

THE EFFECT ON APPRECIATION BY TAILORING MANUALS TO MENTAL FACTORS

Will appreciation be enhanced when advance organizers, the level of chunking and document orientation are tailored to cognitive style, computer self-efficacy and need for cognition?

**Master thesis
Miriam Woestenenk**

XLdoc





UNIVERSITY OF TWENTE.

University Twente

Communication Studies

Prof. Dr. M.F. Steehouder

Dr. J. Karreman

Principal: Cordeo BV

Drs. C.J. Reijnen

Miriam Woestenenk, MSc.

s0075027

Holterweg 96a

7245 SK Laren

06-10774754

m.woestenenk@

student.utwente.nl

“People regulate their level and distribution of effort in accordance with the effects they expect their actions to have. As a result, their behavior is better predicted from their beliefs than from the actual consequences of their actions”

A. Bandura

Summary

Users differ in their knowledge, personality and goals and therefore they have specific needs in the manuals. To satisfy the exact need for information, manuals can be tailored. It was expected in this study that users will appreciate a tailored manual based on the information needs more, than a non-tailored manual.

The purpose of this study was to contribute to creating manuals which optimize task fulfillment with a minimum amount of workload and when possible to achieve a high degree of information elaboration, resulting in learning. It was expected that this can be achieved by tailoring the manual based on mental factors. The research question central in this thesis was: *Do tailored manuals, based on mental factors enhance appreciation?* In this study three mental factors and related tailored elements were tested. Some highlights are presented below.

Tailoring Advance Organizers to Cognitive Style

The first user characteristic focuses on how people process information, by considering cognitive style as developed by Allinson and Hayes. It was expected that matching different type of advance organizers with the cognitive style will influence workload positively and thereby appreciation.

It was tested if users would appreciate a manual more when advance organizers were optimized for their situation (H2). More specific it was expected that intuitive users would appreciate a holistic advance organizer in the manual more than a hierarchical advance organizer (H2a) and analytical users would appreciate a hierarchical advance organizer in the manual more than a holistic advance organizer (H2b). The characteristics of the cognitive style and advance organizers are described in Table a.

Table a: Characteristics of intuitivists and analytics and the related advance organizer

Intuitivists	Analytics
➤ Intuitive ➤ Random ➤ Holistic ➤ Synthesizing ➤ Subjective ➤ Looks at the whole	➤ Logical ➤ Sequential ➤ Rational ➤ Analytical ➤ Objective ➤ Looks at the parts
Holistic advance organizer	Hierarchical advance organizer
➤ Start by presenting final result followed by required elements and related steps ➤ Elaboration of steps in presented order ➤ From End to Start	➤ Start with first step followed by chronological steps ➤ Elaboration of steps in presented order ➤ From Start to End

Little proof could be found for this relation: it appeared *analytical users will appreciate a hierarchical advance organizer in the manual more than a holistic advance organizer*. But overall, appreciation will not enhance when the advance organizer is optimized. Furthermore most users preferred the hierarchical advance organizer and that it was not possible to determine an optimal advance organizer based on the cognitive style. Therefore it can be concluded there is no relation between cognitive style and preferred advance organizer and almost everybody likes the hierarchical advance organizer.

Tailoring the Level of Chunking to the Level of Self-Efficacy

The second user characteristic focuses on the extent to which people think they are able to use the system, by describing their level of self-efficacy, developed by Bandura. It was expected by matching the level of switching with the amount of self-efficacy, successful task fulfillment and amount of workload will be influenced and thereby appreciation.

It was tested if users would appreciate a manual more when the level of chunking was optimized for their situation (H3). More specific it was expected that users with low self-efficacy would appreciate content with a high level of chunking more than content with a low level of chunking (H3a) and users with high self-efficacy would appreciate content with a low level of chunking more than content with a high level of chunking (H3b). The characteristics of the self-efficacy and level of chunking are described in Table b.

Table b: Characteristics of high and low self-efficacy and the related level of chunking

High Self-Efficacy	Low Self-Efficacy
➤ High confidence ➤ Focus on success	➤ Low confidence ➤ Focus on what can go wrong
Low Level of Chunking	High Level of Chunking
➤ Less detailed steps ➤ Less procedural screenshots	➤ Detailed steps ➤ Many procedural screenshots

Little proof could be found for this relation: *users with low self-efficacy will appreciate content with a high level of chunking more than content with a low level of chunking*. But overall, appreciation will not enhance when the level of chunking is optimized. However, the level of chunking to self-efficacy seems to influence the total appreciation. Furthermore it appeared it was not possible to determine an optimal level of chunking based on the level of self-efficacy, but this may be caused by a small number of respondents with a low self-efficacy. It was found that people with a low self-efficacy preferred a high level of chunking and the level of chunking does not matter to people with a high self-efficacy. Therefore it is recommended to use in a general manual a high level of chunking.

Tailoring the Document Orientation to the Level of Need for Cognition

The third user characteristic focuses on *the eagerness of people to learn information*, by describing their need for cognition, developed by Cacioppo and Petty. It was expected that by matching the document orientation with the amount of need for cognition, will influence the amount of learning and workload and thereby appreciation.

It was tested if *users would appreciate the manual more when the document orientation is optimized for their situation* (H4). More specific it was expected that *users with low need for cognition would appreciate a task oriented manual more than a concept oriented manual* (H4a) and *users with high need for cognition would appreciate a concept oriented manual more than a task oriented manual* (H4b). The characteristics of the self-efficacy and level of chunking are described in Table c.

Table c: Characteristics of high and low need for cognition and the related document orientation

High Need for Cognition	Low Need for Cognition
➤ Seek, acquire, think about and reflect information and applies thinking skills easily ➤ Enjoys thinking process ➤ Open for new experiences ➤ Wants to understand the system	➤ Does not easily seek, acquire, think about and reflect information or apply thinking skills easily ➤ Does not enjoy the thinking process ➤ Conservative to new experiences ➤ Wants to execute tasks
▼	▼
Concept Orientation	Task Orientation
➤ Focus on knowledge ➤ First conceptual information then procedural information	➤ Focus on skills ➤ First procedural information then conceptual information

This relationship was statistically significant and therefore the hypothesis could be supported. But due to the asymmetric distribution in the sample, only proof could be found for *users with high need for cognition will appreciate a concept oriented manual more than a task oriented manual*. Furthermore it appeared that some people with a high need for cognition noticed the difference spontaneously and preferred the optimized version. It is expected that it will influence overall appreciation, but no statistical proof could be found. Subsequently, it was not possible to determine an optimal document orientation based on the need for cognition. This may be influenced by a small number of respondents with a low need for cognition.

The Effect on Appreciation by Tailoring Manuals to Mental Factors

Based on cognitive style, computer self-efficacy and need for cognition, respectively advance organizers, the level of chunking and the document orientation were optimized in the manual. It was expected that *users would appreciate the manual more when the manual was optimized for their situation*. No support could be found for this relation, meaning that based on the results of this study appreciation did not enhance when the three elements used in this study were optimized. Beside the total appreciation, it was also measured whether the three individual elements influenced appreciation.

Despite the fact that not all hypotheses were support, it was found that users and their preferences do differ, though, not entirely in the expected way. Most people did not recall the tailored elements spontaneously, but when pointed on the elements, their preference differs. The used arguments were pretty strong for their preference and match the arguments found in theory. Therefore it can be concluded that tailoring manuals does effect the appreciation, although no statistically significant effect was found.

In further research it is interesting to have an equal distribution in gender, system familiarity, self-efficacy and need for cognition. These distributions weren't equal in this study and based on the results there were reasons to assume that it influenced the results.

Samenvatting (Summary in Dutch)

Gebruikers verschillen in hun kennis, persoonlijkheid en doelen. Daarom hebben ze specifieke behoeften in handleidingen. Om aan hun informatiebehoefte te kunnen voldoen zouden handleidingen op maat moeten worden gemaakt. Deze studie heeft gekeken of gebruikers een op maat gemaakte handleidingen, gebaseerd op hun informatiebehoefte meer waarderen dan een niet op maat gemaakte handleiding.

Het doel van deze studie was om bij te dragen aan de het maken van handleidingen die de taakuitvoering verbeteren met zo min mogelijk belasting en indien mogelijk informatieverwerking, resulterend in leren, te stimuleren. Het is verwacht dat dit kan worden bereikt door een handleiding op maat te maken op basis van mentale factoren. De onderzoeksvraag van deze thesis was: *Verhogen op maat gemaakt handleiding, gebaseerd op mentale factoren de waardering?* In dit onderzoek zijn er drie mentale factoren en gerelateerde op maat gemaakt elementen getest. Enkele belangrijke punten zijn hieronder toegelicht.

Het op maat maken van overzichten (Advance Organizers) op basis van cognitieve stijl

De eerste mentale factor focust zich op de manier waarop gebruikers informatie verwerken, door de cognitieve stijl zoals ontwikkeld door Allinson en Hayes te testen. Het was de verwachting dat belasting gedurende de informatieverwerking en daarmee de waardering van de handleiding positief wordt beïnvloed, door op basis van een cognitieve stijl een advance organizer te presenteren.

Er is getest of gebruikers een handleiding hoger waarderen wanneer de advance organizer voor hen is geoptimaliseerd (H2). Specifieker is de verwachting dat *intuïtieve gebruikers een holistische advance organizer in de handleiding hoger waarderen dan een hiërarchische advance organizer (H2a)* en dat *analytische gebruikers een hiërarchische advance organizer in de handleiding hoger waarderen dan een holistische advance organizer (H2b)*. De karakteristieken van de cognitieve stijlen en advance organizers zijn beschreven in Tabel d.

