

A Cognitive Dimensional Analysis of Idea Sketches

C r s C oo

oo o Co n/ n Co n n n
n/ n/ o B on B n/ n o -

n X or C n A C
n/ n/ C n CB AB n/ n o -

ABSTRACT

n/ n n = no/ on o o n/

1 1 n' on - 1 1 /o on , a l , (s) /o n' / - n l l n o l
o r l n x - n x / = n l - o n /y /y - 11 n' /y a on l n x = oo, a l l l
n x n a a n l l l x n l l l l o a x n l n x l l l (- a l l l l
x n x l l l l l l l l l l o o x l l n o l n x n' l o x l o l o l l l l l o n o
n l on n l l l l - on x l l x o l l o l r l l n x n x l l n' l on l l l l
l x n l l - o l x l l n h -

1 1 l x x l o - /y - l l l l o l n a on' r l - n n n l l n n
Co n l l n - l l l x l on l o - l l l l - n = l l l l x l on n x =
o n l on n l l l on x l l l l on l l l o l o l o n' l o n' /y
n' l l on /y n l on n x l l on l n l o x o n l l n n x o o /y
l o o a n l l on l o l on l l on - l o /y - o n l o r a o /y
l l o n l l l l on o /y a n l o l l l y on n o l n x /y l l l l n x n'
l l l x /y - on l = n = x l l l x o n l on n x on l - on l o x l on n x
l l l l o l l n - o o l n x l l l l o a o' = n x on' - l l l l x
o n l on n l l o x l l l on n on x l o a l n l o l o l l l y l l l l l l
l o n l l l l l l n o r o n l l l - n l l l l o x l l l l x
o n l on l l l o o on n l on n x l l l l l l l n o n l l l l l l l l l l l
x l l l x o n l on o on l o l r l l n l l n' l on n x o n l on /y l
o l l l n' l l o l o r l l - o' n n o l on o x l on o x l l l - n
l l on = /y l l l /y a x /y l on n o l n x /y l l l l l l o l l o x l n
l l l = o x l o l l l o l o o n l l y l l n - n x l o l o x l n
x l l o l l n x n' o x l n x n l l l l - n x n l l l n x

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⌘ n l l l n o l on o x l l l l n l l o l l on l l
l l l o l n n o l on l n o x o n o l n n o l l
⌘ n n l o n l l l l n l on o x l l n l n l l l o l l o l o
⌘ n l on n l l l l l n l on o o l l l l - n l l
l l o l l n l on l o o l l l o l l n l o l l n l n
n l l l o l l o l o n x l o l l l l l l o o x l l l o l l -
l n = l o o o n l x n on ⌘ l l n l l o n o l l n l x l x
o l o l o n l o on l l o x l o l l l o l l o l l n l
o l l l o l n n l l o l l l l l o x n n l o l - Co n l x n on

D s. n r t. on

o n l x n on n o x n l on no l on n' l o l x
o l x l o no l x o l n l on o x o
n l on no l on l o l n l on n x l x n o l
n x n n o l l n o l on x on x
no x n no l on l x no x on n o l on o l on
l n l o l l n l x n n l on o l o l o l l
x l no l on l o n n no l x n l n' o
l l o x n l o o l on l n o x l l o o no l l l
o l o x h on - o l o n l x n on l o

o/ψ. |_- o/ψ |_- n_x -_ x |o_x o - |_- n_x n n |n s # o s_n l -_ o |_-
o n/ψ x y on l | l - l l - l | n' = n l l y - n l -_ n | on n
r | l n -_ x y | l - l -

I have easy access to a computer terminal with text editing facilities
 It is inconvenient for me to get access to a computer

	Sample	A (1-3)	missing	B (4-7)	%A	%B
1	A: I have easy access to a computer terminal with text editing facilities B: It is inconvenient for me to get access to a computer	ALL	121	1	6	

		Sample	A	No Pref.	B	%A	%B
6	A: Except where I am reworking existing text, in the early stages of planning a long and complex text I prefer to use pen/pencil B: Even when not reworking existing text I prefer to use a word processor in the earliest stages of planning a long and complex text	ALL	51	19	58	47	53
7	A: I find it easier to think with conventional media B: I find it easier to think when using a computer	ALL	47	36	42	53	47
8	A: Even in situations where I have a computer to hand I sometimes choose to use conventional media B: Wherever possible, I always use a computer in preference to conventional media	ALL	66	17	44	60	40

J: Some things are in capitals and circled and they've got this brace here. And they were easy to do - you didn't have to think about it.

