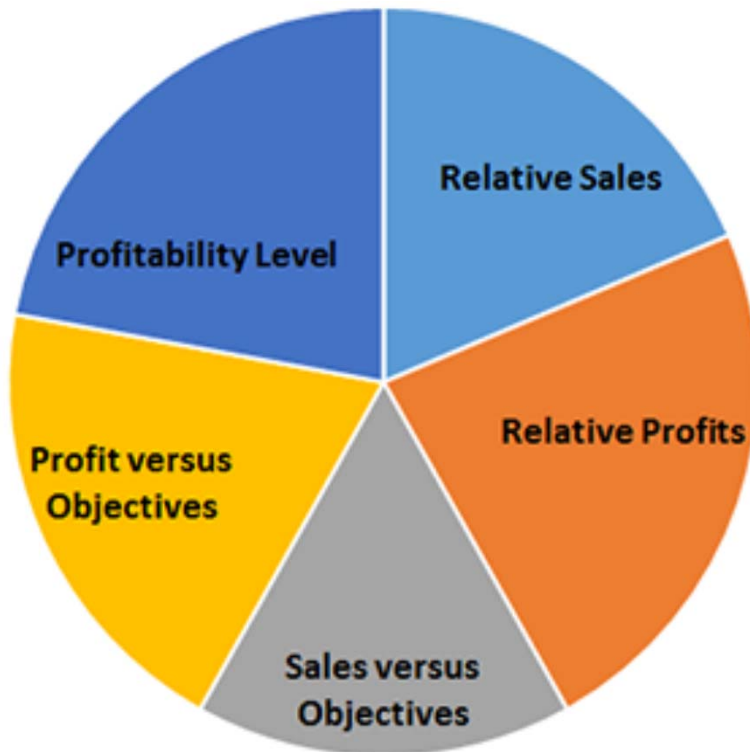
- New technology
- New product line
- New product features
- New product design
- New process
- New service
- New customers
- New uses
- New quality
- New type of benefit

really-new
incremental
radical
evolutionary
improving
discontinuous
imitative
architectural
modular

Product Success – What and How?



Success Based on Financial Performance*



Components	Impact
Having customers' needs, wants, preferences and product requirements well defined prior to product development.	0.590
Introducing a superior product versus competitive products in the eyes of the customer.	0.556
Having strong synergy or fit between the needs of the project and management resources and skills.	0.466

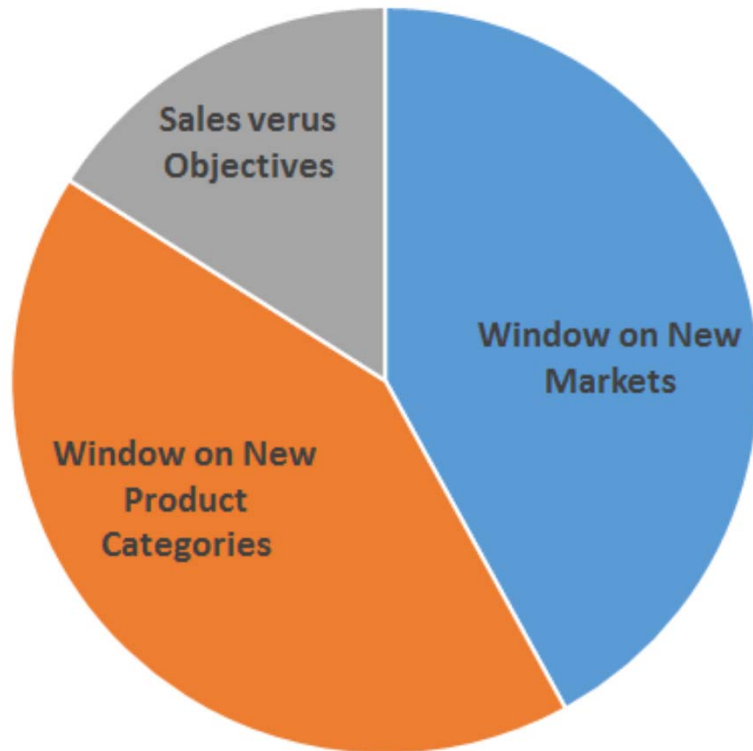
*) Cooper & Kleinschmidt, Success Factors in Product Innovation, Industrial Marketing Management 16, 215-223 (1987)

Success Based on Market Impact



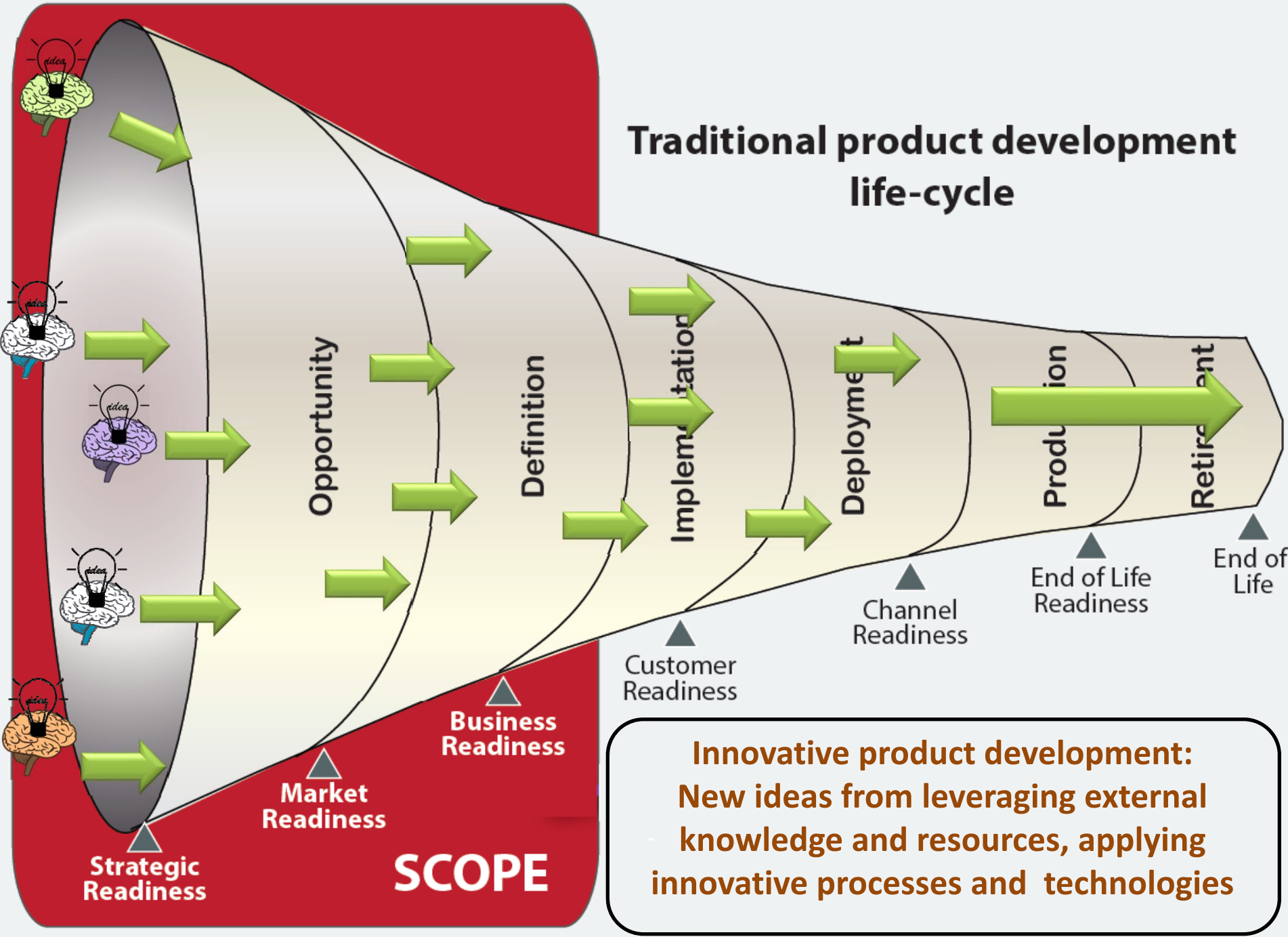
Components	Impact
Introducing a superior product versus competitive products in the eyes of the customer.	0.304
Introducing a higher quality product than competitive products, however quality is defined.	0.299
Introducing a product that offered unique benefits to customers - benefits not found in competitive products.	0.296

Success Based on Opportunity Window

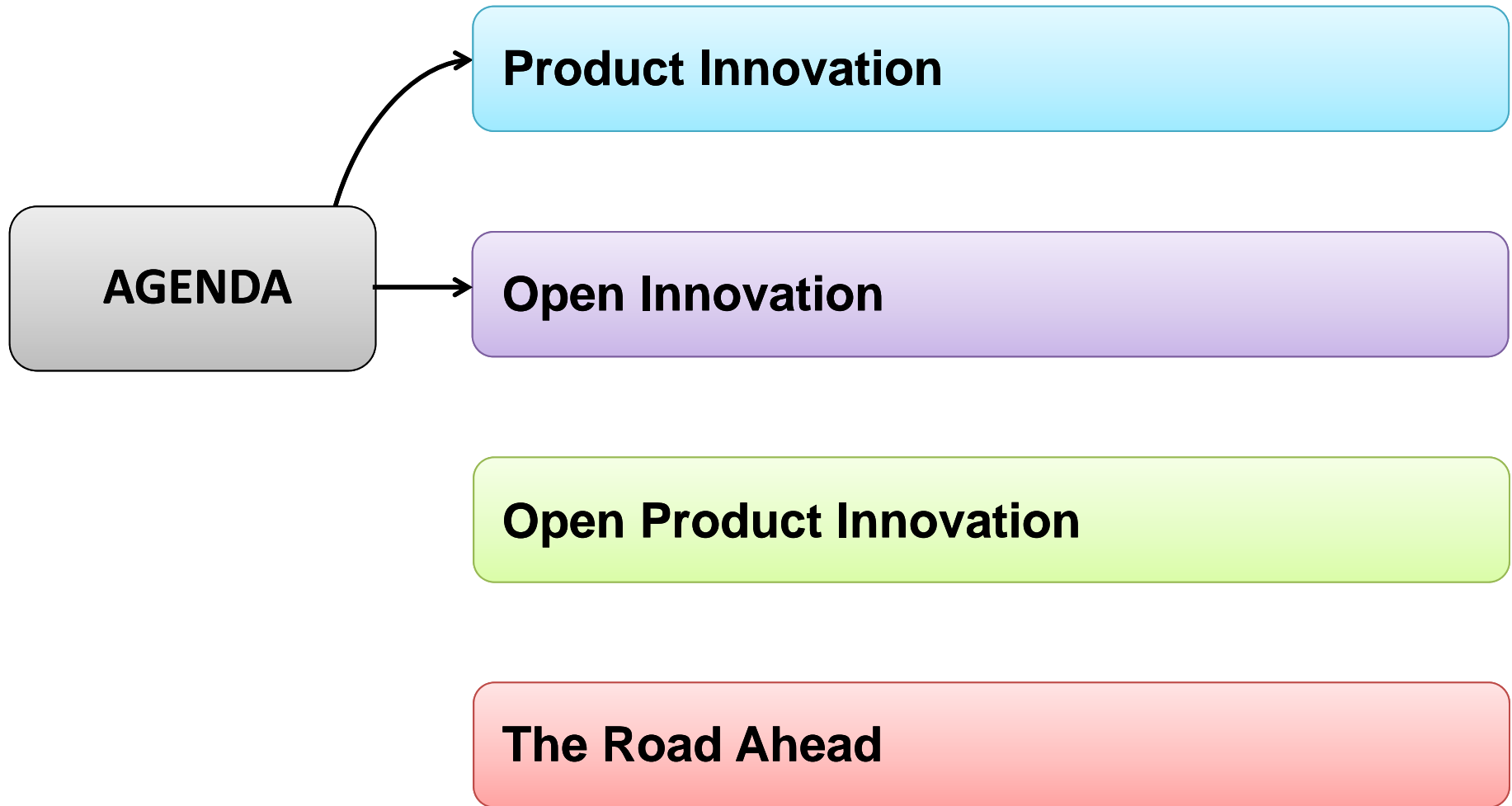


Components	Impact
Introducing a product which enabled the customer to perform a unique task.	0.421
Entering a market where customers' needs and wants for products in this category were changing quickly.	0.345
Entering a product category or market that featured many other new product introductions.	0.331

Traditional product development life-cycle

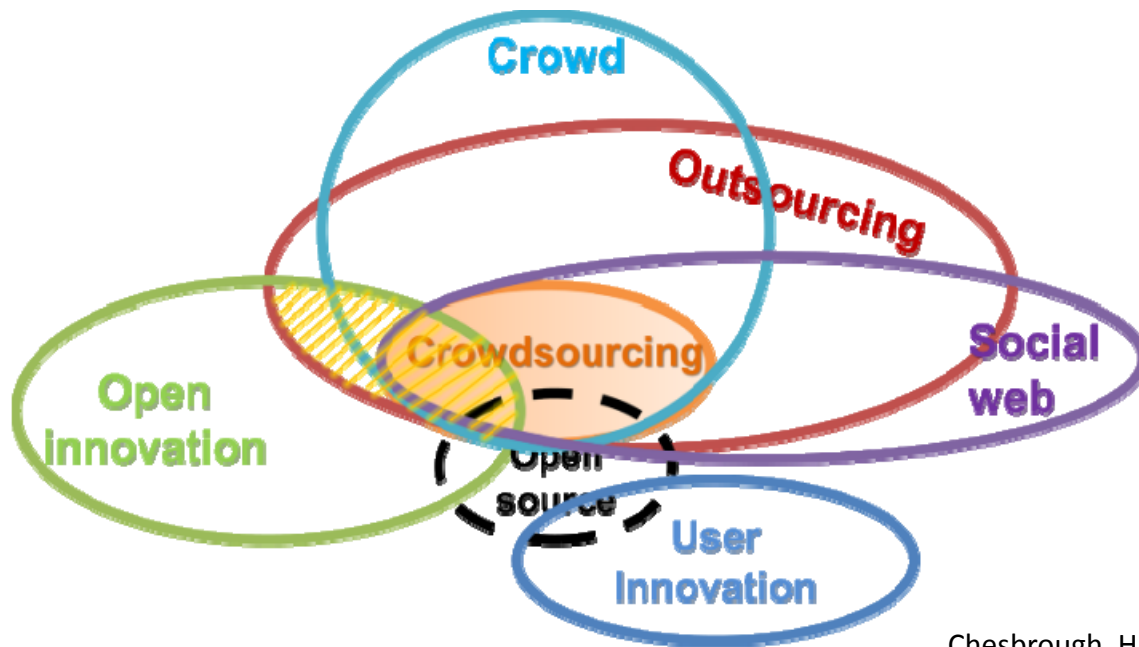


Innovative product development:
New ideas from leveraging external knowledge and resources, applying innovative processes and technologies