Tabel d: Karakteristieken van intuïtieve en analytische gebruikers en de gerelateerde "advance organizer"

Intuïtieve gebruikers	Analytische gebruikers
➤ Intuïtief ➤ Willekeurige volgorde ➤ Holistisch ➤ Samenstellend ➤ Subjectief ➤ Kijkt naar het geheel	➤ Logisch ➤ Opeenvolgend ➤ Rationeel ➤ Analytisch ➤ Objectief ➤ Kijkt naar de delen
▼	▼
Holistische "advance organizer"	Hiërarchische "advance organizer"
➤ Start met het eindresultaat ➤ Laat zien welke stappen benodigd zijn ➤ Van Z naar A	➤ Start met de eerste stap ➤ Daarna chronologisch de volgende stappen ➤ Van A naar Z

Voor deze relatie kon enig bewijs worden gevonden; het bleek dat *analytische gebruikers een hiërarchische advance organizer in de handleiding hoger waarderen dan een holistische advance organizer*. Maar over het geheel wordt de waardering niet hoger wanneer de advance organizer is aangepast aan de stijl van de gebruiker. Daarnaast bleek dat de meeste gebruikers de hiërarchische advance organizer het beste waarderen en dat het niet mogelijk was om een optimale advance organizer te bepalen op basis van de cognitieve stijl. Daarom kan worden geconcludeerd dat er geen relatie is tussen cognitieve stijl en best gewaardeerde advance organizer en dat bijna iedereen de hiërarchische advance organizer prettig vindt om mee te werken.

Het op maat maken van het aantal stappen op basis van zelfvertrouwen in computerbehendigheid

De tweede mentale factor focust zich op de manier waarop gebruikers denken dat ze in staat zijn het systeem te gebruiken, door het zelfvertrouwen in computerbehendigheid ("self-efficacy"), ontwikkeld door Bandura, te meten. Het was de verwachting dat de belasting gedurende de informatieverwerking en de taakuitvoering en daarmee de waardering positief wordt beïnvloed, door op basis van de hoeveelheid zelfvertrouwen een bepaald aantal stappen te presenteren.

Er is getest of gebruikers een handleiding hoger waarderen wanneer het aantal stappen voor hen is geoptimaliseerd (H3). Specifieker is de verwachting dat *gebruikers met een lage "self-efficacy" veel stappen in de handleiding hoger waarderen dan weinig stappen (H3a)* en dat *gebruikers met een hoge "self-efficacy" weinig stappen in de handleiding hoger waarderen dan veel stappen (H3b)*. De karakteristieken van de mate van "self-efficacy" en hoeveelheid stappen zijn beschreven in Tabel e.

Voor deze relatie kon enig bewijs worden gevonden; het bleek dat *gebruikers met een lage "self-efficacy" veel stappen in de handleiding hoger waarderen dan weinig stappen*. Maar over het geheel wordt de waardering niet hoger wanneer de hoeveelheid stappen is geoptimaliseerd. Echter, wanneer self-efficacy en de hoeveelheid stappen goed zijn gecombineerd beïnvloedt dit de algehele waardering.

Tabel e: Karakteristieken van hoge en lage "self-efficacy" en de gerelateerde hoeveelheid stappen

Hoge "Self-Efficacy"	Lage "Self-Efficacy"
➤ Hoog zelfvertrouwen ➤ Focus op succes	➤ Laag zelfvertrouwen ➤ Focus op wat mis kan gaan
▼	▼
Weinig stappen	Veel stappen
➤ Minder gedetailleerde stappen ➤ Minder procedurele screenshots	➤ Veel gedetailleerde stappen ➤ Veel procedurele screenshots

Daarnaast bleek dat het niet mogelijk is om een optimale hoeveelheid stappen te bepalen op basis van de "self-efficacy". Dit kan echter komen doordat er maar weinig mensen in de steekproef waren met een lage "self-efficacy". Verder bleek dat mensen met een lage "self-efficacy" veel stappen hoger waardeerden en dat de hoeveelheid stappen niet uitmaakt voor mensen met een hoge "self-efficacy". Daarom is het aanbevolen om in een algemene handleiding relatief veel stappen te gebruiken.

Het op maat maken van de documentoriëntatie op basis van mate van behoefte aan ontwikkeling

De derde mentale factor focust zich op de mate waarin gebruikers informatie willen leren, door hun behoefte aan ontwikkeling ("need for cognition") te meten, ontwikkeld door Cacioppo en Petty. Het was de verwachting dat de belasting gedurende informatieverwerking en mate van leren, en daarmee de waardering positief wordt beïnvloed, door op basis van de mate van behoefte aan ontwikkeling een documentoriëntatie te presenteren.

Er is getest of gebruikers een handleiding hoger waarderen wanneer de documentoriëntatie voor hen is geoptimaliseerd (H4). Specifieker is de verwachting dat gebruikers met een lage behoefte aan ontwikkeling een taak georiënteerde handleiding hoger waarderen dan een concept georiënteerde handleiding (H4a) en dat gebruikers met een hoge behoefte aan ontwikkeling een concept georiënteerde handleiding hoger waarderen dan een taak georiënteerde handleiding (H4b). De karakteristieken van de mate van behoefte aan ontwikkeling en documentoriëntatie zijn beschreven in Tabel f.

Tabel f: Karakteristieken van hoge en lage behoefte aan ontwikkeling en de gerelateerde documentoriëntatie

Hoge behoefte aan ontwikkeling	Lage behoefte aan ontwikkeling
➤ Zoekt, verkrijgt en reflecteert informatie ➤ Denkt graag na ➤ Staat open voor nieuwe ervaringen ➤ Wil informatie begrijpen	➤ Is praktischer georiënteerd ➤ Behoudend tegenover nieuwe ervaringen ➤ Hoeft niet persé de achtergrond te begrijpen
▼	▼
Conceptoriëntatie	Taakoriëntatie
➤ Focus op kennis ➤ Eerst achtergrondinfo ➤ Daarna procedurele informatie	➤ Focus op vaardigheden ➤ Eerst procedurele informatie ➤ Daarna achtergrondinfo

Deze relatie bleek statistisch significant en daarom is er voldoende bewijs gevonden om deze hypothese voorlopig aan te nemen. Echter, door de asymmetrische verdeling in deze steekproef kan er alleen bewijs worden gevonden voor het feit dat gebruikers met een hoge behoefte aan ontwikkeling een concept georiënteerde handleiding hoger waarderen dan een taak georiënteerde handleiding.

Verder bleek dat mensen met een hoge behoefte aan ontwikkeling het verschil vaker spontaan opmerken en dan de geoptimaliseerde versie beter waarderen. Dit geeft aan de documentoriëntatie de algehele waardering waarschijnlijk zal beïnvloeden, maar hier is geen statistisch bewijs voor gevonden.

Het was niet mogelijk om een optimale documentoriëntatie te vinden op basis van de mate van behoefte aan ontwikkeling. Daaruit kan worden geconcludeerd dat er geen relatie is tussen behoefte aan ontwikkeling en meest gewaardeerde documentoriëntatie, maar dat bijna iedereen de conceptoriëntatie het meeste waardeert. Dit effect wordt beïnvloed door het relatief kleine aantal mensen met een lage behoefte aan ontwikkeling in de steekproef.

Het effect op waardering van op maat gemaakte handleidingen op basis van mentale factoren

Gebaseerd op cognitieve stijl, zelfvertrouwen in computerbehendigheid en behoefte aan ontwikkeling, zijn de "advance organizers", het aantal stappen en de documentoriëntatie aangepast in de handleiding. Het was verwacht dat gebruikers een handleiding hoger waarderen wanneer hij geoptimaliseerd is voor de situatie.

Voor deze relatie kan geen verband worden gevonden, wat betekent dat gebaseerd op de resultaten van deze studie, de waardering niet hoger wordt wanneer de drie elementen gebruikt in deze studie zijn geoptimaliseerd.

Ondanks dat niet voor alle hypothesen bewijs is gevonden bleek dat er daadwerkelijk verschillen in voorkeur van gebruikers zitten. De meeste mensen gaven niet spontaan de voorkeur aan een op maat gemaakt element, maar wanneer de verschillen tussen de elementen werden uitgelegd bleek dat de voorkeur verschilt. Wat daarbij opviel is dat de gebruikte argumenten erg duidelijk waren en overeenkwamen met de argumenten uit de theorie. Daarom kan worden geconcludeerd dat er waarschijnlijk wel een effect is, maar niet statistisch significant.

In vervolgonderzoek is het interessant om een gelijke verdeling in geslacht, bekendheid met het systeem, self-efficacy en behoefte aan ontwikkeling te hebben. Deze waren niet gelijk verdeeld in deze studie en op basis van de resultaten bleek dat dit waarschijnlijk de resultaten heeft beïnvloed.

Voorwoord (Preface in Dutch)

Mijn CV is weer aangevuld met een nieuwe afgeronde studie! Een beetje raar vind ik het wel, want ik vind twee studies wel meer dan bij mij past. Het voordeel van een tweede master thesis is dat je bepaalde dingen hebt geleerd in je eerste afstudeerproject. In heb geprobeerd de valkuilen die ik daar ben tegen gekomen te omzeilen of te zorgen dat ze minder diep werden. Dit is deels gelukt, maar deels kom je ook nieuwe valkuilen tegen. Zo heeft het een grote invloed gehad dat mijn bachelor opleiding bedrijfskunde was, en niet communicatie, waardoor je bepaalde basiskennis mist. Ook het feit dat ik mijn studie in deeltijd heb gedaan heeft grote invloed gehad, maar al met al ben ik tevreden over de combinatie van beiden.

Iets anders wat ik heb geleerd van m'n vorige master thesis, is dat je een dik verslag maakt, maar dat het voorwoord door de meeste mensen wordt gelezen. En dat is niet erg, want het voorwoord is de beste plek om het proces centraal te stellen. Want in een master thesis draait het naar mijn idee niet voornamelijk om het eindresultaat, maar om het proces en de manier waarop je tot je resultaten komt, zowel inhoudelijk als persoonlijk. Wanneer je langer met hetzelfde onderwerp bezig bent, leer je jezelf beter kennen en krijg je de kans om je persoonlijk sterk te ontwikkelen.