	Sample	A	No Pref.	B	%A	%B	
10	A: When trying to think I do not want to be concerned with the practicalities of using a computer	ALL	43	18	62	41	59
	B: When thinking on the computer, I do not find using menus and toolbars, etc, intrudes on my thoughts	CMP	24	13	21	53	47
Spearman correlation with "preference"		N = 119		$\rho = 0.35$	$p < 0.0005$		

	Sample	A	No Pref.	B	%A	%B	
16	A: It is easier to organise and structure ideas when they are represented as terse notes or idea sketches	ALL	101	14	10	91	9
	B: It is easier to organise and structure ideas when they are represented as grammatical prose	CMP	52	4	3	95	5
Spearman correlation with "preference"		N = 121		$\rho = 0.316$	$p < 0.0005$		
17	A: When the structure of a text is clear from the beginning I am less likely to use terse planning notes	ALL	66				

no on to to v = - o o o o n
no x y - v x o n x o - n

1 1 n' on /V no' - o/V 1 1 o /V 1 n, n 1 o 1 1 on n' on x - o/V
 a1 on, n 1 on - - n, n' n 1 o. o1 x 1 n, 1 - 1 1 n' on -
 1 on 1 1 1 1 n x 1 o, n 1 1 - n 1 1 1 1 n' on, on 1 on 1 1 o, n,
 o 1 1 n 1 o 1 1, a, 1 1 - n -

	Sample	A	No Pref.	B	%A	%B	
20	A: I sometimes cluster related idea labels spatially on a page	ALL	80	22	22	78	22
	B: It is not significantly helpful to arrange related notes spatially on a page	CMP	42	11	6	88	12
Spearman correlation with "preference"		N = 121		$\rho = 0.194$		$p < 0.05$	
21	A: When planning a text it is sometimes useful to draw diagrams of ideas (like informal "mind maps" or "spider diagrams")	ALL	62	19	47	57	43
	B: When planning a text it is not useful to draw diagrams of ideas (like informal "mind maps" or "spider diagrams")	CMP	35	13	14	71	29
Spearman correlation with "preference"		N = 124		$\rho = 0.312$		$p < 0.0005$	

44 o t o n t r o p r p t s

$\frac{n_x}{1 - \alpha} = \frac{n}{1 - \alpha} \Rightarrow n_x = n$
 $\frac{n_x}{1 - \alpha} = \frac{n_x}{1 - \alpha} \Rightarrow n_x = n_x$
 $\frac{n_x}{1 - \alpha} = \frac{n_x}{1 - \alpha} \Rightarrow n_x = n_x$
 $\frac{n_x}{1 - \alpha} = \frac{n_x}{1 - \alpha} \Rightarrow n_x = n_x$

n no!

I would always write things down because otherwise you work through your ideas... and if you haven't written them down you come to the end and you've forgotten things at the beginning. So basically it's just like a memory, I suppose. You can remember what you've thought and in what order you thought it.

D: I would always write things down because otherwise you work through your ideas... and if you haven't written them down you come to the end and you've forgotten things at the beginning. So basically it's just like a memory, I suppose. You can remember what you've thought and in what order you thought it.

J: A blackboard would be better in that the thing can be manipulated whereas here we wanted to show things but other things couldn't be moved out of the way, they had to be sliced in there and that made it quite confused, or made it confused to me.

		Sample	A	No Pref.	B	%A	%B
34	A: It is fine to reorder ideas on paper by drawing an arrow from an idea to its new location	ALL	45	21	60	43	57
	B: If you reorder ideas with arrows the notes quickly become messy and confused	CMP	24	8	28	46	54

4 por r.n ss

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Handwritten notes with various symbols and arrows, including the word "on" and a large "M".

O: We used a lot of these arrows that are a lot like implication arrows. We seem to sort of understand what we mean by those. I use that lots when I do this sort of thing and it can mean all sorts of things. It's kind of "led to", "developed into", "related to", sorts of things.

	Sample	A	No Pref.	B	%A	%B
36	A: Ambiguous notes are useful as you can jot down an idea without yet being quite sure what it is	98	16	13	88	12
	B: I do not write down an idea until it is concrete enough to be written down unambiguously	49	9	4	92	8

	Sample	A	No Pref.	B	%A	%B
38 A: Some notes which I produce when planning a text would be unintelligible to someone else	ALL	104	8	16	87	13