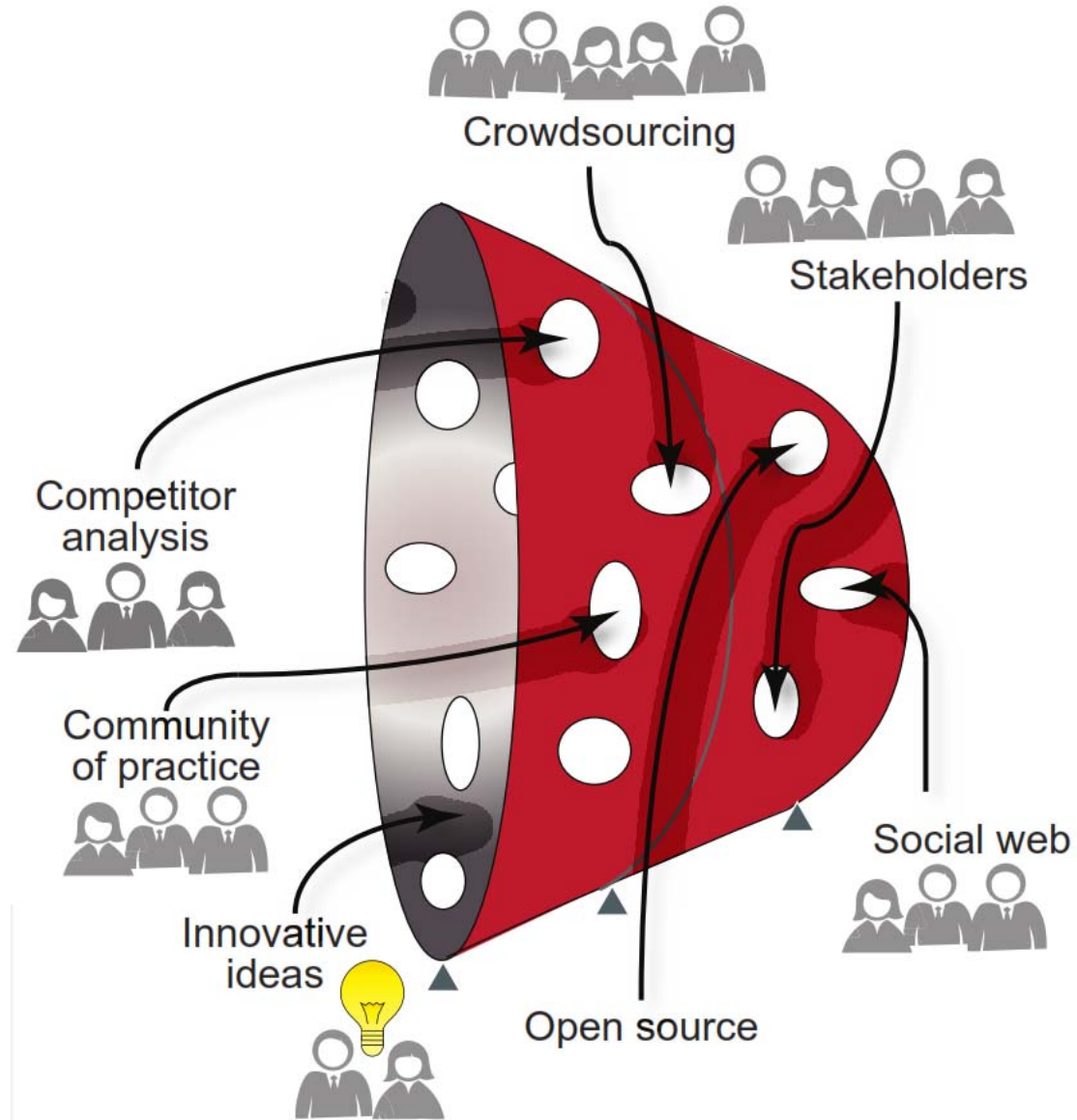
Open Innovation

- An (open) approach for integration of internal and external ideas and paths to market that merges distributed knowledge and ideas into production processes.



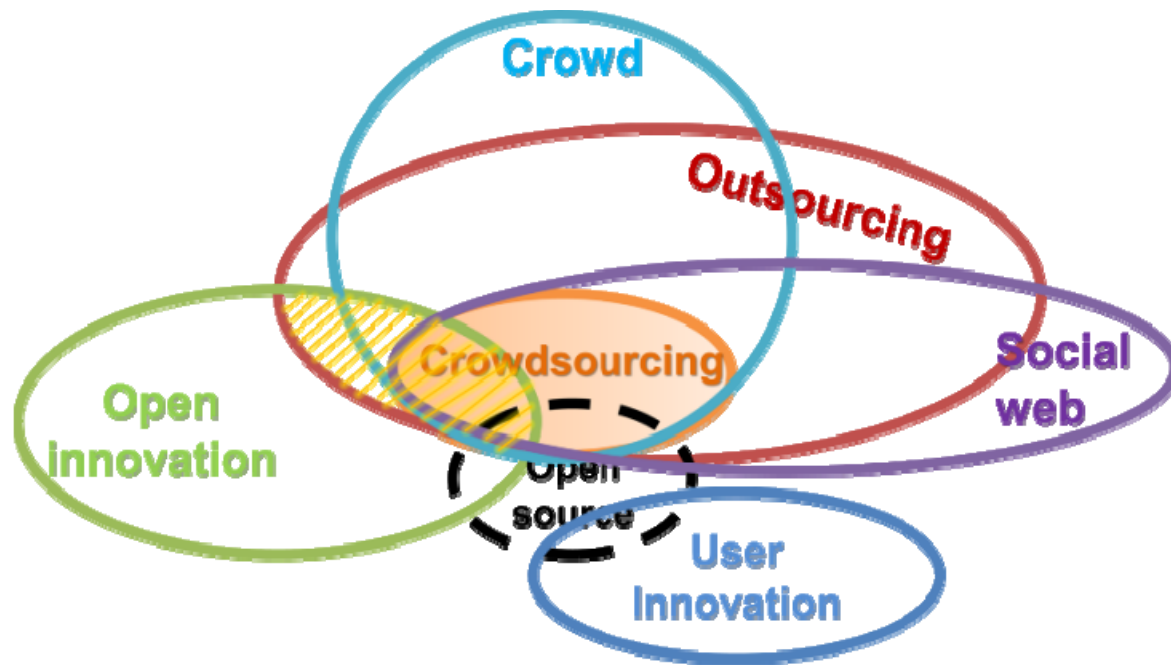
Chesbrough, H., "Open Innovation: The New Imperative for Creating and Profiting from Technology", Harvard Business Press, 2003.