Deze afstudeerperiode heeft een lange tijd geduurd, doordat ik er niet altijd evenveel aandacht aan kon besteden. Het mooie van een lange afstudeerperiode (van mei 2009 tot februari 2010) is dat je zelf soms weer fris tegen het onderwerp en het geschreven stuk aan kan kijken. Dit maakt het een stuk makkelijker om compact te schrijven en om losse gaten ineens wel op te kunnen vullen. Ook komt het onderwerp dan op onverwachte momenten naar voren. Zo zat ik pinksterzondag 2010 in de kerk en begon de dominee, na de schriftlezingen over de stenen tafels van Mozes (de oorsprong van het pinksterfeest) met de tien geboden en de zending van de heilige geest uit Handelingen, met zijn preek. Het ging over de heilige geest en dat mensen daar op verschillende manieren tegenaan kunnen kijken. De één kan zich er weinig bij voorstellen en vindt de heilige geest maar een abstract begrip. De ander vindt de heilige geest de kern van het geloof en vindt het de kracht die mensen vernieuwd. Voor een deel hebben die verschillende reacties van mensen ook te maken met hun karakter. Hij vertelde dat je volgens de psychologie mensen qua karakter in kunt delen in twee types: mensen die van regels en structuur houden en mensen die niet van regels houden, maar juist van vrijheid. Mensen die van regels houden, zijn vaak wat minder uitbundig. Ze willen precies weten waar ze aan toe zijn. En als het leven zo dreigt te lopen dat je met die regels niet meer uit de voeten kan, worden deze mensen bang. Ze hebben het gevoel dat ze dan hun houvast kwijt raken. Daar tegenover staan de mensen die van regels niets willen weten. Ze willen zelf kunnen beslissen en zien wel waar het schip strandt. Deze mensen zijn vaak iets avontuurlijker, iets meer naar buiten gericht. Maar ook deze mensen zijn bang, bang voor de regels. En ik dacht: dat komt mij bekend voor!

De dominee ging verder: "Het lijkt alsof er twee groepen bestaan, die niet te verenigen zijn. De mensen die er niets mee kunnen omdat ze zich liever houden aan de regels en de mensen die het totaal omarmen omdat elke regel hen te veel is. Maar hier, hier komen beide juist samen. Hét gaat bij God om regels en structuren, maar dan wel zo dat er leven in komt, beweging, vrijheid."

Iedereen heeft dus z'n zwakke en sterke kanten, en wanneer je dat opvangt waardoor je in het midden uit komt dan is dat geen probleem. En dat is nou precies het doel van mijn master thesis. Daarnaast blijkt dat wanneer je beide combineert en goed samenwerkt je er wel komt!

Zo komt een master thesis niet helemaal door één persoon tot stand, maar heb je andere mensen en soms andere visies nodig. Ik wil mijn ouders, familie en vrienden bijzonder bedanken voor hun belangstelling en luisterend oor. Daarnaast mijn collega's (met behulp van google talk) en de testpersonen die hun tijd beschikbaar hebben gesteld. Het is erg fijn dat mensen zo spontaan mee willen werken en dat ze na afloop zo enthousiast zijn over hetgeen waar ik mee bezig ben.

Ook wil ik Cordeo, als bedrijf bedanken. Allereerst is mij de mogelijkheid gegeven om na het afronden van Bedrijfskunde parttime te gaan werken, waardoor ik nog een tweede opleiding kon gaan volgen. Daarnaast is tijdens deze opleiding alle mogelijke hulp en flexibiliteit geboden. Ten slotte is er altijd het toekomstperspectief op een fulltime baan geweest. Een kans die ik altijd met beide handen aan heb willen grijpen en nu ook met alle plezier concreet zal gaan maken!

Vanuit Cordeo heeft Cyril Reijnen mij met veel enthousiasme en met een blik van een intuitivist (wil je weten wat dit is, lees dan het verslag ☺) geholpen. Ik kreeg elke keer snel feedback en hij was altijd beschikbaar als klankbord.

Daarnaast wil ik ook mijn afstudeerbegeleiders van de Universiteit, Dhr. Michael Steehouder & Mevr. Joyce Karreman, bedanken! Ik heb altijd begrip en goede en snelle feedback ontvangen en prettige gesprekken gehad. Dit verhoogt het plezier en ik denk daarmee het resultaat! Als laatste afstudeerstudent van Dhr. Steehouder hoop ik voor alle afstudeerders voor mij dat zij net zo'n goede begeleiding hebben gehad en ik hoop dat er voor Mevr. Karreman nog vele zullen volgen!

Als laatste, maar misschien wel het meest wil ik Gert Jan bedanken. Allemachtig, wat ben ik toch blij met jou! Bedankt voor het meedenken, motiveren en gewoon voor het feit dat je al ruim negen jaar m'n vriendje wilt zijn!

Miriam Woestenenk, MSc²

Table of Contents

1	INTRODUCTION	1
1.1	Context of the Research	2
1.2	Tailoring Manuals	3
1.3	How do people process information: <i>Intuitivists vs. Analytics</i>	4
1.4	Do people believe they are able to use the system: <i>Low vs. High Self-Efficacy</i>	9
1.5	How eager are people to learn information: <i>Low vs. High Need for Cognition</i>	12
1.6	Summarizing Hypotheses	15
2	METHOD	16
2.1	Procedure & Measurement	16
2.2	Participants	17
2.3	Materials	18
3	RESULTS	20
3.1	The Effect of Tailoring to Mental Factors (H1)	20
3.2	The Effect of Tailoring to Cognitive Style (H2)	21
3.3	The Effect of Tailoring to Computer Self-Efficacy (H3)	24
3.4	The Effect of Tailoring to Need for Cognition (H4)	26
3.5	The Effect of User Characteristics	28
3.6	The Effect of Task Complexity	29
4	DISCUSSION	30
4.1	Influence of Test Materials & Methodology	30
4.2	Remarks on Cognitive Style & Advance Organizers	30
4.3	Remarks on Self-Efficacy & Level of Chunking	31
4.4	Remarks on Need for Cognition & Document Orientation	31
4.5	Remarks on Tailoring Manuals in General	31
5	CONCLUSIONS	32
5.1	The Effect on Appreciation by Tailoring Manuals to Mental Factors: <i>Results of this Study</i>	32
5.2	Recommendations for Further Research	33
5.3	Practical Recommendations	33
6	REFERENCES	34

APPENDIX A: MEASURING COGNITIVE STYLE

Cognitive Style Index (Hayes & Allinson, 1996)

Cognitive Style Index Scoring Key (Hayes & Allinson, 1996)

APPENDIX B: MEASURING COMPUTER SELF-EFFICACY

Computer Self-Efficacy Measure (Compeau & Higgins, 1995)

Scoring Self-Efficacy (Compeau & Higgins, 1995)

APPENDIX C: MEASURING NEED FOR COGNITION

Need for Cognition Scale (Cacioppo, Petty, Feinstein, & Jarvis, 1996)

Scoring Need for Cognition

APPENDIX D: TEST PROCEDURE

Step 1. Questionnaire

Step 2. Briefing

Step 3. Test

Step 4. Interview

Step 5. Debriefing

APPENDIX E: TASKS

About XLdoc

Test Site

Task A: Ordering

Task B: Creation

APPENDIX F: RESEARCH TIME SCHEDULE

APPENDIX G: EXTENDED TEST RESULTS

APPENDIX H: TEST MANUAL

1 Introduction

Users are not satisfied about technical manuals in general. Schriver (1997) identified several problems of users when using manuals, such as the presentation of too many features, no topic-oriented organization, a missing index, poor graphic design, poor writing and bad illustrations. This is a missed opportunity for organizations because manuals should result in efficient and effective use of (all features) of the (software) product. Furthermore it appeared that manual satisfaction influences customer loyalty (Jansen & Balijon, 2002) and therefore it is relevant to improve manuals and stimulate use.

Schriver (1997) and Jansen and Balijon (2002) studied the actual use of manuals for consumer electronics among Dutch and American respondents. The results are slightly different, but the rough distribution is the same, as shown in Table 1.1. It turns out that 97% of the respondents are using manuals one way or another, so it seems relevant to focus on improving satisfaction among these users, rather than focusing on the small percentage of non-users.

Table 1.1: How do Dutch and American respondents read manuals? (Jansen & Balijon, 2002)

	Cover to Cover	Scan	Read when Stuck	Never
Dutch Respondents	20%	54%	23%	3%
American Respondents	15%	46%	35%	4%

Research focusing on differences in using software manuals showed differences for young, middle and older people, the amount of computer experience and reading level (Nielsen, 1992; Jansen & Balijon, 2002). Jansen and Balijon (2002) found that the older the consumers and the higher their levels of education, the higher their likelihood of reading the manual. It appeared that demographical factors influence the use of manuals.

Furthermore Schriver found four different strategies which are used while learning some new software using manuals: (e.g. Ganier, 2004)

- Work with the equipment simultaneously with reading the instructions (42%)
- Read the instructions before using the equipment (23%)
- Proceed learning by doing, without making any reference to the instructions (19%)
- Look at the instructions in case of doubt (17%)

The results of Schriver show that people use manuals in different ways. Other authors, such as Hsu and Turoff (2002), Popovic (2000) and Ganier (2004) found proof for different information needs. Information needs may differ in which information is needed (which applications, rights and tasks should be described) or how the information should be presented to enhance processing. Ganier (2004) found that novice users will use manuals in a more linear way and experienced users more in an interactive way. It is recommended to consider these information processing and learning needs in the manual, because satisfaction will enhance. Thus it is interesting to consider user differences and thus tailor manuals. However, it is not possible to consider all different user needs in one manual some needs can be taken into account. This study focuses on how information can be processed best, by tailoring on mental factors.

1.1 Context of the Research

The principal of this study is Cordeo. Cordeo is a consultancy organization, established in 2001, in the field of marketing, information technology and communication. Since 2010, Cordeo is unofficially split up in two parts, Cordeo BV as a consultancy organization delivering document management solutions to businesses and XLdoc BV as a software organization, selling their software application to partners.

1.1.1 Cordeo BV

Cordeo's focus is on improving efficiency through streamlined and transparent processes, effective brand management and cost control. Cordeo delivers a tailored advice concerning how to manage the document lifecycle, using the features of the XLdoc Suite. The final goal of the XLdoc Suite is to support the complete creation process of documents, from initial design to the final order, focusing on document creation and management. The solutions build an integrated chain from document creation, maintenance and production to fulfillment and distribution.