<p>Delayed Gratification</p> <p>transparency</p> <p>richness</p>	<p>How much effort and delay is involved in creating a representation. It is sometimes important to get ideas down quickly and conventional media is often better for this.</p> <p>Can the user be unconscious of the system and concentrate on the task? It is important that the interface does not demand cognitive resources. Computers are more opaque than paper!</p> <p>Does the representation include many graphical marks, redundant encodings, etc, because it is quick and easy to make it so? Richness facilitates perceptual cueing.</p>
<p>Terseness</p> <p>overview</p> <p>structurability</p> <p>visible area</p>	<p>Are there few symbols per idea? Terseness allows overview, structurability, lower delayed gratification and in turn higher richness. Conventional media seem to favour terseness.</p> <p>Can the user perceive much of the representational structure at once? Overview favours accessibility and structurability. Conventional media afford better overview.</p> <p>Is the user's ability to reorganise the structure facilitated by and increase in accessibility and lowering of viscosity which results from terseness?</p> <p>Is there a large display area for the representation? A large visible area, combined with terseness, supports overview and structurability.</p>
<p>Perceptual cues (typographical)</p> <p>Perceptual cues (graphical)</p>	<p>Can the user produce many typographical marks easily? Typographical cues are facilitated by low delayed gratification and help accessibility by providing an access structure.</p> <p>Can the user easily produce graphical marks like clustering, linking, etc? Graphical cues may not be produced on computer due to low richness.</p>
<p>Accessibility</p> <p>location through perceptual cues</p> <p>facilitation through terseness</p> <p>meaning through perceptual cues</p>	<p>Can the user access information with ease? Where idea labels are continuously perceived they help maintain elements in working memory and assist long term memory retrieval.</p> <p>Do perceptual cues help the user direct attention to the relevant parts of the representational structure? Computers do not generally allow such rich perceptual access structures.</p> <p>Does terseness assist the user in directing attention to the required parts of the representational structure? Conventional media seem to allow this more.</p> <p>Can perceptual cues be used to carry meaning, or provide context which facilitates the recall of meaning? Conventional media may facilitate recall with perceptual cues more than computer.</p>
<p>Premature commitment</p> <p>downsliding</p> <p>finished character</p>	<p>Is the user forced to make choices too early in the task, or can she explore different options fully with the representation? Many idea sketchers use ambiguous notes.</p> <p>Is the user drawn into fine grained production of grammatical sentences, when they are trying to operate at a more global, exploratory level? Downsliding leads to premature commitment.</p> <p>Does the typographical character of a representation fairly reflect its provisionality, or does its finished looking character mislead the user? Computer text can lead to downsliding.</p>
<p>Viscosity</p> <p>exhibits evolution</p> <p>temporariness</p>	<p>Does the representation offer high resistance to editing? Computer "cut and paste" should reduce viscosity, but it is not a great problem for conventional media.</p> <p>Does the representation display its history, as well as its current state? History is likely to be displayed if deletion is difficult, and may provide context which assists encoding and recall.</p> <p>Is there much investment in the representation, or is it intended to be thrown away shortly after production? Temporariness overcomes viscosity, and discourages premature commitment.</p>
<p>Formalness</p> <p>faithful conveying</p> <p>semantic potential</p>	<p>Does the representation unambiguously carry meaning for someone with the right background and language, or does it rely heavily on context for interpretation? Idea sketches are informal.</p> <p>Can the representation be used for asynchronous communication with others or the self? Informal idea sketches are often unintelligible outside the context of their production.</p> <p>Can the representation mean different things? Semantically potent representations are quicker to produce, terser, avoid premature commitment, and lower viscosity.</p>