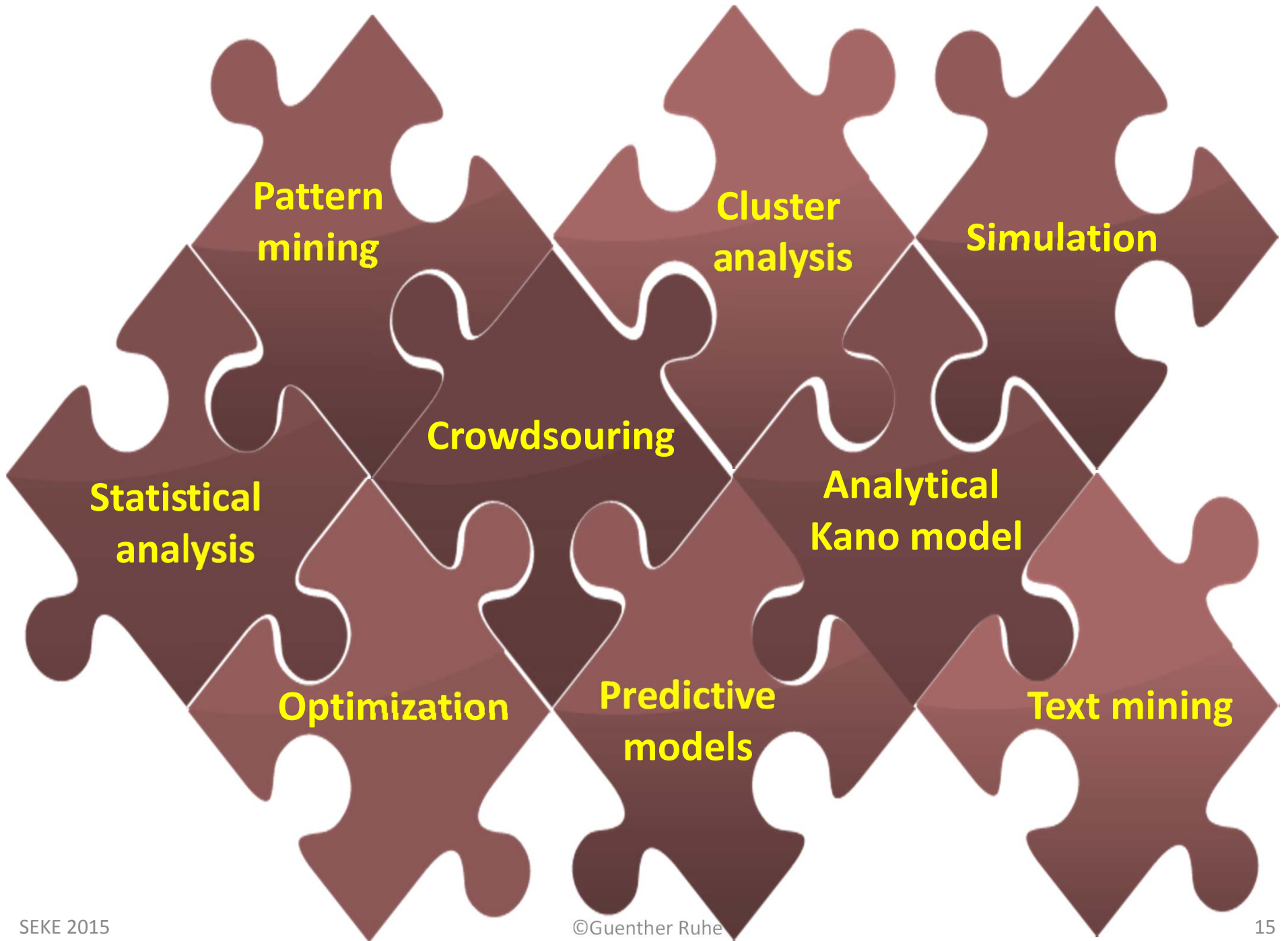
Open Innovation for New Products



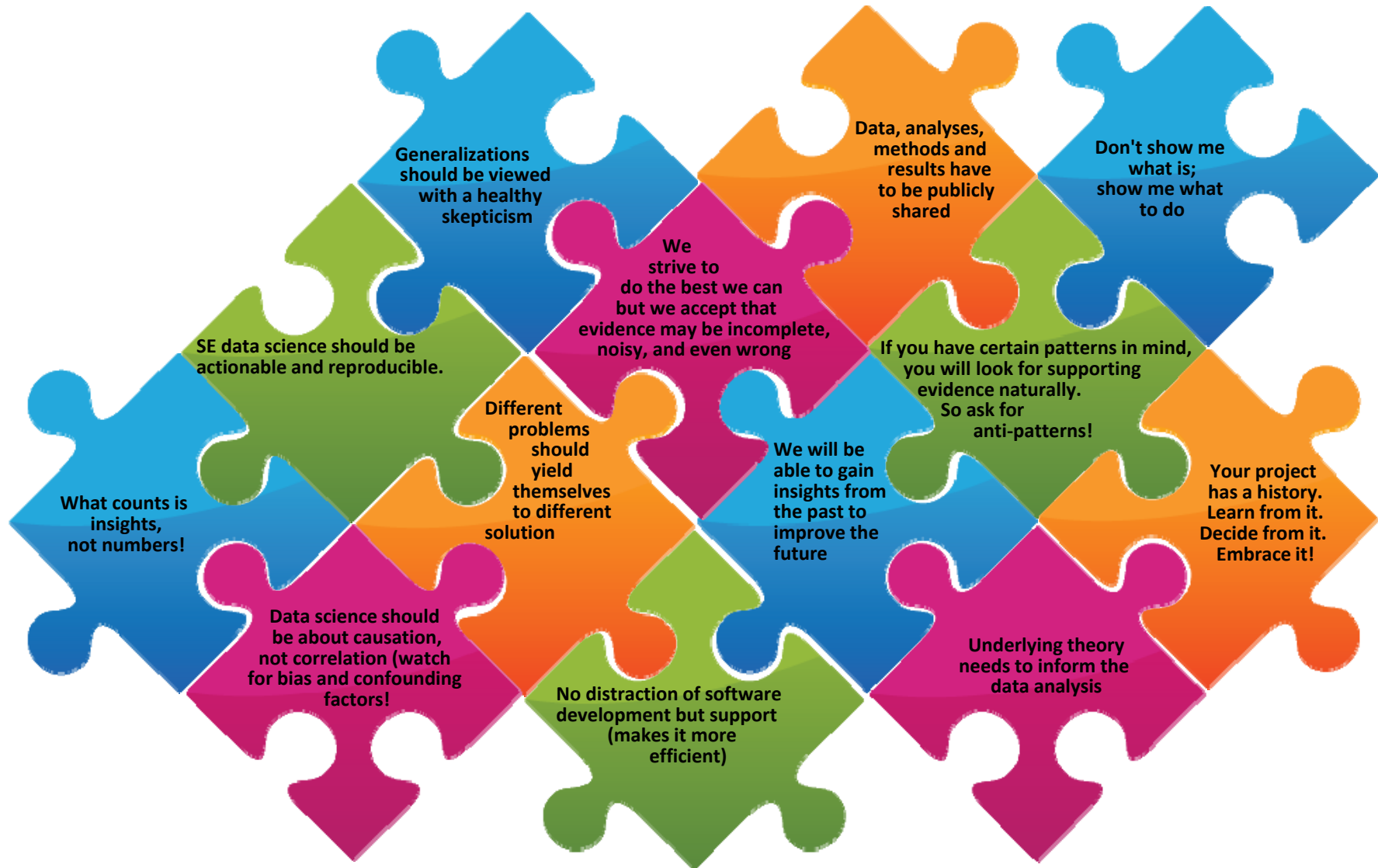
Analytical Open Innovation

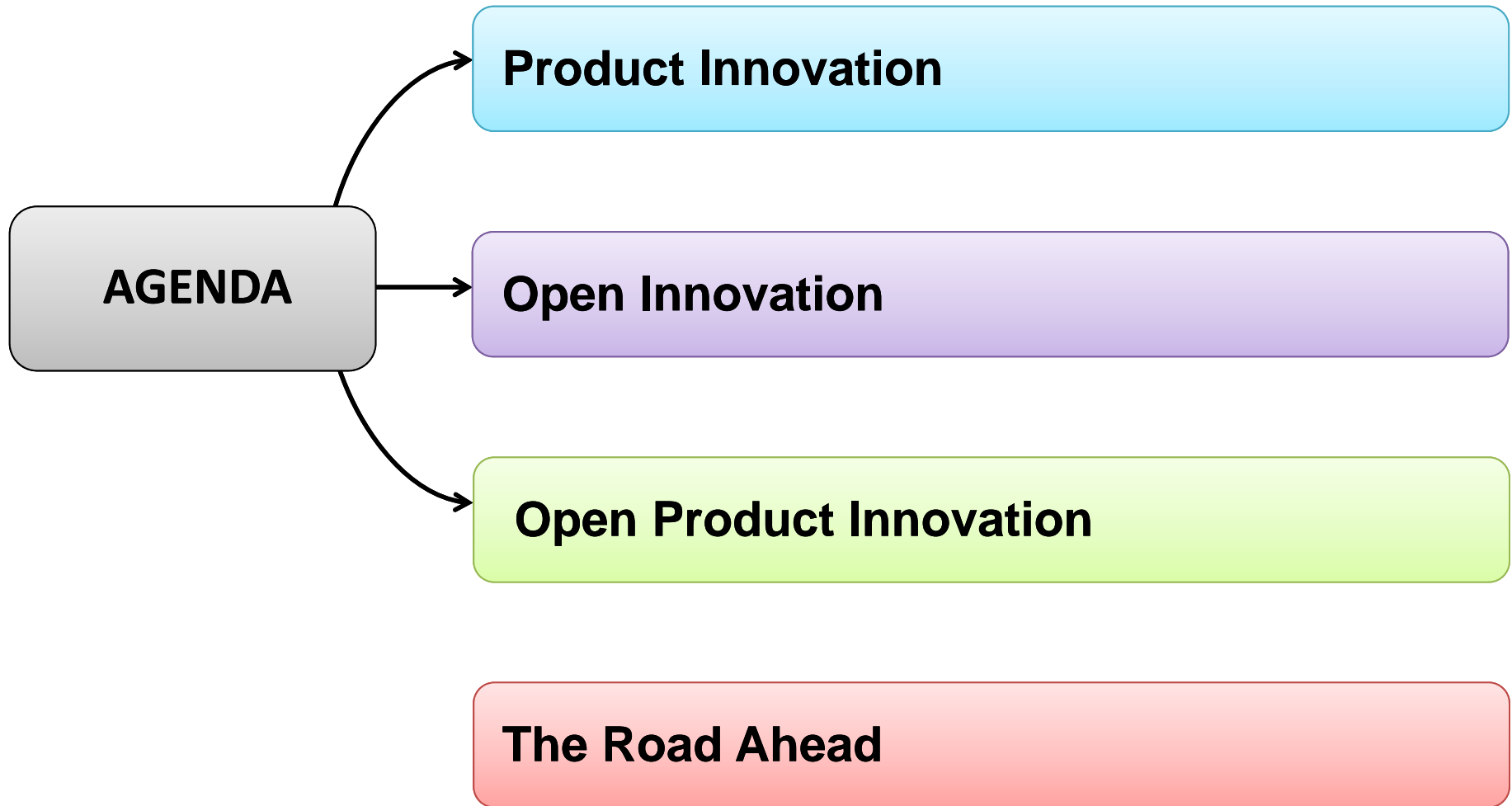
- Open innovation from utilizing the power of analytics (processes, tools, knowledge, techniques, decisions).





What Counts is Insight ... not Numbers*





New Products – Data & Information Needs

	Information needs							
Type of release planning problem	Features	Feature dependencies	Feature value	Customer needs	Stakeholder priorities	User feedback	Market trends	Cost
What to release	x	x	x	x	x		x	x
Theme based	x	x	x	x	x		x	x
When to release	x	x	x	x	x	x		x
Quality planning	x		x	x	x	x	x	x
Operational release planning	x		x					x
Consideration of technical debt	x	x				x	x	
Multiple products	x	x	x	x	x	x		x

The Beautiful New World ... of App Stores

AppBrain

Join AppBrain Browse Apps » Browse Games »

All apps » Word » Bonza Word Puzzle

Bonza Word Puzzle

App's Name | General information | **Change log** | Info for developers | Permissions & concerns ⚠

by MiniMega

App's Developer

Apps' release date and price log and version number and ...

Date	Action	Details
Jun 5, 2014	MORE DOWNLOADS	100,000+ downloads
Jun 1, 2014	MORE DOWNLOADS	50,000+ downloads
May 30, 2014	UPDATE	Version 1.2.11
May 28, 2014	MORE DOWNLOADS	10,000+ downloads
May 28, 2014	PRICE DROP	New Price: Free (\$0.93)
May 16, 2014	UPDATE	Version 1.2.5
May 8, 2014	UPDATE	Version 1.2.0
Apr 26, 2014	MORE DOWNLOADS	1,000+ downloads
Apr 22, 2014	UPDATE	Version 1.1.7
Apr 10, 2014	MORE DOWNLOADS	500+ downloads

Apps rating

Rating (moving average)

Apr 2014 May 2014 Jun 2014

Install **Free** **88** **4.4** **11773** **1** **100,000+** **22419 kb**

User ratings Installs File size Concerns

SEKE 2015

Zoom CY: Goes Mobile

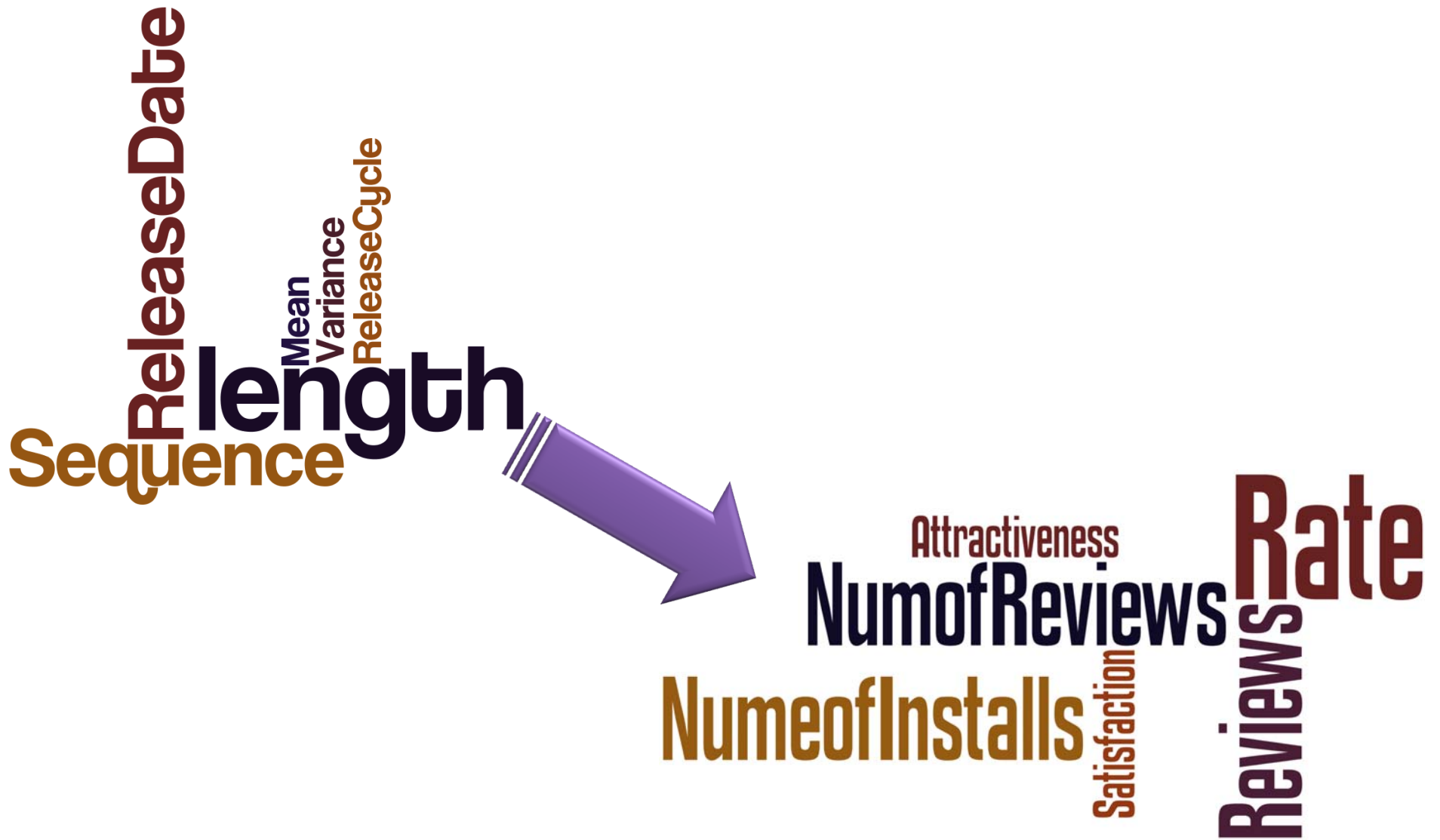
Related Android apps

- Red Herring Blue Ox Technologi 78 Free 100,000+
- Word Brain Puzzle Quiz Game Studio 75 Free 100,000+
- Word Fit Puzzle Havos Ltd 77 Free 500,000+
- 100 Sec Word Puzzl SpiceLabs 85 Free 50,000+