The advice of Cordeo is based on several consultancy approaches. A method for creating tailored manuals and generating them automatically with the XLdoc Suite, may become one of those. Therefore this study is relevant for Cordeo.

1.1.2 XLdoc BV

XLdoc delivers an integrated software suite for document lifecycle management, from creation, via asset management to distribution. The system enables casual users to create, manage and order well designed documents in a very short time, thereby fulfilling the need for up-to-date documents at low costs. XLdoc its mission is to serve its international partner network – organizations active in the document management and production chain – with the best integrated configurable standardized Documents-on-Demand-platform.

The XLdoc Suite consists of several applications and modules, which can be selected independently. All the applications can be extended and are fully scalable.

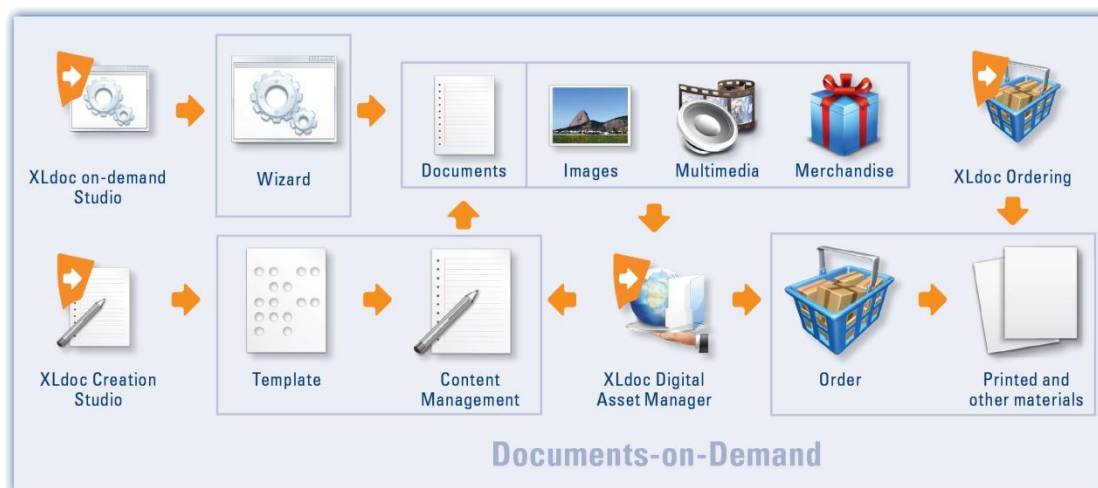
At the core of the XLdoc Suite is the XLdoc Digital Asset Manager, a solution in which all digital assets such as documents, images and media, can be managed.

It is possible to create simple rule-based documents with the XLdoc on-demand Studio or to create, edit and manage more complex documents in the XLdoc Creation Studio.

Once created, the documents are placed in the XLdoc Digital Asset Manager, from which they can be ordered with XLdoc Ordering and will be sent automatically to the printer. It is also possible to order other digital assets such as merchandise.

This whole process as presented in *Figure 1.1* is known as Documents-on-Demand, which includes the creation, storage, organization, transmission, retrieval, manipulation, updating, ordering and eventual disposal of documents.

Figure 1.1: XLdoc Suite - Documents-on-Demand



XLdoc is used by white collar workers in the working-age population, who have some computer experience and are mostly well educated (Reijnen, 2009). Based on the results of Jansen and Balijon (2002) this group uses manuals rather often and therefore it is, especially in this case, more interesting to focus on improving appreciation instead of usage in this study.

This study is relevant for XLdoc because XLdoc can serve as a test case for testing the method, which results in a tailored manual for the XLdoc Suite. When it is possible to generate tailored manuals with the XLdoc Suite, creating tailored manuals can become an XLdoc product.

1.2 Tailoring Manuals

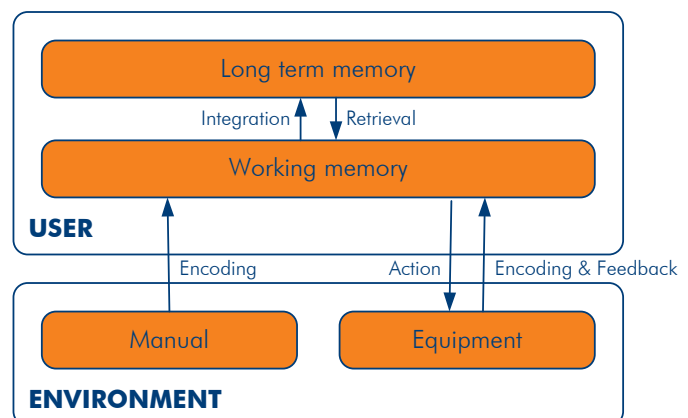
1.2.1 Why Tailoring Manuals?

Manuals are only used if long-term memory and the equipment do not provide sufficient information to complete a task successfully using the software. This is because people try to reduce workload by nature. Document search imposes a higher cognitive workload than does information retrieval in memory and therefore users try to combine the equipment and their long-term memory to acquire information for successful task fulfillment. (Ganier, 2004) This process is presented in Figure 1.1.

In other words, users use manuals for task fulfillment while minimizing workload when the information in the equipment and long term memory are not sufficient.

Users differ in their knowledge, personality and goals and therefore they have specific needs in the manuals. To satisfy the exact need for information, manuals can be tailored. It is expected in this study that users will appreciate a tailored manual based on the information needs more, than a non-tailored manual.

Figure 1.1: Processing procedural information (after Ganier, 2004)



1.2.2 How can Manuals be Tailored?

Some authors state that the user should be known demographically in terms as gender, age and reading capability to determine their learning capabilities (Nielsen, 1992) (Mayhew, 1999). However, Hayes and Allinson (1996) state that demographic characteristics are not influencing learning activity very much. They found some evidence that learning activities are influenced by cognitive style and thus that mental or cognitive factors have much more influence. Therefore the focus in this study is on the effect of tailored manuals based on mental (cognitive) factors.

Cognition is defined as the process of thought to knowing. It is the faculty for processing and elaborating information, applying knowledge and changing preferences. Elaboration is taking place when the information is integrated with existing knowledge. The degree of elaboration during information processing influences the amount of learning taking place (Blackwell, Miniard, & Engel, 2005).

Ultimately, learning is the desired outcome of the manual. When people remember the information, the tasks can be completed more efficient and effective and overall appreciation for the manual will enhance and thereby of the software.

Therefore the purpose of this study is to contribute to creating manuals which optimize task fulfillment with a minimum amount of workload and when possible to achieve a high degree of information elaboration, resulting in learning. It is expected that this can be achieved by tailoring the manual based on mental factors. The research question central in this thesis is: *Do tailored manuals, based on mental factors enhance appreciation?*

The main hypothesis is: *H1: Users will appreciate the manual more when the manual is optimized for their situation.* The mental factors used in this study to create tailored manuals focus on successful task fulfillment, minimizing workload and optimizing learning.

The first user characteristic focuses on *how people process information*, by considering cognitive style as developed by Allinson and Hayes, in *Paragraph 1.3*. It is expected that matching different type of advance organizers with the cognitive style will influence workload positively and thereby appreciation.

The second user characteristic focuses on the *extent to which people think they are able to use the system*, by describing their level of self-efficacy, developed by Bandura in *Paragraph 1.4*. It is expected by matching the level of switching with the amount of self-efficacy, successful task fulfillment and amount of workload will be influenced and thereby appreciation.

The third user characteristic focuses on the *eagerness of people to learn information*, by describing their need for cognition, developed by Cacioppo and Petty in *Paragraph 1.5*. It is expected that by matching the document orientation with the amount of need for cognition, will influence the amount of learning and workload and thereby appreciation.

The user characteristics and consequences in the manual are described below. It describes why the user characteristic is relevant and why it is expected that appreciation will enhance. The measurement instrument of the user characteristic is described and by using measurement instrument tested in other studies, the validity is ensured.

Furthermore the relation between the user characteristic and the consequence for the manual is presented. It is also presented why the manual characteristic is relevant, how it is expected to influence appreciation and it is operationalized.

1.3 How do people process information: *Intuitivists vs. Analytics*

One of the characteristics influencing the cognitive elaboration of information is cognitive style. Cognitive style is defined as consistent individual differences in preferred ways of organizing and processing information and experience (Hayes & Allinson, 1996). In other words, it is the way individuals think, perceive and remember information and their preferred approach using information to solve problems. Cognitive styles can be used in organizations in the context of recruitment, task and learning performance, internal communication, career guidance and counseling, team composition and team building, conflict management and training and development.

Hayes and Allinson (1996) examined 19 studies focusing on the effect of matching cognitive style to learning performance. They found that matching has a positive effect in 12 studies. This matching hypothesis is criticized by Harris, Dwyer and Leeming (2003) who state that designing programs specifically to meet the preferences for each student may not be necessary to improve his or her performance levels. This criticism might be correct, because preferring one cognitive style over another does not mean a person cannot perform well using other cognitive styles. Thus, although performance will not always enhance when the cognitive style is matched appreciation will enhance. In this study the performance will be left aside.

Coffield, Moseley, Hall and Ecclestone (2004) tested the most common cognitive (learning) instruments¹ for internal consistency, test-retest reliability, construct validity and predictive validity. The only method that met all four criteria is the Cognitive Style Index (CSI) of Allinson and Hayes (1996). Therefore this method is assumed as valid and used in this study.

¹ Allinson and Hayes' Cognitive Styles Index (CSI); Apter's Motivational Style Profile (MSP); Dunn and Dunn's model and instruments of learning styles; Entwistle's Approaches and Study Skills Inventory for Students (ASSIST); Gregorc's Style Delineator (GSD); Herrmann's Brain Dominance Instrument (HBDI); Honey and Mumford's Learning Styles Questionnaire (LSQ); Jackson's Learning Styles Profiler (LSP); Kolb's Learning Style Inventory (LSI); Myers-Briggs Type Indicator (MBTI); Riding's Cognitive Styles Analysis (CSA); Sternberg's Thinking Styles Inventory (TSI); Vermunt's Inventory of Learning Styles (ILS)

The Cognitive Style Index is a one-dimensional, easy-to-use instrument (Allinson & Hayes, 1996) tested within organizations (Coffield, Moseley, Hall, & Ecclestone, 2004). Therefore this method is especially suitable for the analysis of business users. However, criticisms state that one dimensional cognitive styles do not justice reality and that multidimensional theories should be used to understand nature and stress individual differences in the processing of information.