Chart Summary of cognitive dimensions and subdimensions of idea sketches

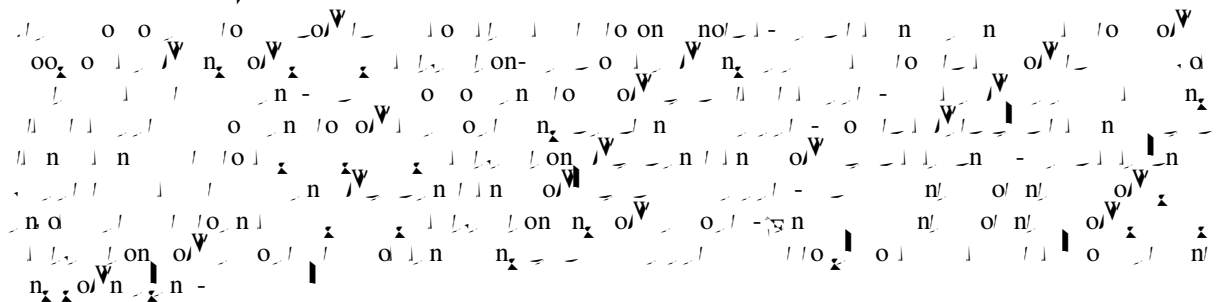
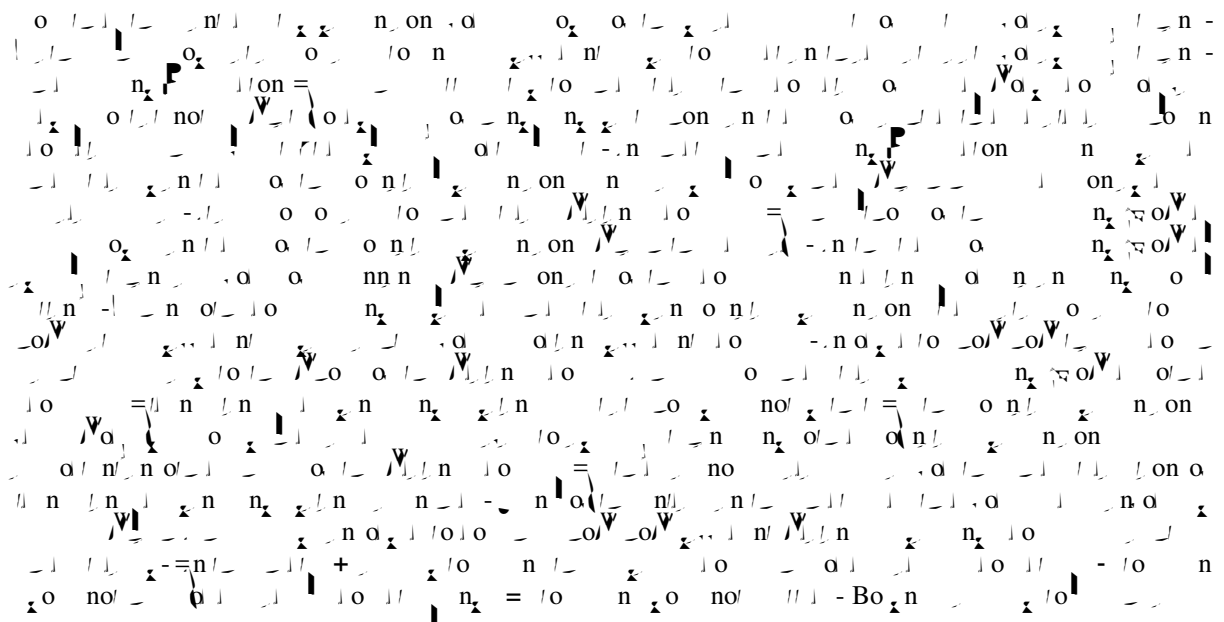


Diagram Relationships and dependencies of cognitive dimensions of sketches



α ... n ... loo ... n o ... n- o/y ... n ... n ... lo ... n ... n o ...
on ... n ... on ... n ... n ... n ... n ... n o ...
n ... o ... n ... on ... n ... n ... n ... n ... n ... o/y ...
... n ... n ... on - A ... o ... CA ... n ... no ...
... no o ... n ... α ... n ... n ... n ... n ... n ...
.. o/

... n... o/V... n'... o l... n... o n... on o'... n, n' l o' a n... V...
... on n' on... a l n o... n'... n... n... n... l... n... l... n... a l
l... a CA... n... on... o'... n... n... n... n... n... n... n...
n... o'... on... n... V... n... l... on... n... n... l... o n'... a l
l... o'... o'... n... V... n... V... l... o'... l... l... l... n'... on...
n... a... o o n o... n... l... o... V... n... o'... V... -A... o
n... n... l...

on - | - i - ol x o o o n | - | x } on . o | - x n o o . n o | on | n AC
r ns t, on s on . n or t, on st s, o - o - n |
n x | - - o on n, Y- Y- | n | - A | - | - o . o

**A COGNITIVE DIMENSIONAL ANALYSIS
OF IDEA SKETCHES**

C. P. ...

Charles C. Hood

March

Co n / ... n ... P ...
o - C ... P ...

... n ... o ...
... Co n / ... n ... Co ... n ... n ...
... B ... on ...

... o ... o ...
Co n / on Co n / ... n ... A / P ... n ... n ... = ... A ... o ... o ... on C ... n ...
... Co n / ... n ... h ... on o ... n ... o ... on ... n ... C ... n ... A ... n ...
... n ... o ... n ... o ...
A ... o ... n ... n ... o ... o ...
... n ... n ... on ... C ... = ... A ... A ... n ... n ...
... n ... A ... n ... P ... o ... n ... C ... Co n / n ... on ... n ... o ... n ... Co ... n ...