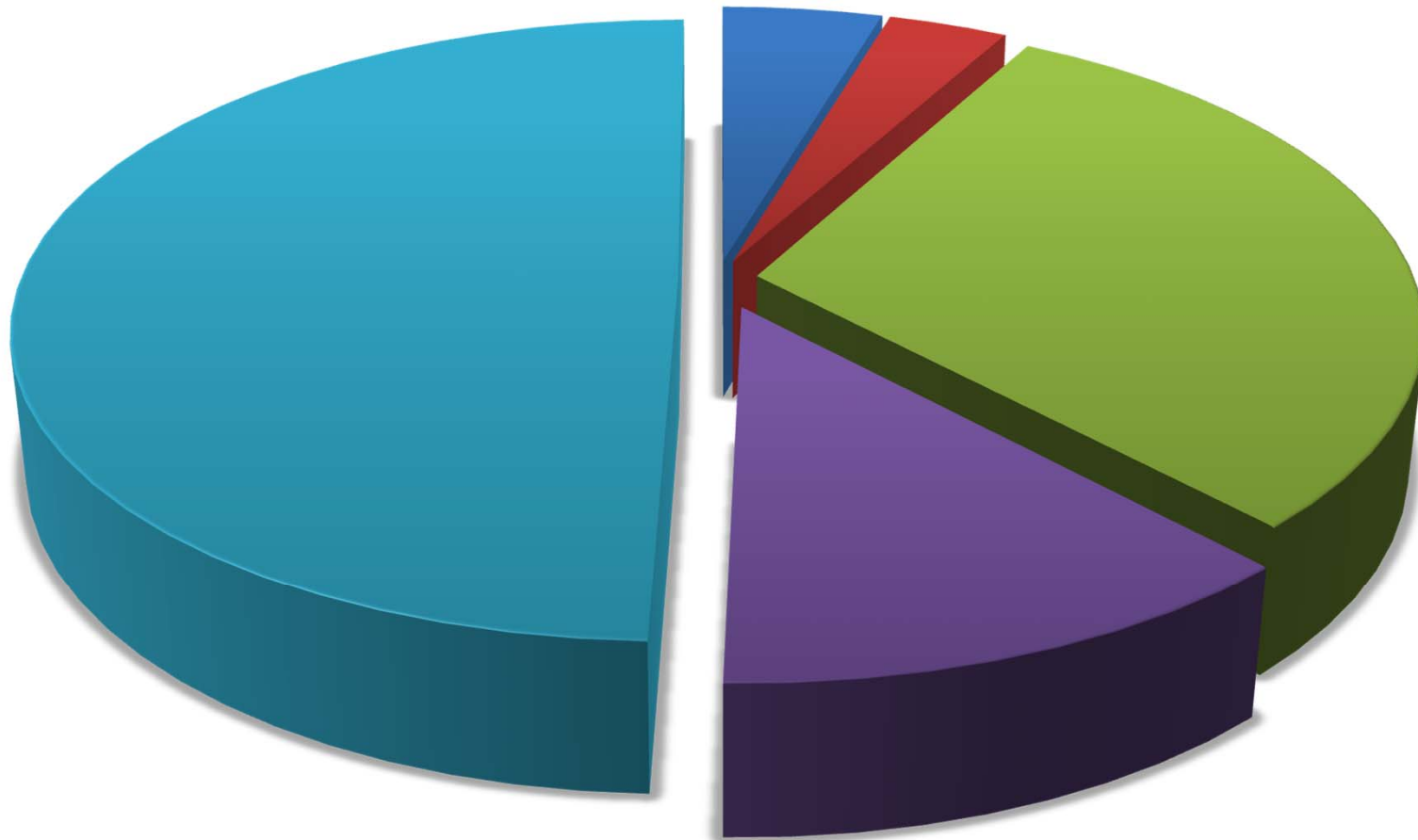
Mining for Release Cycle Time Patterns



Mining for Release Cycle Time Patterns

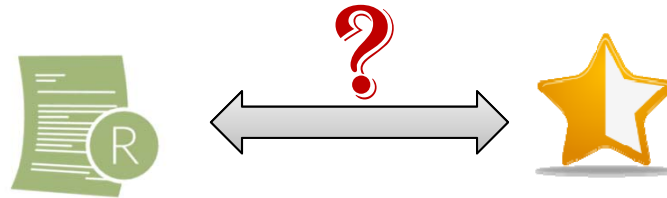


Dataset: 6013 Apps from Android App Store

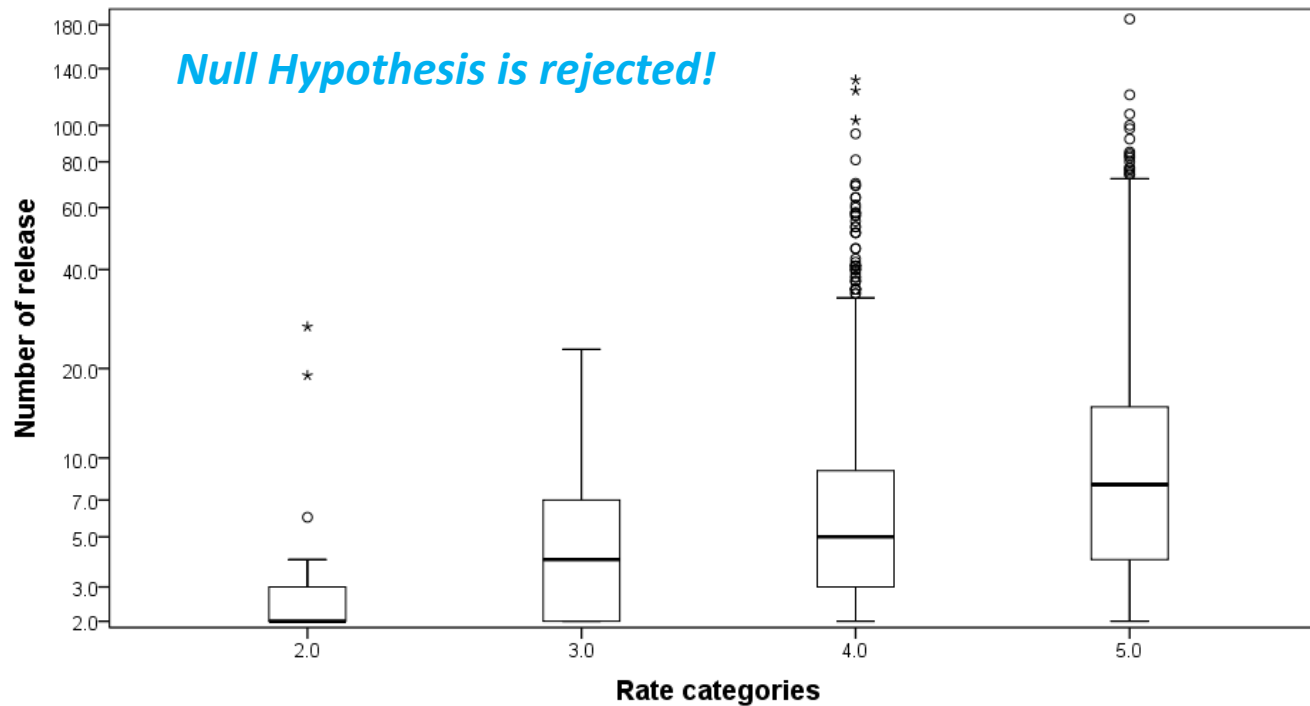


■ Redundent Records ■ Incomplete Data ■ One release only ■ Two release ■ The rest

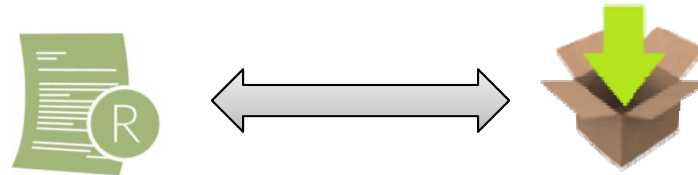
Number of Releases vs App Rating



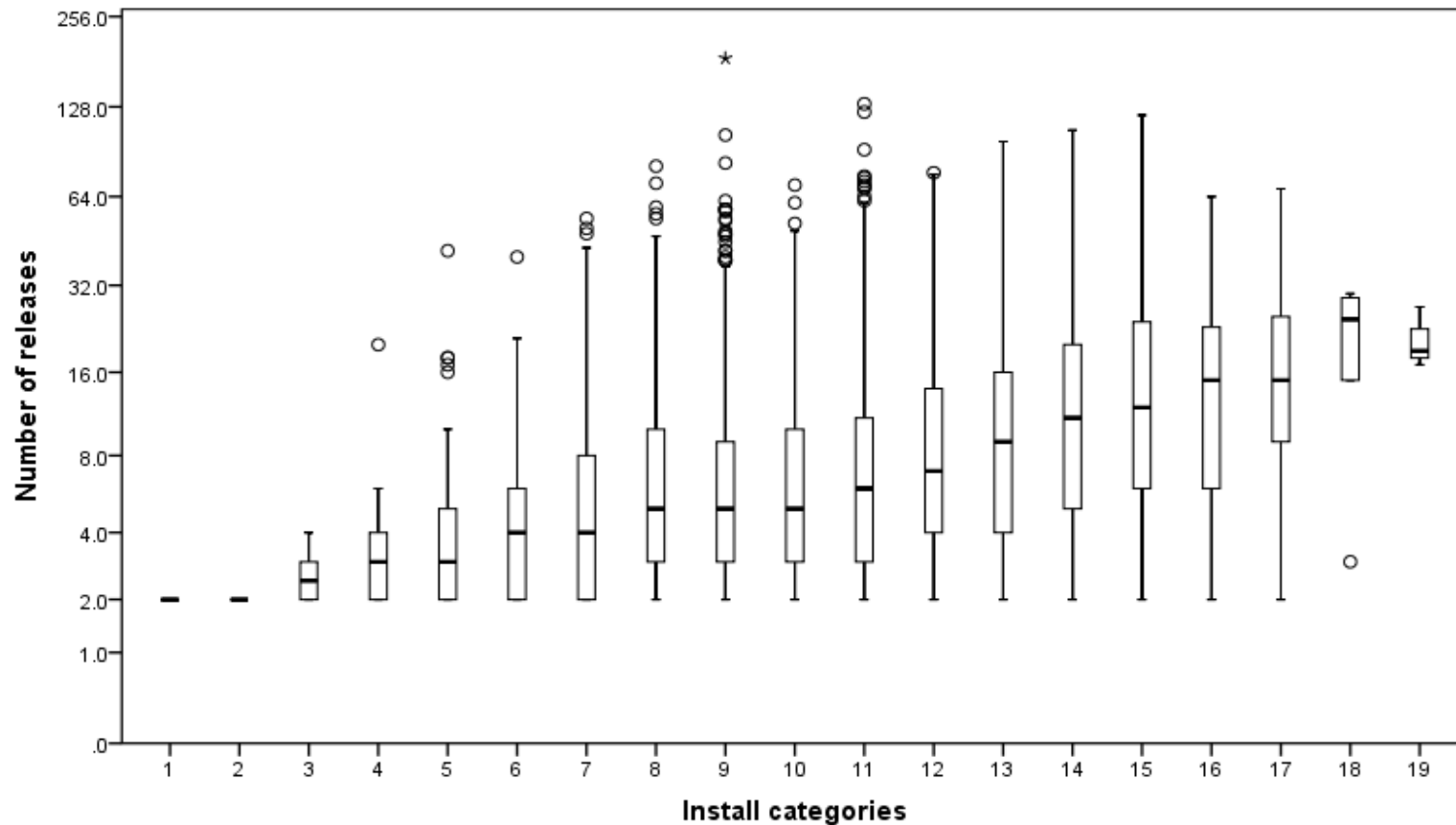
H_0 : No relation between # of releases and rate



of Releases vs # of Installs



H_0 : There is no relation between number of releases and # of installs



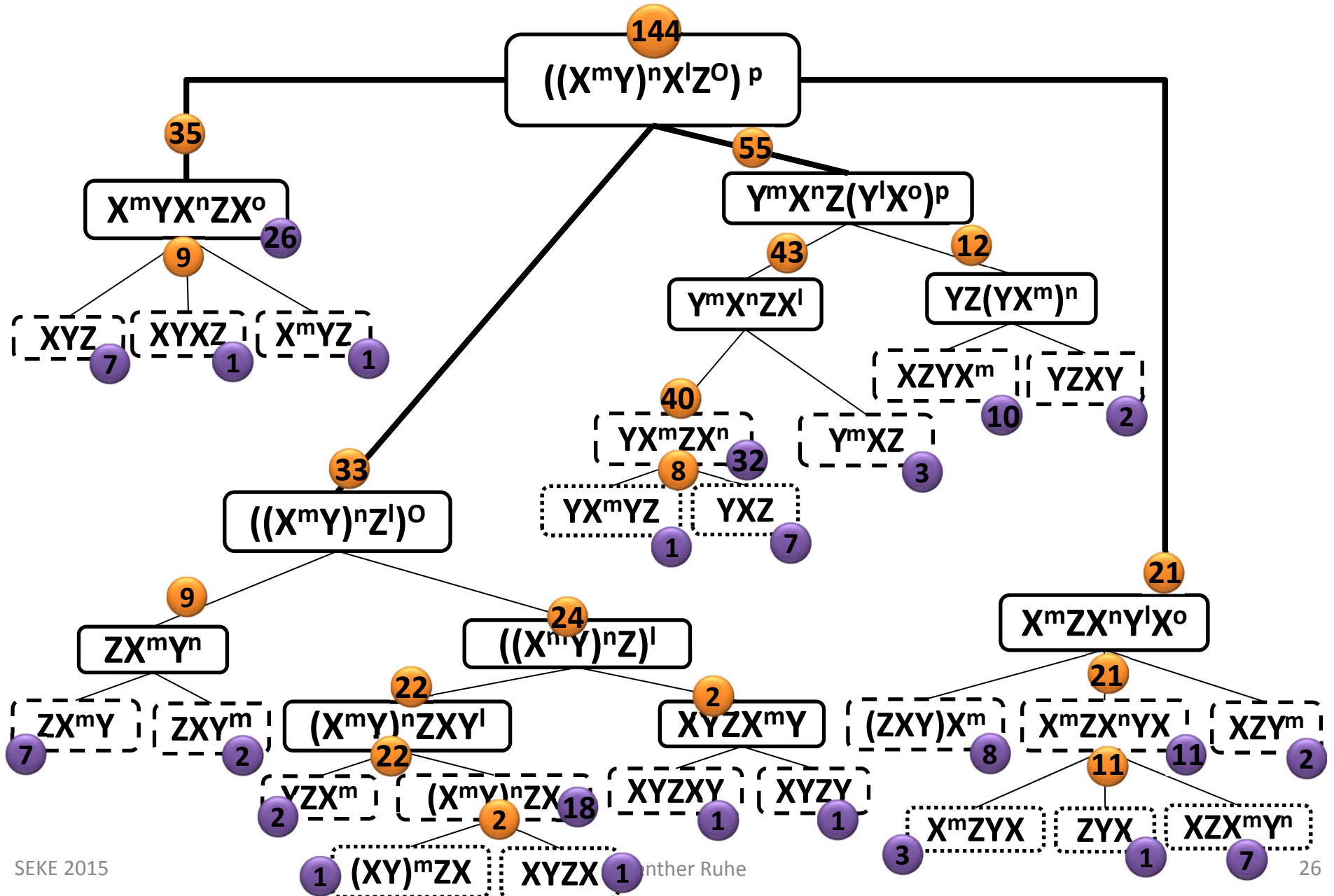
In Search for Release Cycle Time Patterns