The Cognitive Style Index tests whether users are more intuitive or analytical (Allinson & Hayes, 1996). Analytical people focus on the parts and interpret information more rational, logical and sequential. Intuitive people focus on the whole and interpret information more holistic, subjective and random. Criticisms argue that analysis and intuition are better conceived as separate dimensions and thus cannot be considered as one dimension (Hodgkinson & Sadler-Smith, 2003). However, using the results of the CSI in learning situations do effect the learning outcomes and thus the values on the dimension do have influence (Hodgkinson & Sadler-Smith, 2003).

Measuring Cognitive Style

The questionnaire of the Cognitive Style Index of Allinson and Hayes is validated many times (Hayes & Allinson, 1996) (Coffield, Moseley, Hall, & Ecclestone, 2004). It is measured by 38 items which are drawn from the intuition and analysis domain. Each item should be scored by a trichotomous response scale (true; uncertain; false) (Hodgkinson & Sadler-Smith, 2003). Based on a scorings list, each item is scored 0 or 2 and when uncertain is selected with 1. Examples of questions are (Hayes & Allinson, 1996):

- *The best way for me to understand a problem is to break it down into its constituent parts*
Scoring 2 for true, 1 for uncertain and 0 for false.
- *I find that to adopt a careful, analytical approach to making decisions takes too long*
Scoring 0 for true, 1 for uncertain and 2 for false.

The entire questionnaire can be found in *Appendix A: Measuring Cognitive Style*. As showed in the examples above, some items are formulated positively for analytic style and other negatively. The scores should be summed to get the final score. Scores vary between a minimum of 0 to a maximum of 76, based on maximum 2 points for each of the 38 items. The higher the score the more analytical the person is (Hodgkinson & Sadler-Smith, 2003).

Respondents scoring equal or below 37 ($CSI \leq 37$) are considered as Intuitivists, respondents scoring equal or above 38 ($CSI \geq 38$) as Analytics.

1.3.1 Tailoring to Cognitive Style via Advance Organizers

As presented above, it appeared that matching cognitive styles influences learning performance positively. Matching instruction to the preferred style covers less cognitive resources. These resources can use for making links between information, information from previous screens and prior knowledge (Pillay, Boles, & Raj, 1998). The Intuitive-Analytical dimension influences the structural way in which individuals think about, view, and respond to information and situations. This affects the manner in which information is organized during learning (Riding R. , 2001). It is the manner in which the information is structured that assists to effectively process information (Pillay, Boles, & Raj, 1998).

Ausubel (1960) developed the concept of advance organizers to structure information. He recognized that individuals need to have an overview to assist them in learning and therefore he developed advance organizers. Advance organizers are defined as cognitive instructional strategies used to promote the learning and retention of new information. It is introductory material at a higher level of abstraction, generality and inclusiveness than the learning passage itself. They help individuals to build a cognitive structure to which new learning may be linked in a meaningful way, which influences learning performance. (Riding & Sadler-Smith, 1997) Advance organizers are a type of overviews, direct attention to what is important in the coming material; they highlight relationships among ideas that will be presented; and remind you of relevant information you already have (Pillay, Boles, & Raj, 1998).

Advance organizers, when used in appropriate situations and when evaluated adequately, do appear to influence the outcome of learning, as reviewed in 27 studies (Mayer, 1979) (Riding & Sadler-Smith, 1997) (Bajraktarevic, Hall, & Fullick, 2003). The advantage is stronger when the content is unfamiliar and the learners are less experienced in the subject matter (Mayer, 1979) (Riding & Sadler-Smith, 1997). This is overlapping with critics who note that advance organizers are not beneficial, especially to users who have a good understanding of concepts and do come with previous knowledge (Mayer, 1979) (Pillay, Boles, & Raj, 1998).

Furthermore it appeared that advance organizers are most useful with information that is not well organized (Marzano, Pollock, & Pickering, 2004), because the organizer is a new way of presenting information. Another founding is that higher level advance organizers produce deeper learning than lower level advance organizers (Marzano, Pollock, & Pickering, 2004). These principles should be taken into account when developing advance organizers.

Advance organizers are elaborated in many ways by several authors (Langan-Fox, Waycott, & Albert, 2000). Marzano, Pollock and Pickering (2004) found that different types of advance organizers produce different results, depending on the focus of the advance organizer. The intuitive-analytical dimension of CSI interacts with the structure and organization of the contents of instruction (eg. simultaneous versus sequential; wholes versus parts) (Riding & Sadler-Smith, 1997) this is important to consider when developing two different advance organizers. Satterly and Telfer (1979), Pillay, Boles and Ray (1998), Boles, Pillay and Ray (1999), Riding and Sadler-Smith (1992), Riding and Sadler-Smith (1997) and Riding and Watts (1997) relate different types of advance organizers to the wholist-analytic dimension. Satterly and Telfer (1979) started defining three types: the Integrator, the Analyser and the Linker.

The first type is the Integrator which has the purpose to make the whole clear (Riding & Sadler-Smith, 1992). This advance organizer is more abstract and inclusive than the new material to be learned. It is a more global overview which gives a non-hierarchical view showing interrelationships and horizontal linkages of the content. (Riding & Sadler-Smith, 1997)

The second type is the Analyser which has the purpose to make the parts clear (Riding & Sadler-Smith, 1992). This organizer indicates the structure of the material. It is a more hierarchical advance organizer which presents the divisions of the content into topics and sub-topics (Riding & Sadler-Smith, 1997).

The third type is the Linker, which links the parts to the whole (Riding & Sadler-Smith, 1997).

Matching one type of advance organizer with a typical cognitive style can be done in two ways. On the one hand evidence can be found for compensating the weaknesses of a person during elaborating information. In this case an analytical person should be supported with a more intuitive advance organizer and the other way around (Pillay, Boles, & Raj, 1998) (Riding & Sadler-Smith, 1997). On the other hand evidence is found for using the preferred mode of presentation. In this case an analytical person should be supported with more analytical advance organizers and the other way around (Riding & Sadler-Smith, 1997).

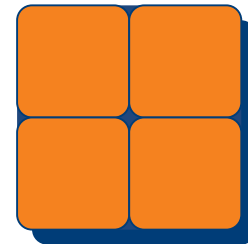
To make an optimized advance organizer it should trigger the user to read the organizer and present information which is elaborated naturally by the user. Therefore a combination is made between the Integrator for Intuitivists (focusing on the whole) or the Analyzer for Analytics (focusing on the parts) and the Linker for both Analytics and Intuitivists (linking the parts and the whole). It is expected that the user will be triggered to read the advance organizer, because it starts with describing the whole/parts, and then it links them together, which is a new way of interpreting the information. This makes the processing of information easier and therefore will enhance manual appreciation.

1.3.2 Advance Organizers for Intuitivists: Holistic Advance Organizers

Intuition, as a characteristic of right-brain orientation, refers to immediate judgment based on feeling and the adoption of a global perspective. The right hemisphere emphasizes synthesis and simultaneous integration of many inputs at once and is mainly responsible for spatial orientation and the comprehension of visual images. (Allinson & Hayes, 1996) Intuitivists will retain a global or overall view of information (Riding & Sadler-Smith, 1997). They tend to be relatively nonconformist, prefer an open-ended approach to problem solving, rely on random methods of exploration, remember spatial images most easily and work best with ideas requiring overall assessment (Allinson & Hayes, 1996).

Intuitivists, also called Wholists, are also described in terms of synthetic, inductive, expansive, unconstrained, divergent, informal, diffuse and creative (Cools & van den Broeck, 2007). Intuitivists tend to organize information into loosely clustered wholes to construct an overall understanding of the given information. They retain a global overall view of information, as shown in Figure 1.2. Strengths include their ability to see the big picture of a situation and therefore intuitivists have a balanced view of the given information. For Intuitivists there is the danger that the distinction between the parts of the topic may become blurred (Riding & Sadler-Smith, 1997). They find it difficult to separate situations into parts and become analytical. (Pillay, Boles, & Raj, 1998) (Riding & Sadler-Smith, 1997)

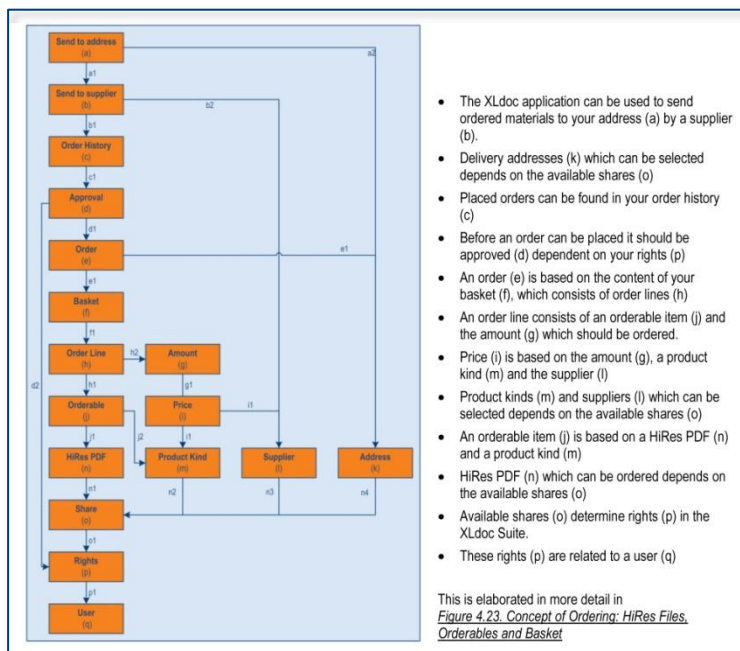
Figure 1.2: Intuitivist view



Satterly and Telfer (1979) provided evidence that the use of advance organizers helps Intuitivists to develop a big picture of given information rather than having to engage in search and construction processes from unfamiliarly structured information (Pillay, Boles, & Raj, 1998).

It is expected that Intuitivists will benefit most from an advance organizer which combines the Integrator type with the Linker type. It starts with an overview of the whole, describing exactly what is presented in the chapter (both verbal and using images), stressing the holistic view of Intuitivists. This is the integrator type which is structured more simultaneously and presents the information in wholes (Riding & Sadler-Smith, 1997). Then the parts are elaborated in the Linker type, by presenting which parts are required for the whole, focusing on the weaknesses of Intuitivists. An example of a holistic advance organizer can be found in Figure 1.3.

Figure 1.3: Example of a holistic advance organizer

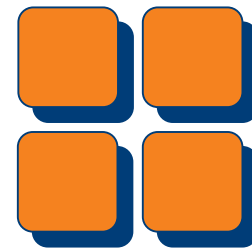


This results in the following hypothesis: H2a: *Intuitive users will appreciate a holistic advance organizer in the manual more than a hierarchical advance organizer.*

1.3.3 Advance Organizers for Analytics: Hierarchical Advance Organizers

Analysis, as a characteristic of left-brain orientation, refers to judgment based on mental reasoning and a focus on detail. The left hemisphere emphasizes a primarily linear mode of operation with information being processed sequentially and is mainly responsible for logical thought, especially in verbal and mathematical functions. (Allinson & Hayes, 1996) Analysts will deconstruct information to its component parts (Riding & Sadler-Smith, 1997), as shown in Figure 1.4.

Figure 1.4: Analytic view



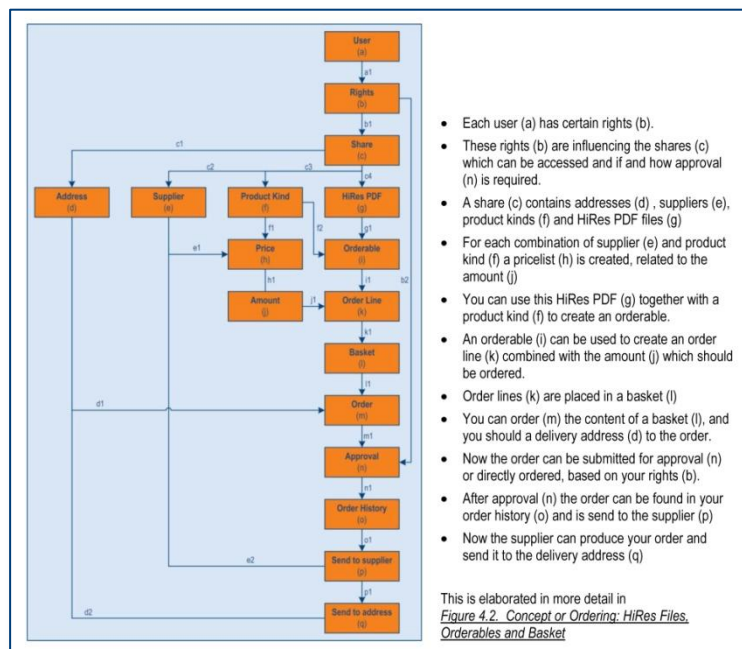
Analytics tend to more compliant, favor a structured approach to problem solving, depend on systematic methods of investigation, recall verbal material most readily and are especially comfortable with ideas requiring step by step analysis. (Allinson & Hayes, 1996) Analytics are also described in terms of deductive, rigorous, constrained, convergent, formal and critical (Cools & van den Broeck, 2007). Analytics tend to process information in clear-cut conceptual groups and often focus on one of these groupings at a time. They can decompose problems into separate parts and may quickly diagnose a problem, but they may not be able to develop a big picture and synthesize information. (Pillay, Boles, & Raj, 1998) (Riding & Sadler-Smith, 1997)

For Analytics, the separation of the whole into its parts may mean that one may focus on one aspect of the whole, at the expense of the others and the whole view (Riding & Sadler-Smith, 1997). The Analytic style person seeks detailed and highly structured information to conceptualize.

For the Analytics, consideration must be given to how the information is broken down to spread it over a number of steps and finally pull it together as a unit of information (Pillay, Boles, & Raj, 1998).

It is expected that Analytics will benefit from an advance organizer which combines the Analyzer type with the Linker type. It starts with a summary of the hierarchical steps which should be executed, stressing the focus on parts of Analytics. This is the Analyzer type which is structured more sequential and presents the information in parts (Riding & Sadler-Smith, 1997). Then the final result is presented (Linker type), by combining the steps, focusing on the weaknesses of Analytics and presenting the whole. An example of a hierarchical advance organizer can be found in Figure 1.5.

Figure 1.5: Example of a hierarchical advance organizer



This results in the following hypothesis: H2b: Analytical users will appreciate a hierarchical advance organizer in the manual more than a holistic advance organizer.

1.3.4 Advance Organizers for different Cognitive Styles

The two hypotheses presented above can be summarized in hypothesis: *H2: Users will appreciate a manual more when advance organizers are optimized for their situation.* The relation between cognitive style and advance organizers is presented in Table 1.2.

Table 1.2: Characteristics of intuitivists and analytics and the related advance organizers

Intuitivists	Analytics
➤ Intuitive ➤ Random ➤ Holistic ➤ Synthesizing ➤ Subjective ➤ Looks at the whole	➤ Logical ➤ Sequential ➤ Rational ➤ Analytical ➤ Objective ➤ Looks at the parts
▼	▼
Holistic advance organizer	Hierarchical advance organizer
➤ Start by presenting final result followed by required elements and related steps ➤ Elaboration of steps in presented order ➤ From End to Start	➤ Start with first step followed by chronological steps ➤ Elaboration of steps in presented order ➤ From Start to End

1.4 Do people believe they are able to use the system: Low vs. High Self-Efficacy

To enable people to work efficient and effective with the instructions and thereby increasing appreciation, the instructions must elaborate on their prior skills, knowledge and computer experience by directly recruiting the scenarios and procedures of the task domain that are familiar to the users (van der Meij & Carroll, 1998).

The relevant information depends not only on the information a person has or has not, but on the information the user thinks he/she needs to fulfill the task successfully, using the system. This is considered in the concept of computer self-efficacy, developed by Bandura (1993). He states that the level of motivation, affective states, and actions are based more on what they believe than on what is objectively the case.

Computer self-efficacy is defined as a judgment of one's capability to use a computer and which tasks which can be executed. It is not concerned with the skills one has, but with judgments of what one can do with the skills one possesses (Compeau & Higgins, 1995). It is influencing whether new technologies will be adopted (Compeau, Higgins, & Huff, 1999) (Davis, 1993) and it influences overall computer knowledge (Compeau & Higgins, 1995) (Levine & Donitsa-Schmidt, 1998). Self-efficacy is one of the factors that determines whether or not trainees apply the skills they have acquired (Kraiger, Ford, & Salas, 1993) and therefore it is relevant to consider self-efficacy when introducing new technologies (Venkatesh, 2000). It is affected by past experience, by observing others, by persuasion and affective arousal, listed in order by magnitude of the effect (Dishaw, Strong, & Bandy, 2002).

Computer self-efficacy judgments differ on three dimensions: magnitude, strength and generalizability. The magnitude refers to the level of task difficulty one believes is attainable. Individuals with a high magnitude might be expected to perceive themselves as able to accomplish more difficult computing tasks than those with lower judgments.

Strength refers to the level of conviction about the judgment or the confidence an individual has regarding his or her ability to perform the various tasks.

Generalizability indicates the extent to which perception of self-efficacy are limited to a particular domain of activity. Individuals with a high computer self-efficacy generalizability would expect to be able to competently use different software packages and computer systems. (Compeau & Higgins, 1995) Self-efficacy is related to confidence, but as stated by Bandura (1997) confidence refers to the strenght of belief but does not necessarily specify what the certainty is about. Someone might be supremely confident that he/she will fail in a certain situation. In this case confidence is high, but self-efficacy is low.

Self-efficacy beliefs influence cognitive, motivational, affective and selection processes. When one has a high sense of self-efficacy one visualizes success scenarios that provide positive guides and supports performance.

People with a low self-efficacy visualize failure scenarios and dwell on the many things that can go wrong. It influences motivation by determining the goals people set for themselves, how much effort they expend, how long they persevere in the face of difficulties and their resilience to failures. (Bandura, 1993) This makes self-efficacy an essential motive to learn (Zimmerman, 2000) or just process information.

Measuring Self-Efficacy

Compeau and Higgins (1995) developed a measurement instrument for general computer self-efficacy measuring the magnitude, strength and generalizability. They used five existing measurement instruments as a basis and tried to remove the limitations of these scales. The instrument is tested and validated by Compeau, Higgins and Huff (1999), Venkatesh (2000) and Johnson and Marakas (2000). (Gravill, Compeau, & Marcolin, 2002)

This instrument is quite unique because most instruments are focusing on a specific software application (Dishaw, Strong, & Bandy, 2002). To develop such an instrument is very time-consuming and situation specific, which would make this study less generalizable (Dishaw, Strong, & Bandy, 2002). However, at the same time this is the main subject for criticisms who state that self-efficacy can be measured better with application specific instruments (Venkatesh, 2000).

Computer Self-Efficacy is measured by 10 items on a Likert scale. The questionnaire items are answers on the following question "I could complete the job using the software package...." (Compeau & Higgins, 1995) For example: *I could complete the job using the software package if there was someone giving me step by step instructions.*

The entire questionnaire can be found in *Appendix B: Measuring Computer Self-Efficacy*. The respondent should identify if he/she thinks is able to complete the job using the software package with the given solution. The extent to which the respondent is confident should be indicated from a scale from 1 to 10.

Scoring the self-efficacy measure can be accomplished by summarizing the responses on the confidence scale, counting 0 for a "NO" response. The minimum score is 0 and the maximum is 100, based on maximum 10 points for each of the ten questions (Compeau & Higgins, 1995).

Based on the scale from 1 to 10 it is expected that 5 will mean insufficient and 6 is sufficient. Therefore respondents scoring equal or below 59 ($SE \leq 59$) are considered as having a low self-efficacy, respondents scoring equal or above 60 ($SE \geq 60$) are considered as having a high self-efficacy.