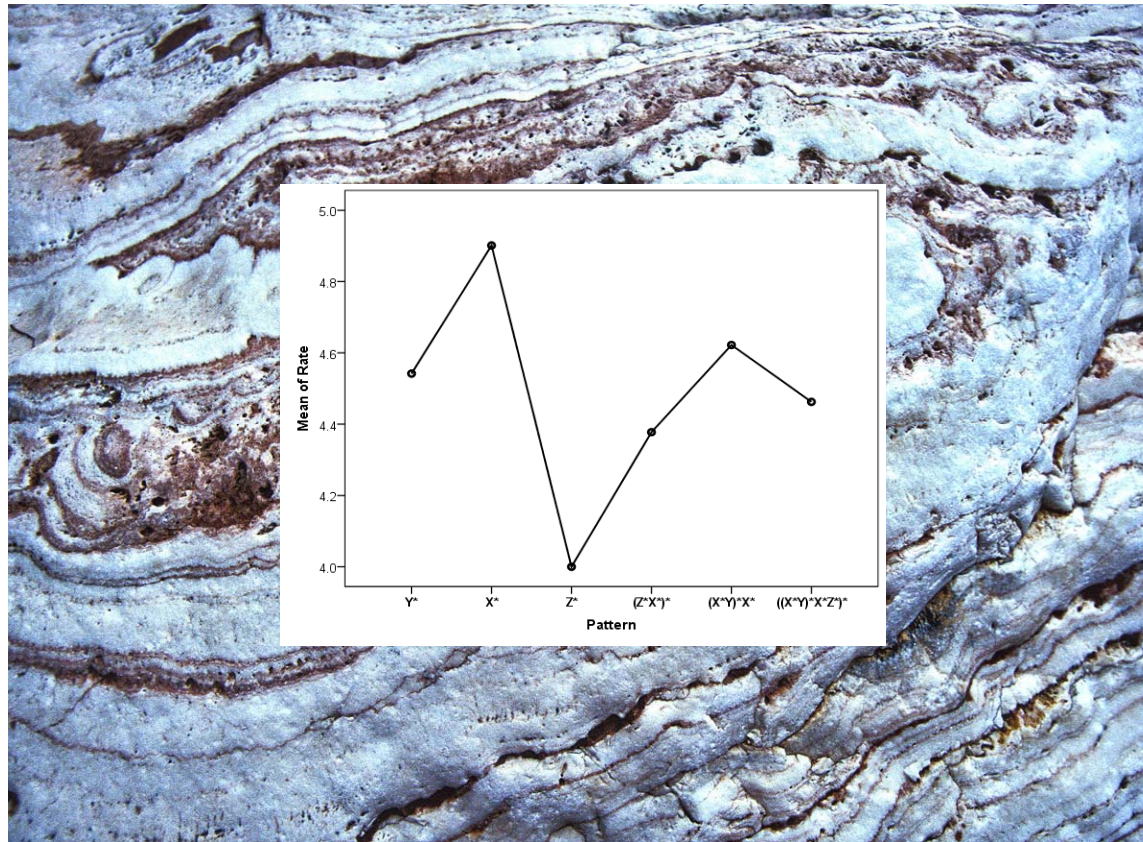
Patterns related to

- The length of release cycle times and their occurrence?
- The nature of releases (corrective, adaptive, perfective, preventive)?

"Y", "X" and "Z" Patterns Hierarchy



In Search for Release Cycle Time Patterns



Patterns related to

- The length of release cycle times and their occurrence
- The nature of releases (corrective, adaptive, perfective, preventive)?

Open Product Innovation – Sample Results



From (Android) app store mining: There exist release cycle time patterns associated with app ratings.

From text mining, Kano-based crowdsourcing and optimization: New product (Super app) design.

Adaptive product development from incorporating usage data and user feedback.

Customized product development from clustering of user interests.

New Products – Data & Information Needs

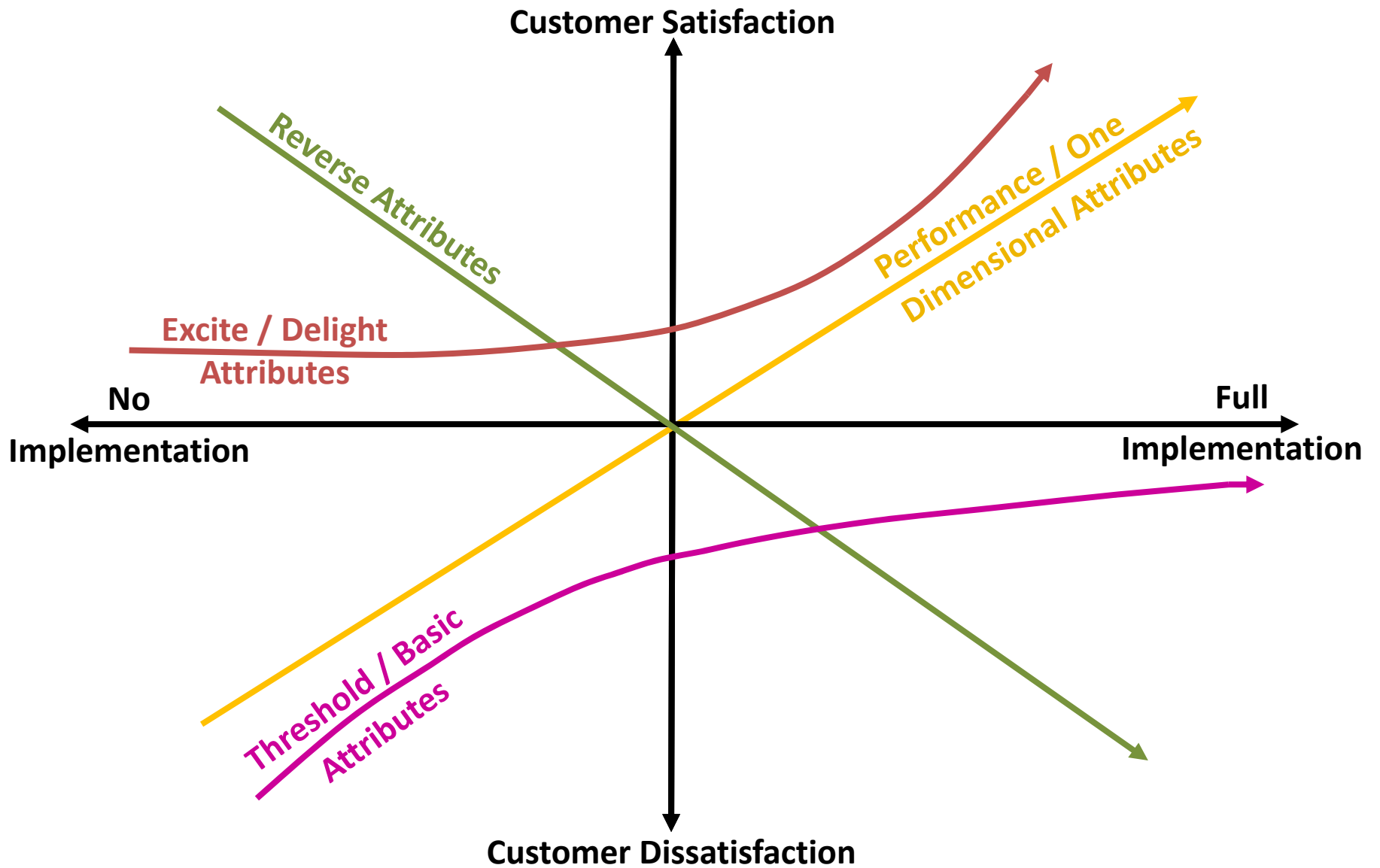
	Information needs							
Type of release planning problem	Features	Feature dependencies	Feature value	Customer needs	Stakeholder priorities	User feedback	Market trends	Cost
What to release	x	x	x	x	x		x	x
Theme based	x	x	x	x	x		x	x
When to release	x	x	x	x	x	x		x
Quality planning	x		x	x	x	x	x	x
Operational release planning	x		x					x
Consideration of technical debt	x	x				x	x	
Multiple products	x	x	x	x	x	x		x

Feature Prioritization: The Kano Model

Approach	Definition of Priority
Theory W	Stakeholders perception of requirement priority
Quantitative win-win	Stakeholders perception of requirement priority
Priority Groups	Stakeholders perception of requirement priority
Planning Game	Value, risk, and effort defined by development team
100 Points	Stakeholders perception of requirement priority
AHP	Stakeholders pairwise comparison of value and cost of requirements
Value-oriented prioritization	Core value for a company




Kano, N.; Seraku, N.; Takahashi, F.; Tsuji, S. (1984): Attractive quality and must-be quality, Journal of the Japanese Society for Quality Control (in Japanese) 14 (2), pp.39-48.



OTT Services - Kano Questionnaire

How would you feel if “Support of Video-on-Demand (VOD)” was provided with this mobile app?


- _____ I like it that way
- _____ It must be that way
- _____ I'm indifferent
- _____ I can live with it that way
- _____ I dislike it that way



***Functional form
of the question***

How would you feel if “Support of Video-on-Demand (VOD)” was NOT provided with this mobile app?

- _____ I like it that way
- _____ It must be that way
- _____ I'm indifferent
- _____ I can live with it that way
- _____ I dislike it that way



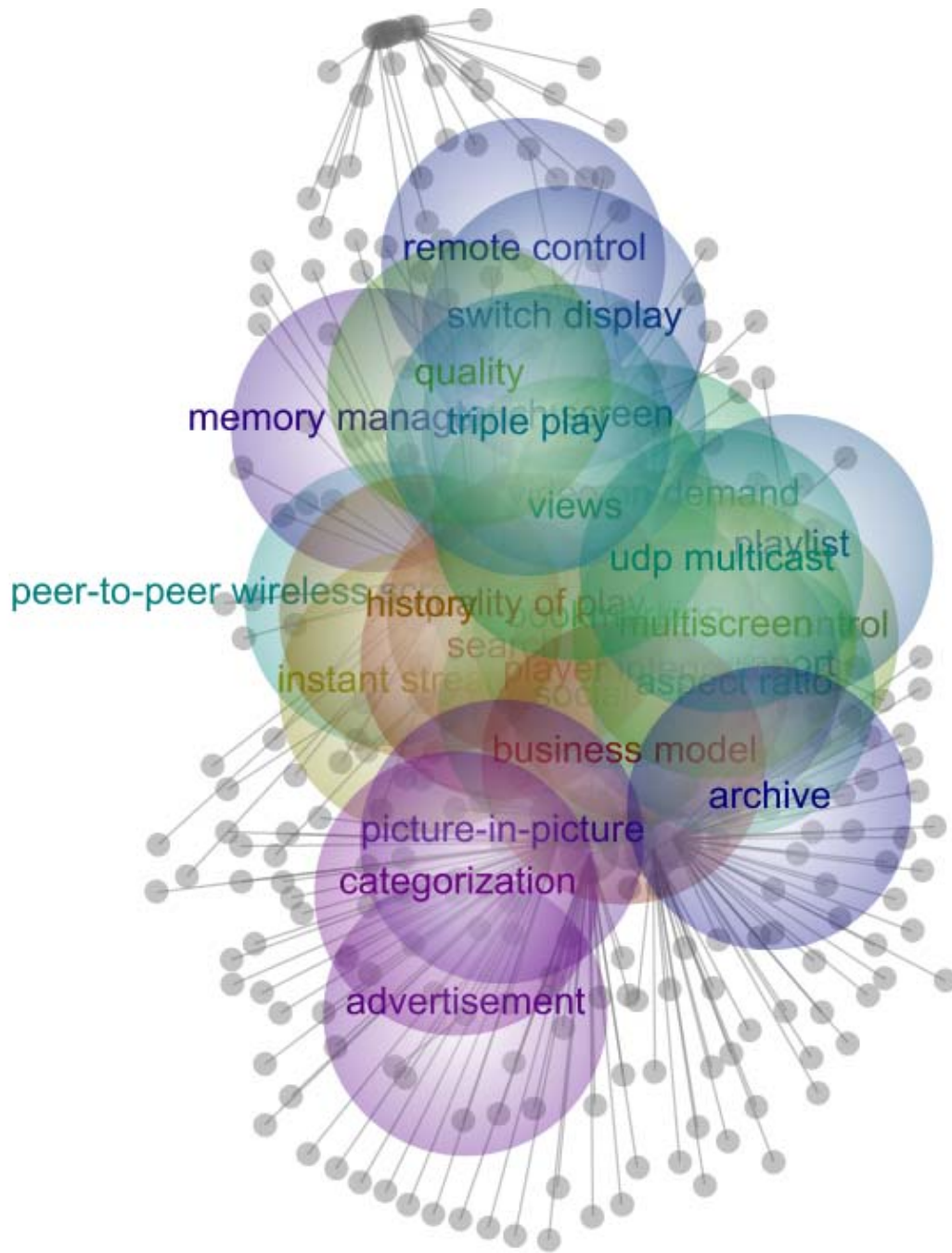
***Dysfunctional form
of the question***

https://qtrial2014.az1.qualtrics.com/SE/?SID=SV_eeMrc9WjpFX6ZKd

Kano Evaluation Table

Customer Requirements		Dysfunctional questions				
		Like	Must-be	Neutral	Live with	Dislike
Functional questions	Like	Q	A	A	A	O
	Must-be	R	I	I	I	M
	Neutral	R	I	I	I	M
	Live with	R	I	I	I	M
	Dislike	R	R	R	R	Q

Must-be (M) *One-Dimensional (O)* *Attractive (A)* *Indifferent (I)*
Reverse (R) *Questionable (Q)*