1.4.1 Tailoring to Self-Efficacy via Level of Chunking

Whether self-efficacy is low or high, the information workload should be as less as possible to enhance appreciation or achieve learning. In case of overload it will not be stored in long term memory. Cognitive workload consists of intrinsic, germane and extraneous cognitive load. Intrinsic cognitive load is the inherent difficulty of the instruction itself and can't be influenced by manuals. (Antonenko & Niederhauser, 2010)

Germane cognitive load is devoted to the processing, construction and automation of schemas. This type of load should be promoted because it created structures that organize our knowledge and assumptions about something and are used for interpreting and processing information (Sweller, Van Merriënboer, & Paas, 1998).

Extraneous workload is generated by the manner in which information is presented to learners. This type of load occurs when readers lack facility with computers or familiarity with the program and they must invest cognitive resources to figure out the basic operation of the computer and software (Antonenko & Niederhauser, 2010).

One of the factors influencing (extraneous) workload is the level of chunking. Chunking involves the division of sentences into nonoverlapping segments (chunks) and facilitates switching between the manual and the application (Steehouder, 2007).

One way of chunking is using screenshots, because people want to check whether the screenshot in the manual corresponds with the application and they simplify the process of looking up from the manual (Gellevij & van der Meij, 2002).

Another way to create chunks is varying the number of presented steps. The same message can be presented in one step (go to print), a combined step (go to file, and click print) or multiple steps (1. go to file, 2. go to print). This difference is also used in the concept of fading, but it can also be used for different types of users. (van der Meij & Gellevij, 2004)

When the manual is used in an interactive way or chunking elements are used, users have to switch between reading the manual, executing the action in the application and to check the result in the manual. On the one hand this iteration process reveals mental workload and results in less errors and required time,

especially when self-efficacy is low. On the other hand this imposes cognitive load because users have to split their attention among multiple sources and have to integrate the information to match and perform instructions from the document on to the equipment. (Ganier, 2004)

Switching can be stimulated or not by adapting the number of chunks. Chunks can be adapted by the number of screenshots or the number of presented steps. It is expected that appreciation will be enhanced when the level of chunking is optimized for in level of self-efficacy.

1.4.2 Tailoring to low Self-Efficacy by increasing the Level of Chunking

People with low self-efficacy will experience more cognitive load, especially extraneous load. This type can be influenced by manuals and therefore the focus on the tailored manuals should be on decreasing the extraneous workload. When self-efficacy is low the natural extraneous load will be larger and thus the total cognitive load will be faster overloaded (Antonenko & Niederhauser, 2010).

When self-efficacy is low, confidence in executing the task successfully is low and people should be prevented from making errors which requires more checks and iterations. Therefore the information should be presented in many chunks, ensuring many checks (Antonenko & Niederhauser, 2010).

As a consequence there will be no space left for learning, but that is not an issue because people with low self-efficacy have low intent to learn and will not use learning strategies (Craig & Tulving, 1975). When the user does not understand the instructions their amount of self-efficacy will decrease and they might even give up.

This means the manual should contain many (correct) screenshots and detailed steps, giving the possibility to check the process and enhancing the chance of successful task fulfillment. This means using many chunks and thus content with a high level of chunking. An example of a page with a high level of chunking can be found in Figure 1.6.

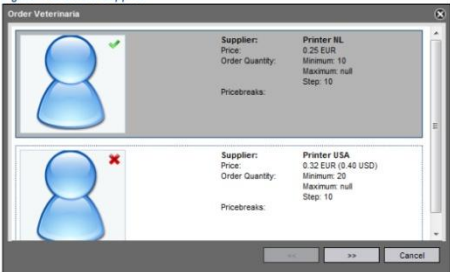
Figure 1.6: Example of content with a high level of chunking

From the Ordering* Application* you can order items that are available for you.

To do so follow these steps:

1. Go to **Start > Ordering**
2. Select the orderable in the content window you want to order
3. Click the **Add to basket** button in the Sub menu
4. A screen as in Figure 4.3. Select Supplier appears where you have to select a Supplier*

Figure 4.3. Select Supplier



You can do so by clicking on the desired supplier. The supplier you select will get a green check mark

5. Click the button **Next** to the right to go further or the **Cancel** to close the screen without saving to the basket
6. A screen as in Figure 4.4. Add Order Details appears where you have to enter an amount and optionally a comment for the item.

Figure 4.4. Add Order Details



- Depending on the settings in XLdoc it could be that there is a minimum and maximum amount or there is a certain multiple required. If this happens the input field is colored red. This means that your amount is invalid
- You can also put comment for the approver in the comment input field

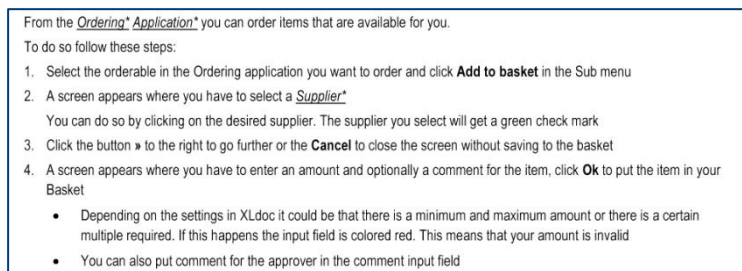
This results in the following hypothesis: *H3a: Users with low self-efficacy will appreciate content with a high level of chunking more than content with a low level of chunking.*

1.4.3 Tailoring to high Self-Efficacy by decreasing the Level of Chunking

When self-efficacy is high, users (they think) need less detailed steps and less checks of the process. Many chunks enhances workload but are not necessary for successful task fulfillment and people will not be able to learn because workload capacity will be overloaded.

This means the manual should contain less screenshots and less (detailed) steps, thus with a low level of chunking. This means using less chunks and thus content with a lower level of chunking. An example of a page with a low level of chunking can be found in *Figure 1.7*.

Figure 1.7: Example of content with a low level of chunking



This results in the following hypothesis: *H3b: Users with high self-efficacy will appreciate content with a low level of chunking more than content with a high level of chunking.*

1.4.4 Levels of Chunking for different levels of Self-Efficacy

The two hypotheses presented above can be summarized in hypothesis: *H3: Users will appreciate a manual more when the level of chunking is optimized for their situation.* The relation between self-efficacy and the level of chunking is presented in *Table 1.3*.

Table 1.3: Characteristics of high and low self-efficacy and the related level of chunking

High Self-Efficacy	Low Self-Efficacy
➤ High confidence ➤ Focus on success	➤ Low confidence ➤ Focus on what can go wrong
▼	▼
Low Level of Chunking	High Level of Chunking
➤ Less detailed steps ➤ Less procedural screenshots	➤ Detailed steps ➤ Many procedural screenshots

1.5 How eager are people to learn information: Low vs. High Need for Cognition

The ultimate goal of a manual is learning, because then the manual won't be needed anymore to understand the software application. The amount of elaboration of information and learning depends on the person its motivation and ability to do so (Mayhew, 1999) (Blackwell, Miniard, & Engel, 2005) both intrinsic (dispositional) and situational.

Ability depends on the intelligence of a person (intrinsic) and the environment (situational), for example a quiet or noisy room. Motivation appeared to be very essential for learning and may even moderate intelligence (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Kraiger, Ford and Salas (1993) states that if a user does not want to learn, independent of their capabilities, learning skills will not be used. In addition, Boscolo (2000) found that interest or a positive attitude may compensate low prior knowledge for achieving good results. In other words, motivation can determine behavior and performance.

The intrinsic motivation is taken into account in need for cognition. Need for cognition is defined by Cacioppo and Petty as the tendency for an individual to engage in and enjoy thinking (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Individuals high in need for cognition naturally tend to seek, acquire, think about, and reflect back on information to make sense of stimuli, relationships and events in their world. Individuals low in need for cognition, in contrast, are characterized as more likely to rely on others (e.g. celebrities and experts) or social comparison processes to provide this structure.

The individual differences are derived from past experience, sustained by accessible memories and behavioral histories, manifest in current experience, and are influential in the acquisition of processing of information relevant to dilemmas or problems (Cacioppo, Petty, Feinstein, & Jarvis, 1996).

An individual who has a high need for cognition is more likely to be a thinker. They readily engage in thinking about topics as they are presented, enjoy the thinking process, and are motivated to apply their thinking skills with little prompting. In an educational context, these personality traits and learned skills to process information efficiently can be linked with greater academic achievement. These individuals tend to be more conscientious and more open to experiences than are individuals who have a low need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996).

Measuring Need for Cognition

Cacioppo & Petty originally developed a measurement instrument for need for cognition of 34 items. Later on this is shortened to 18 items. The short version is tested and validated by Cacioppo & Petty, Cacioppo, Petty, Feinstein, & Jarvis, Cacioppo et al., Sadowski, Sadowski & Gulgoz (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Examples of questions are:

- *I like to have the responsibility of handling a situation that requires a lot of thinking*
Scoring 4 for agreement and -4 for disagreement
- *Thinking is not my idea of fun*
Scoring 4 for disagreement and -4 for agreement

The entire questionnaire can be found in *Appendix C: Measuring Need for Cognition*. Out of the 18 statements on the Need for Cognition Scale, 9 are reverse scored. The final score for each individual is a sum of the individual's points from each of the 18 questions. The minimum score is -72 and the maximum is 72, based on a score of -4 to +4 for each of the eighteen questions (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Respondents scoring below 0 ($NfC < 0$) are considered as having a low need for cognition, respondents scoring equal or above 0 ($NfC \geq 0$) are considered as having a high need for cognition.

1.5.1 Tailoring to Need for Cognition via Document Orientation

Individuals differing in their need for cognition also differ in the tendency to engage in effortful cognitive activity when given a task or making sense of the world and in their tendency to enjoy (or are less stressed by) cognitively effortful problems, life circumstances, or tasks (Cacioppo, Petty, Feinstein, & Jarvis, 1996).

For executing tasks different types of information are available: procedural and declarative. Procedural information consists of actions, conditions for actions and results from actions. This information is characterized by action verbs and imperatives, step by step presentations, and if... then constructions. This is the most important information during use (Karreman, Ummelen, & Steehouder, 2005). This type of information is focusing on skill development which is needed to speed up and automate the execution of basic tasks (Van der Meij, 1997).