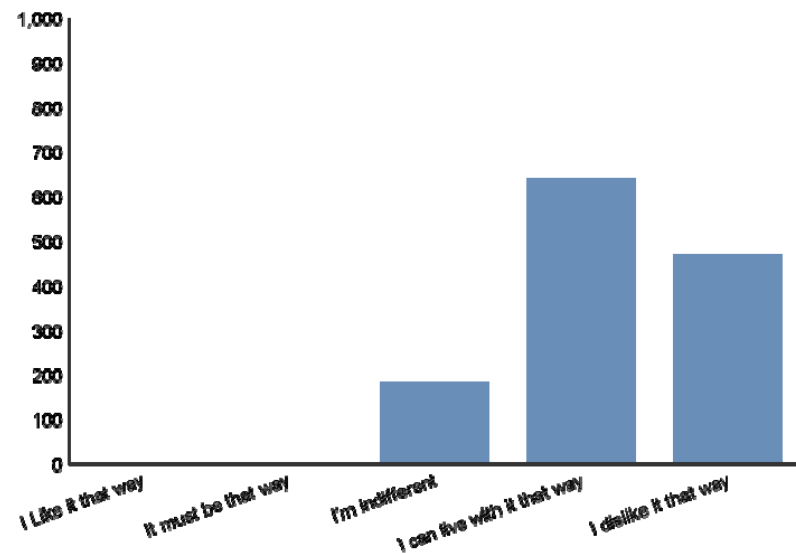
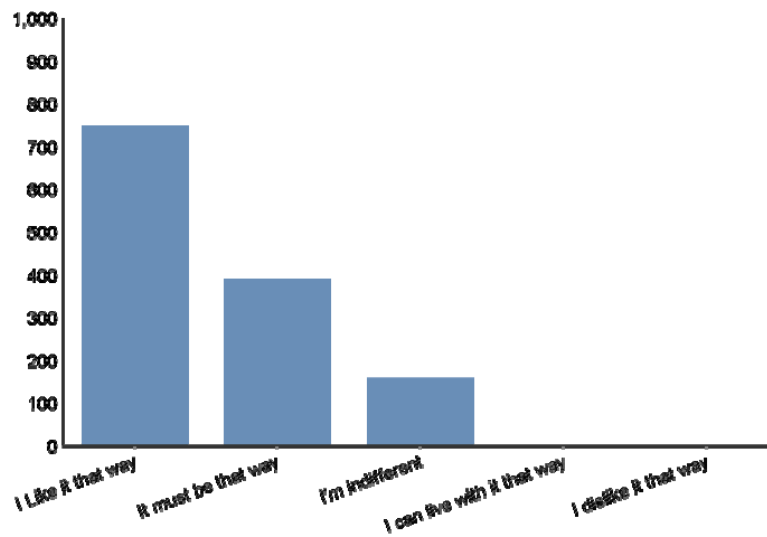
ServiceID	Service
S1	Live channel coverage
s2	Multiscreen
S3	Switch display
S4	Aspect ratio change
S5	EPG
S6	Remote control
S7	Support without touch screen
S8	Video on demand
S9	Youtube integration
S10	Source signal selection
S11	Variety of product usage model support
S12	Advertisement
S13	Archive
S14	Search
S15	Intuitive navigation
S16	Detect location
S17	Bookmarking
S18	Categorization
S19	Triple play
S20	Social network accessibility
S21	Playlist
S22	History
S23	Multicast
S24	Different views supportability
S25	Replay
S26	Instant streaming
S27	DRM
S28	Memory management
S29	Player integration
S30	Variety of quality support
S31	Parental control
S32	Channel preview
S33	Picture-in-picture
S34	Peer-to-peer wireless screen casting support
S35	Video recommendation
S36	Share content

Perceived Value from Stakeholders

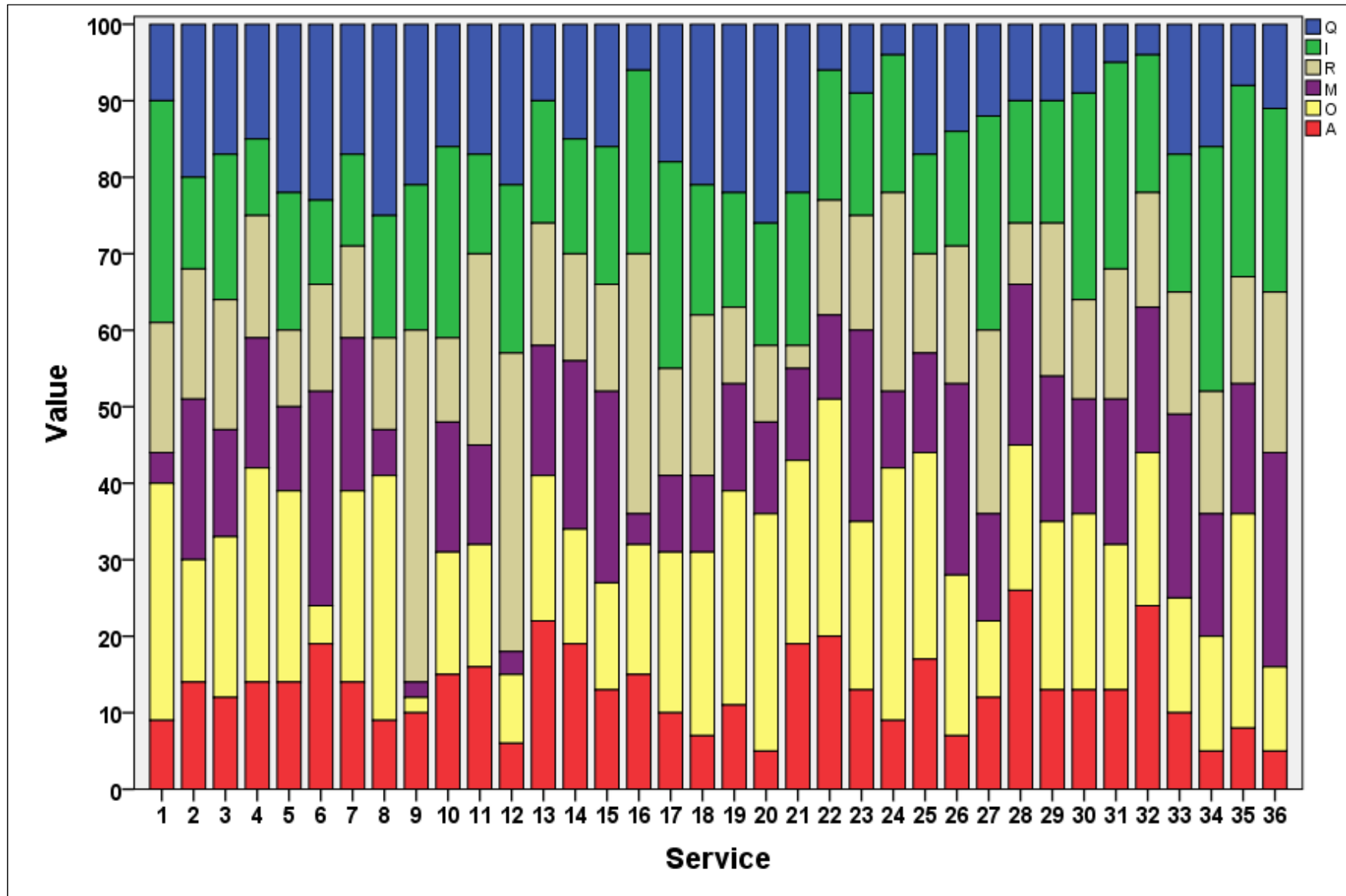
Integration with Youtube provides all the features in the Youtube website within the app.

9-a) How would you feel if "YouTube integration" was provided with this mobile app?

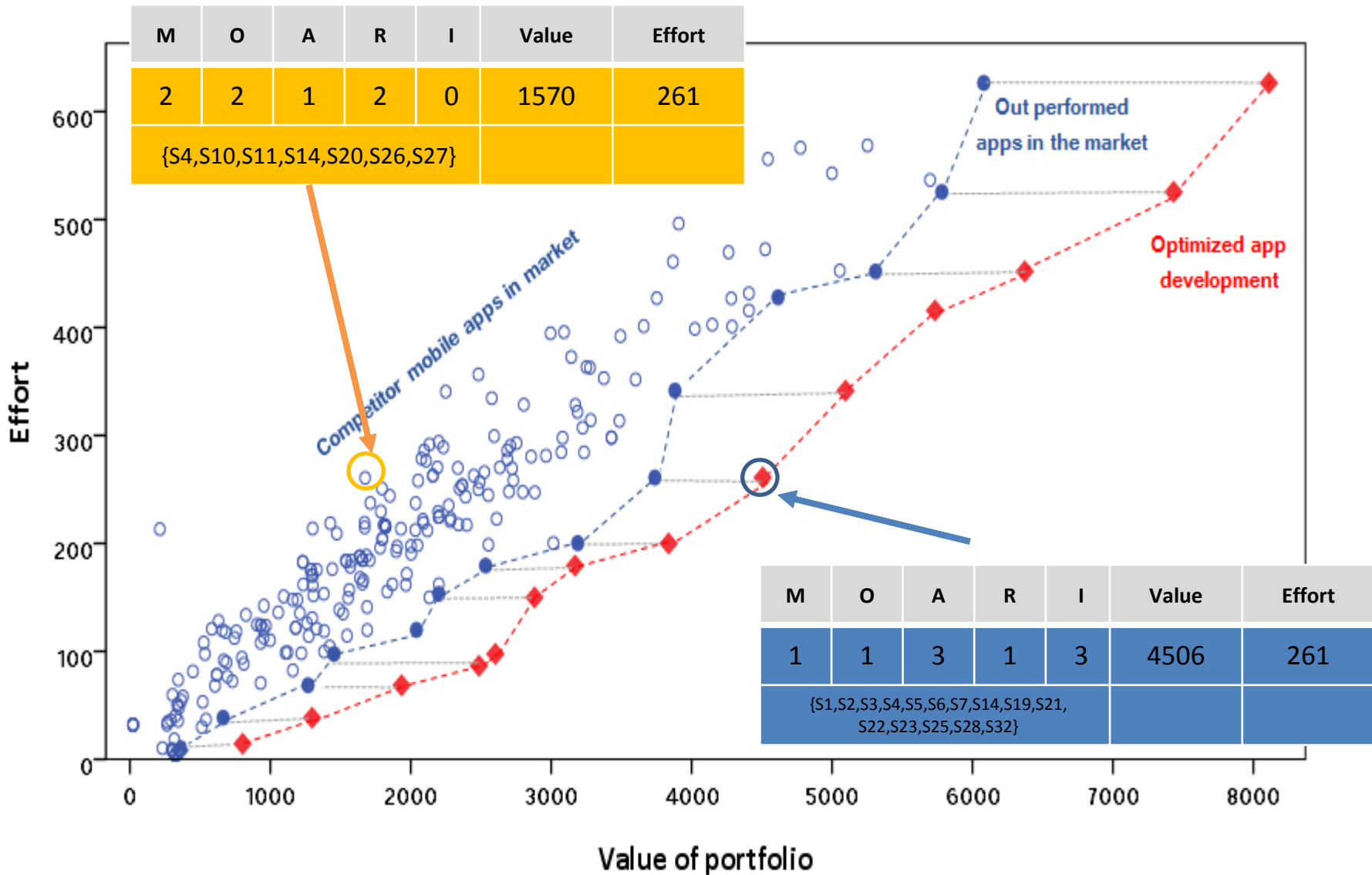
9-b) How would you feel if "YouTube integration" was **NOT** provided with this mobile app?



Perceived Value from Kano Crowdsourcing



New Product (Super App) Design



Open Product Innovation – Sample Results



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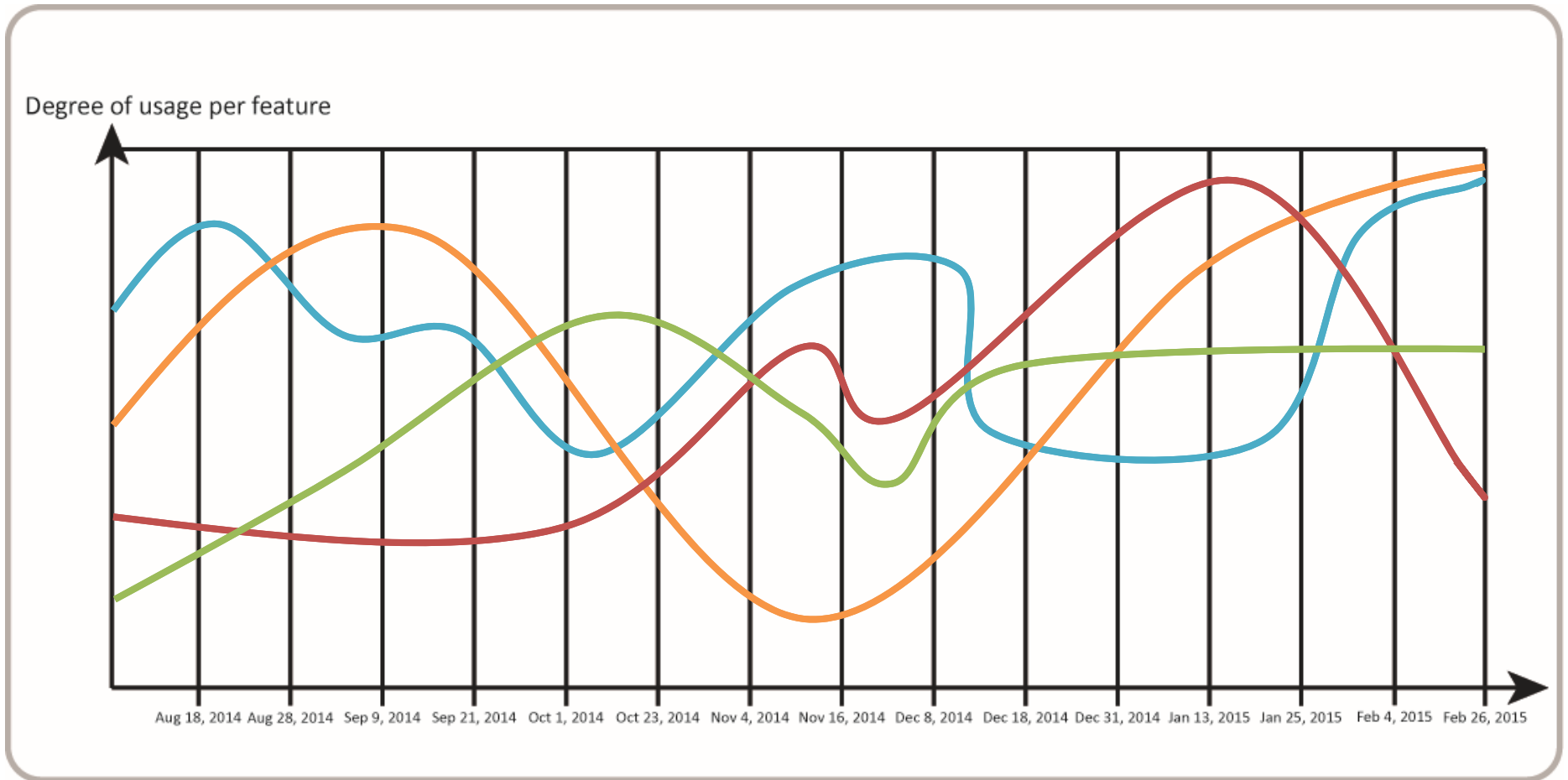


From text mining, Kano-based crowdsourcing and optimization: New product (Super app) design.

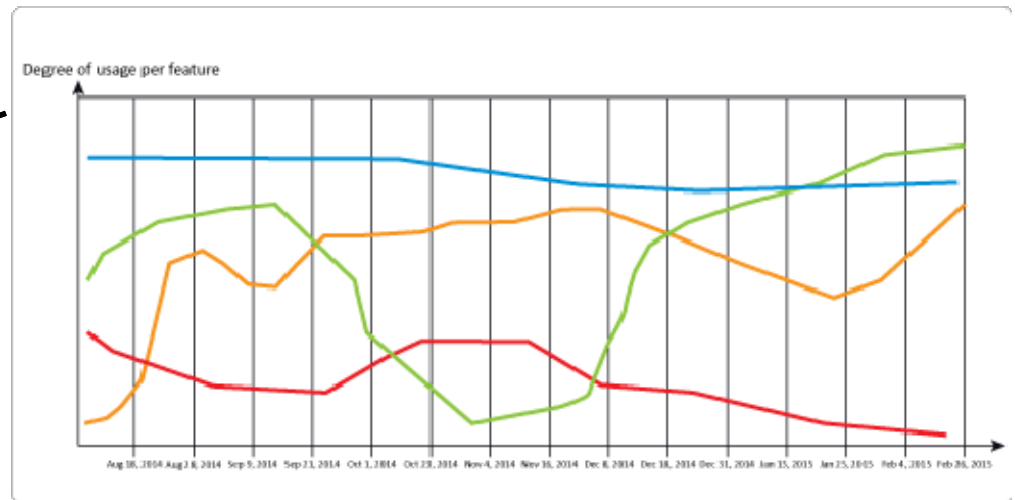
Adaptive product development from incorporating usage data and user feedback.

Customized product development from clustering of user interests.

Monitoring Usage of Features



Usage Feedback Analytics



#	topic	∅ rating	rating distribution
18	recommendation	4.88	
12	helpfulness	4.85	
13	feature info.	4.81	
117	how to	4.80	
11	praise	4.78	
111	content request	4.25	
∅ sample rating		4.08	
114	improvement. requ.	3.92	
17	other app	3.91	
18	feature request	3.89	
19	noise	3.67	
116	other feedback	3.67	
113	question	2.89	
112	promise	2.27	
14	shortcoming	2.10	
15	bug report	1.84	
115	dispraise	1.69	
110	dissuasion	1.39	



D. Pagano, W. Maaekj: User Feedback in the AppStore: An Empirical Study, RE 2013

Open Product Innovation – Sample Results



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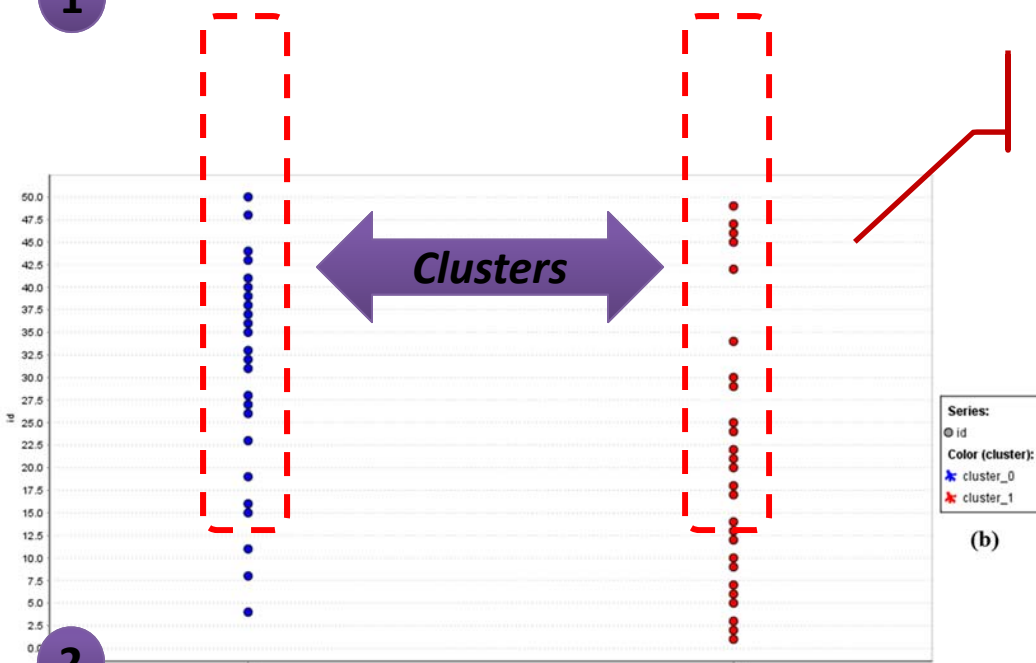


Adaptive product development from incorporating (real-time) usage data and user feedback.

Customized product development from clustering of user interests.

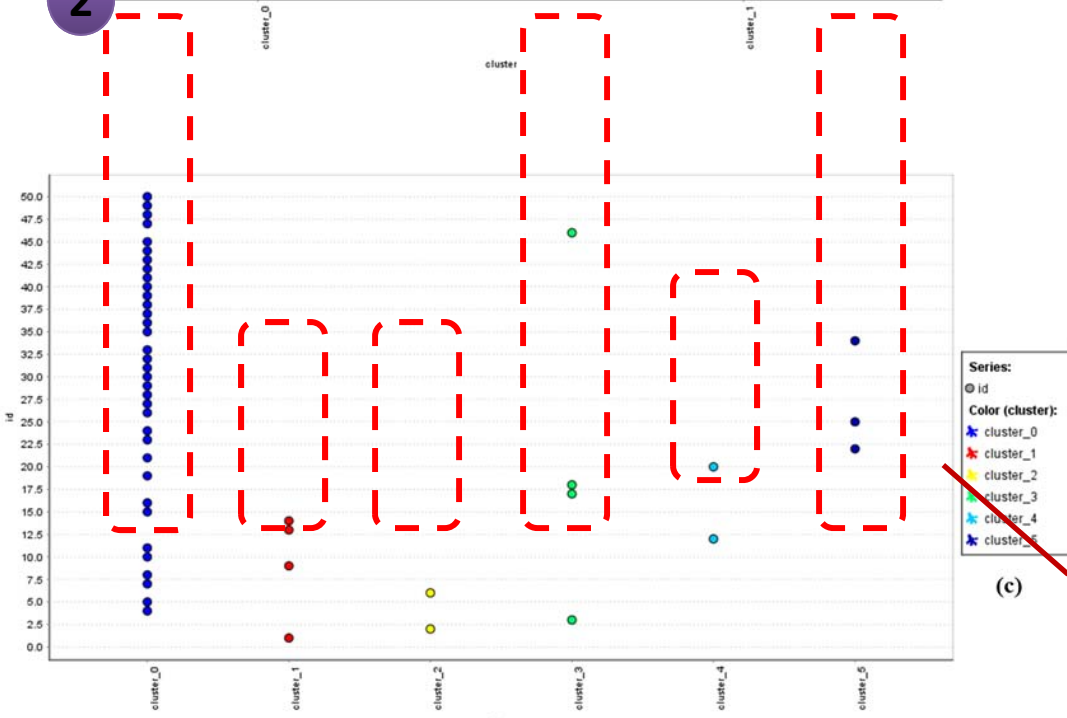
id	Epsilon: 10	Epsilon: 11
	cluster	
1	cluster 1	cluster 1
2	cluster 2	cluster 1
3	cluster 3	cluster 1
4	cluster_0	cluster_0
5	cluster 0	cluster 1
6	cluster 2	cluster 1
7	cluster 0	cluster 1
8	cluster 0	cluster 0
9	cluster 1	cluster_1
10	cluster 0	cluster 1
11	cluster 0	cluster 0
12	cluster 4	cluster 1
13	cluster 1	cluster 1
14	cluster 1	cluster 1
15	cluster 0	cluster 0
16	cluster 0	cluster 0
17	cluster 3	cluster 1
18	cluster 3	cluster 1
19	cluster 0	cluster 0
20	cluster 4	cluster 1
21	cluster 0	cluster 1
22	cluster 5	cluster 1
23	cluster 0	cluster 0
24	cluster 0	cluster 1
25	cluster 5	cluster 1
26	cluster_0	cluster_0
27	cluster 0	cluster 0
28	cluster 0	cluster 0
29	cluster 0	cluster 1
30	cluster 0	cluster 1
31	cluster 0	cluster 0
32	cluster 0	cluster 0
33	cluster 0	cluster 0
34	cluster 5	cluster 1
35	cluster 0	cluster 0
36	cluster 0	cluster 0
37	cluster 0	cluster 0
38	cluster 0	cluster 0
39	cluster 0	cluster 0
40	cluster 0	cluster 0
41	cluster 0	cluster 0
42	cluster 0	cluster 1
43	cluster_0	cluster_0
44	cluster 0	cluster 0
45	cluster 0	cluster 1
46	cluster 3	cluster 1
47	cluster 0	cluster 1

1



Having two cluster of customers

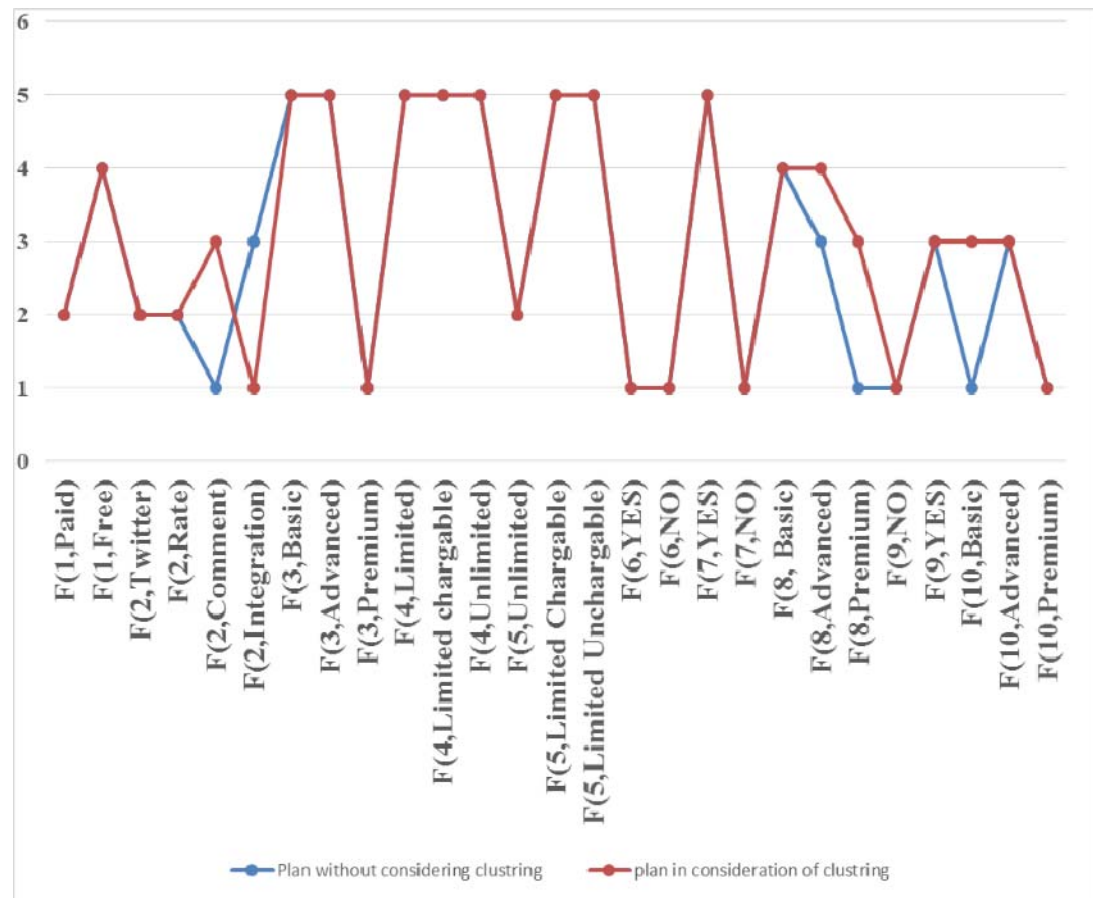
2



Having six clusters of customers

Customized product development (1/2)

Customized product development (2/2)



structural comparison of first alternative of plans in before and after

Criteria for Planning	Explanation	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
9-Willingness to pay + 0-Cost Estimate	Degree of optimality	100.0%	99.7%	99.3%	98.6%	98.3%
	(Stakeholder feature points)	(18354)	(18308)	(18220)	(18095)	(18045)

Value without considering clustering

Criteria for Planning	Explanation	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
9-Willingness to pay + 0-Cost Estimate	Degree of optimality	100.0%	99.9%	99.6%	99.5%	98.7%
	(Stakeholder feature points)	(19085)	(19060)	(19013)	(18994)	(18840)

Value in consideration of clustering

Open Product Innovation – Sample Results



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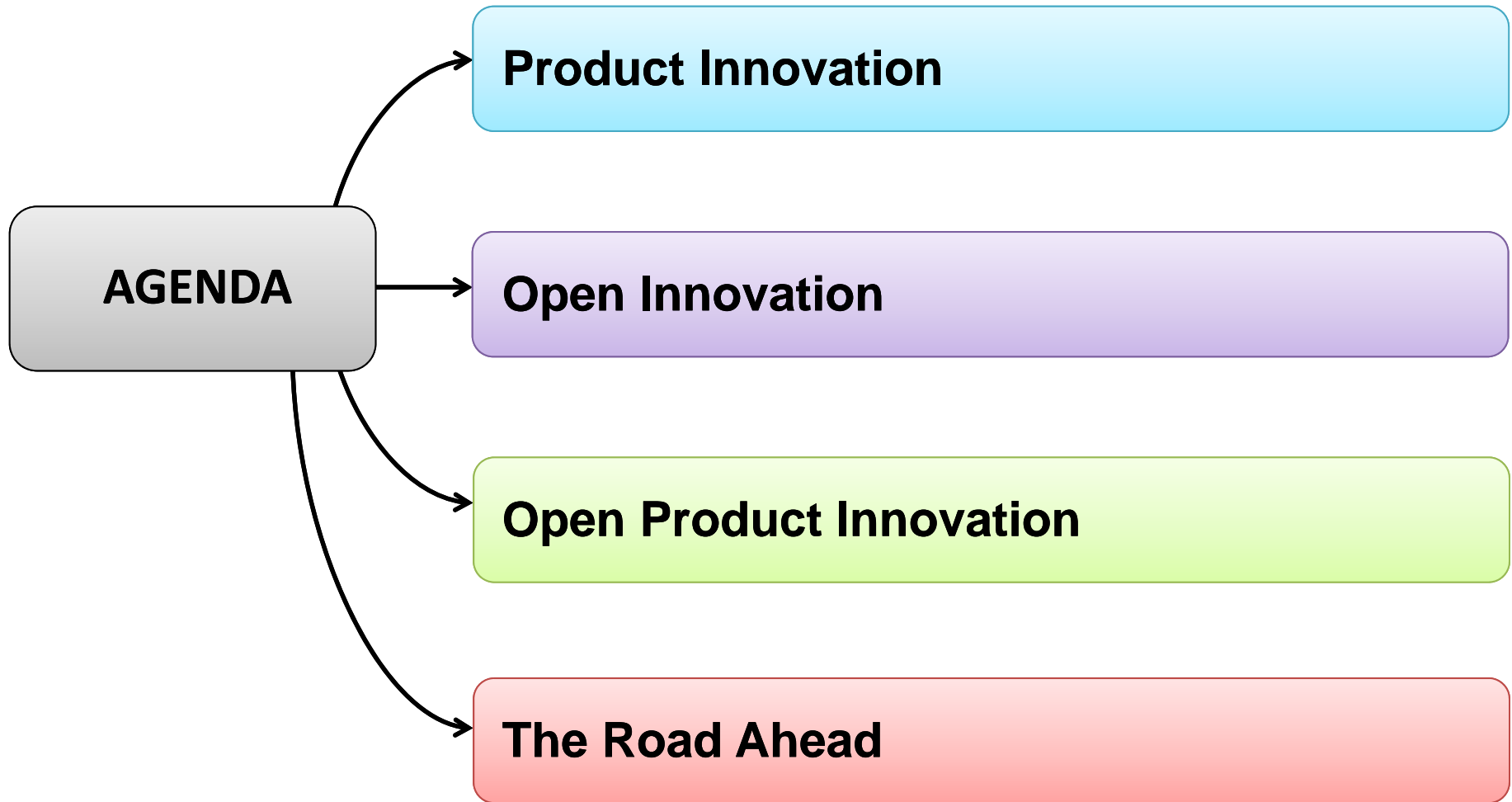
From text mining, Kano-based crowdsourcing and optimization: New product (Super app) design.



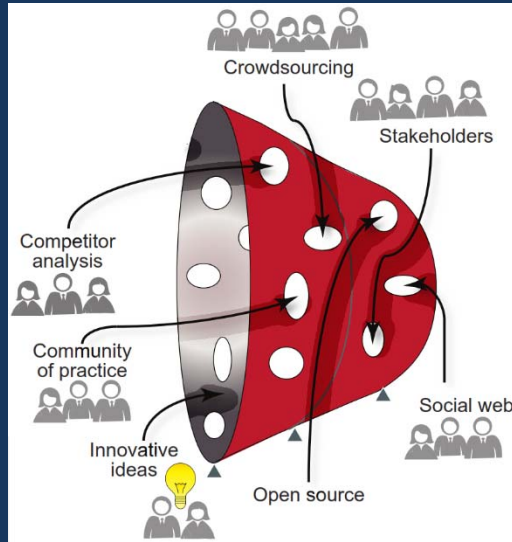
Adaptive product development from incorporating (real-time) usage data and user feedback.



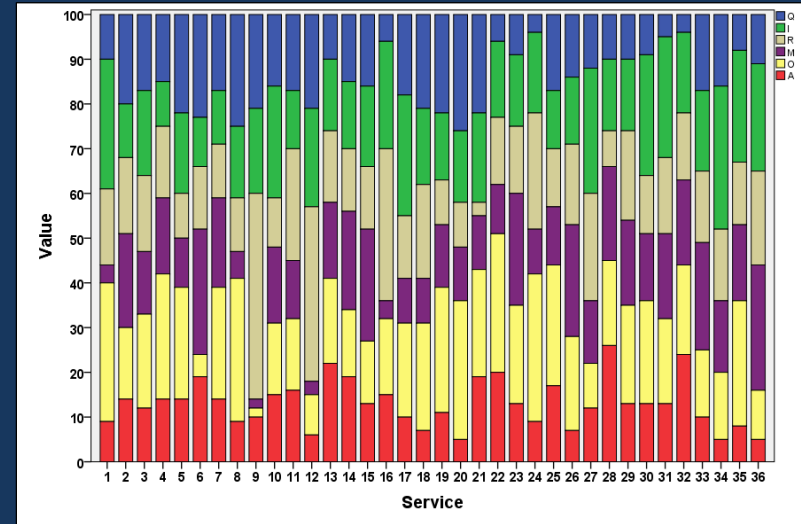
Customized product development from clustering of user interests.



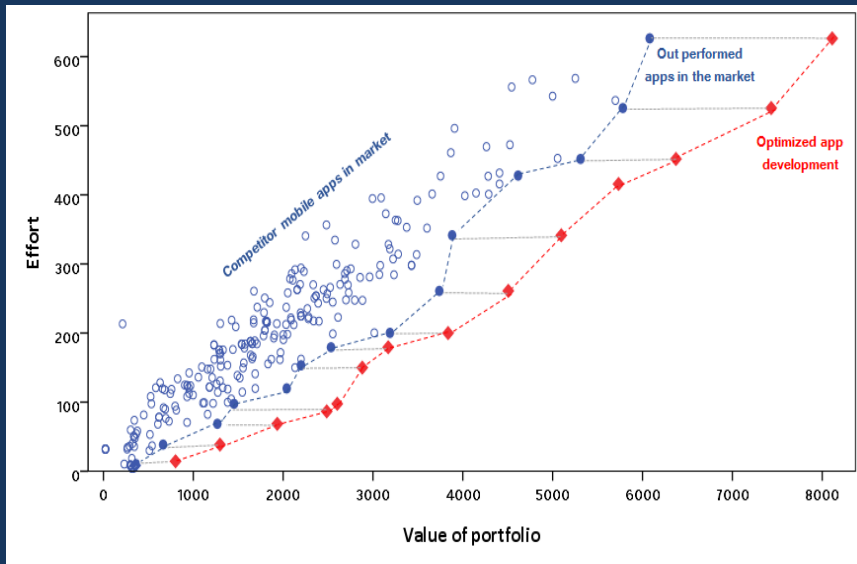
Open Innovation for New Products



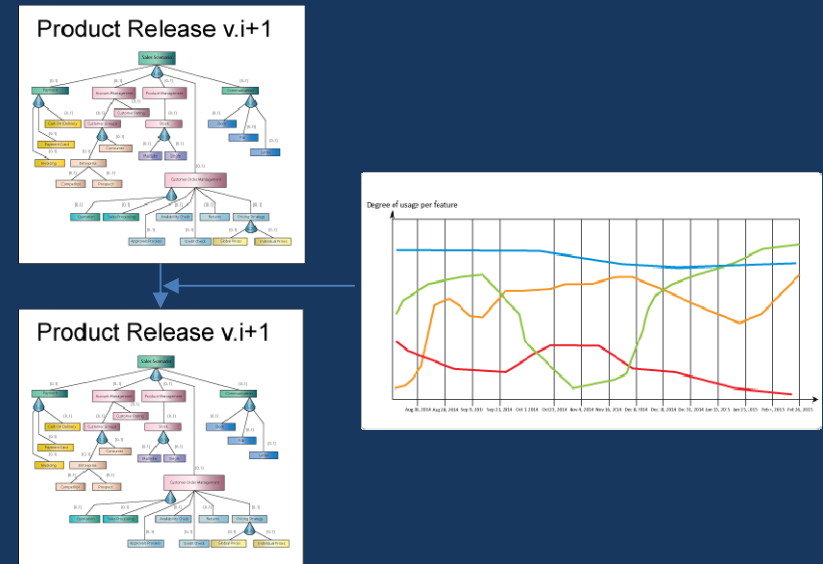
Kano-based Crowdsourcing



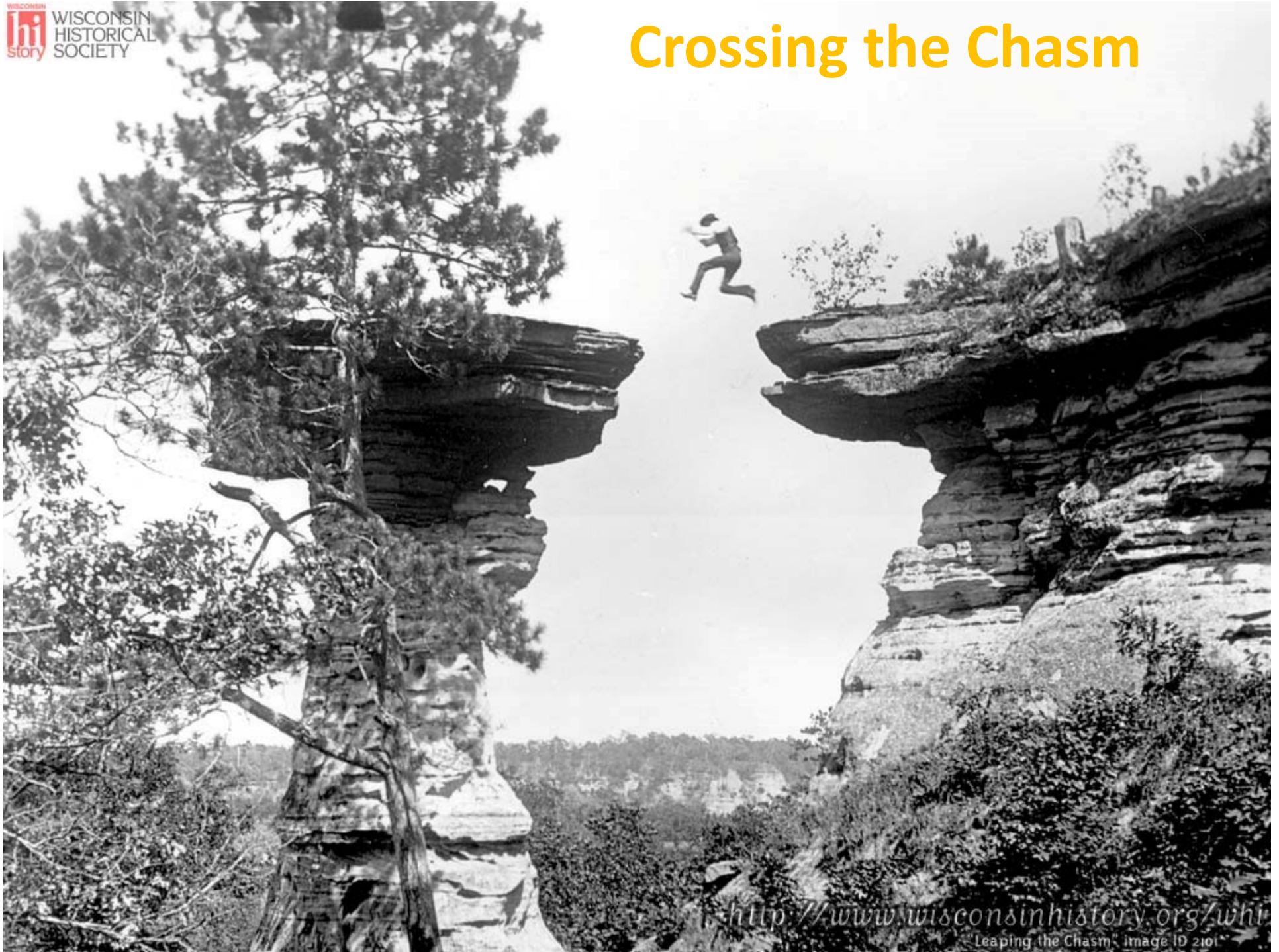
New Product (Super App) Design



Real-time Usage and User Feedback



Crossing the Chasm



<http://www.wisconsinhistory.org/whi>

"Leaping the Chasm", Image ID 2101

Open Innovation in Software Engineering



OISE

AUG 24 2015

Tallinn, Estonia



References

- [1] Nayebi, M and Ruhe, G (2015), “Analytical Product Release Planning”, In: The Art and Science of Analyzing Software Data: Analysis Patterns”, C. Bird, T. Menzies, and T. Zimmermann (eds.), Kaufman & Morgan 2015.
- [2] Nayebi, M (2014), “Mining Release Cycles in the Android App Store”, 36th CREST Open Workshop on App Store Analysis, London.
- [3] Workshop on Data Analytics, Dagstuhl, June 2014.
- [4] Chesbrough, H, “Open Innovation: The New Imperative for Creating and Profiting from Technology”, Harvard Business Press, 2003.
- [5] Maalej, W, Nayebi, M, Johann, T and Ruhe, G, “Towards Data-Driven Requirements Engineering”, submitted to IEEE Software (2015).
- [6] Mao K, Capra L, Harman M and Jia Y, “A Survey of the Use of Crowdsourcing in Software Engineering”, accepted for TSE 2015.

Acknowledgements

- Maleknaz Nayebi from Software Engineering Decision Support Laboratory at U of Calgary.
- Ongoing collaborations with Bram Adams (Montreal) and Walid Maalej (Hamburg).
- NSERC: This research was partially supported by NSERC Discovery Grant 250343-12.