Declarative information is all explanatory information other than action information. It is characterized by modal verbs, continuous prose and indirect style. However, declarative information is not required for task fulfillment, it is read spontaneously (Karreman, Ummelen, & Steehouder, 2005). This type of information is focusing on knowledge development about important principles, structures, classifications and facts about the program (Van der Meij, 1997).

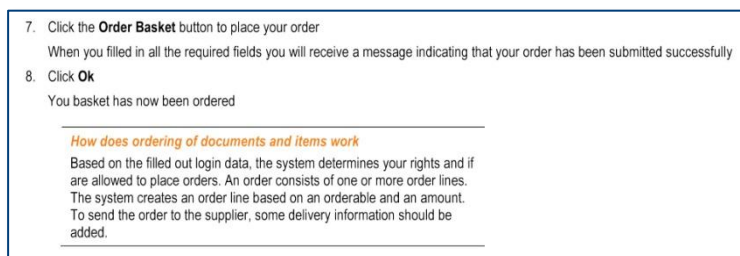
According to the "levels of processing" framework of Craik and Lockhart (1972), the "deeper" the processing, the more that will be remembered. Information that involves strong visual images or many associations with existing knowledge will be processed at a deeper level. The theory also supports the finding that one remembers things that are meaningful because this requires more processing than meaningless stimuli. Having multiple representations enhances the number of possible mental pathways when trying to remember (Blackwell, Miniard, & Engel, 2005). Declarative information adds an additional source of information and stimulates processing of information and possibly learning.

This means that by focusing on procedural or declarative information, learning can be stimulated or not. It is expected that need for cognition is influencing the extent to which users elaborate declarative information. Users who have a high need for cognition will elaborate the declarative information more. When users have a low need for cognition people use mainly procedural information. Therefore it might be relevant to change the document orientation based on need for cognition, by differing the focus on declarative information.

1.5.2 Tailoring to low Need for Cognition by a Task Orientation

Users with a low need for cognition use the manual to execute an action in the system and do not focus on learning, so the goal is to minimize workload and fulfill the task successfully (Cacioppo, Petty, Feinstein, & Jarvis, 1996). The user may develop some knowledge and skills thanks to incidental learning, but that is not the main goal (Craik & Lockhart, 1972). This type of user is action oriented and procedural information is most important, in other words they are reading-to-do. It is expected that these users will appreciate a task oriented manual more. This will present the procedural information first and then declarative information (Ament, 2003), thus the focus will be on the procedural information. It does not focus on the concept behind the system but on executing the task. An example of a page of the task oriented manual can be found in Figure 1.8.

Figure 1.8: Example of a task oriented manual

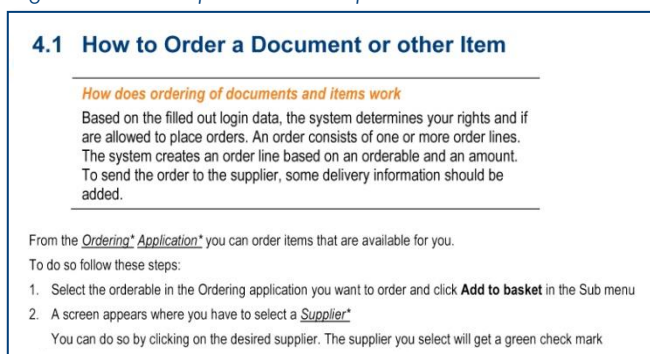


This results in the following hypothesis: *H4a: Users with low need for cognition will appreciate a task oriented manual more than a concept oriented manual.*

1.5.3 Tailoring to high Need for Cognition by a Concept Orientation

Users with a high need for cognition are more likely to learn while doing. When reading-to-learn, the readers' primary goal is to absorb information for future recall (Redish, 1989). It is expected that these users will appreciate a concept oriented manual more. The focus should be on combining declarative (conceptual) and procedural information (Ament, 2003) and therefore the focus will be more on the declarative information. This results in deeper processing of information. An example of a page of the concept oriented manual can be found in Figure 1.9.

Figure 1.9: Example of a concept oriented manual



This results in the following hypothesis: *H4b: Users with high need for cognition will appreciate a concept oriented manual more than a task oriented manual.*

1.5.4 Document Orientations for different levels of Need for Cognition

The two hypotheses presented above can be summarized in hypothesis: *H4: Users will appreciate the manual more when the document orientation is optimized for their situation.* The relation between need for cognition and document orientation is presented in Table 1.4.

Table 1.4: Characteristics of high and low need for cognition and the related document orientation

High Need for Cognition	Low Need for Cognition
➤ Seek, acquire, think about and reflect information and applies thinking skills easily ➤ Enjoys thinking process ➤ Open for new experiences ➤ Wants to understand the system	➤ Does not easily seek, acquire, think about and reflect information or apply thinking skills easily ➤ Does not enjoy the thinking process ➤ Conservative to new experiences ➤ Wants to execute tasks
▼	▼
Concept Orientation	Task Orientation
➤ Focus on knowledge ➤ First conceptual information then procedural information	➤ Focus on skills ➤ First procedural information then conceptual information

1.6 Summarizing Hypotheses

The main hypothesis is: *H1: Users will appreciate the manual more when the manual is optimized for their situation.* The other three hypotheses presented before are summarized in Table 1.5.

Table 1.5: Summarizing hypotheses

	If score is high, then..	If score is low, then..
H2 Analytic style	Hierarchical advance organizer	Holistic advance organizer
H3 Computer Self-Efficacy	Low level of switching	High level of switching
H4 Need for Cognition	Concept Orientation	Task Orientation
	...will be preferred	

2 Method

This chapter explains the methodology of this study and describes the procedures and measurement, participants and materials.

2.1 Procedure & Measurement

2.1.1 Questionnaires measuring Mental Factors

First of all the (potential) respondents filled in a questionnaire measuring their cognitive style, computer self-efficacy and need for cognition. The questionnaire was sent by e-mail and had to be returned before the test. The respondents ($n=43$) filled out the questionnaire in an Excel-sheet. These questionnaires are presented in *Appendix A: Measuring Cognitive Style*, *Appendix B: Measuring Computer Self-Efficacy* and *Appendix C: Measuring Need for Cognition*. The questionnaires are tested and validated in previous research. The reliability turned out to be sufficiently high, as shown in *Table 2.1*.

Table 2.1: Reliability of questionnaires in cronbach's alpha (α)

Cognitive Style Index	0,889
Computer Self-Efficacy	0,917
Need for Cognition	0,800

2.1.2 Briefing the Respondents

Next the selected participants were introduced to the study object. This briefing took place face to face (81%) or by telephone (19%). The participants were told that a manual is developed and that feedback is required for improvement. Therefore they receive a printed manual and a task description, including the login data and two tasks. When briefing took place by telephone the materials were sent upfront and participants were asked to print the files, but not look into them yet. Nothing was said about tailoring the manual to their mental factors. The respondents should focus on giving feedback on the manual, in their state of mind. More detailed information of the briefing can be found in *Appendix D: Test Procedure*.

2.1.3 Task Execution & Using Manuals

During the actual test, the participants were asked to execute the two tasks after each other. The task included a preset scenario and defined the content to be used. This ensured the task had a certain difficulty and some functions had to be used. The test packages were opened after the briefing, shortly before the task execution. The task descriptions can be found in *Appendix E: Tasks*. The order of the task differed, as described in *Paragraph 2.3 Materials*. This should prevent the effect of order of testing, because both tasks were executed as first task. The respondent should focus on getting an opinion about the manual. To make the test not too long a time indication of 40 to 60 minutes was given.

2.1.4 Measuring Appreciation by an Interview

The results were measured by interviews with users, by face to face (81%) or telephone (19%). Interviews are used because appreciation by users is most important and slight nuances can be noticed. Appreciation is determined by the reader, user specific and is very well measurable in a qualitative way. However, appreciation is a subjective concept and differs per person, it is most relevant to measure, because it determines the behavior of an individual user and thereby the use of manuals. The results were measured in several phases. The questions asked in the interview can be found in *Appendix D: Test Procedure* and are described below.

1. Appreciation Score

The interview started with some questions about the task description and the manual, both for the creation section and ordering section. For the task description the difficulty (difficult vs. simple) and clarity (unclear vs. clear) were measured to get an idea of the task and the task description.

To measure the quality of the manual the following items were used: pleasantness (unpleasant vs. pleasant), structure (bad structured vs. well structured), completeness (incomplete vs. complete), conciseness (long-winded vs. concise), logic (illogical vs. logical) and usefulness (useless vs. useful). There is no standard for the quality of manuals and therefore some relevant items were prepared. These items were selected because the advance organizer is focusing on improving the structure, the level of chunking is focusing on improving the completeness and conciseness, and the document orientation is focusing on improving logic and usefulness. A more general item is pleasantness, which combines the total experience. These items were measured on a Likert scale from 1 to 7. The average score on the items resulted in the appreciation score, which will be used for interpreting the data.

2. Spontaneous Remarks

It was asked which remarks appeared spontaneously, by asking which and why elements in the manual were liked or not. These remarks were most important because they are on top of head and it is most likely they will influence appreciation.

Furthermore it was asked which section of the manual was preferred, the creation or ordering section. This is the judgment of the entire manual.

3. Preferred Elements

The third phase started with an introduction of the tailored elements (advance organizers, the level of chunking and document orientation). The results of the questionnaire were not presented yet, but it was told which elements differ between the manuals and it was asked which of the variants was preferred. This enlarged the change for usable results. Furthermore these are usable results, because, however, they are not at the top off the head, it represents an opinion of the participant and will influence appreciation at the end.

Furthermore it was asked which section of the manual was preferred, compared to the complexity of the task. This can be used to adjust for differences in task complexity.

2.1.5 Debriefing the Respondents

Immediately after the interview it was told what was measured by the questionnaire. First it was asked which results was expected and then the results from the questionnaire were told. The expectation was considered in the evaluation of the measurement instruments. Finally, the real purpose of the test was explained. More detailed information about what was told in the briefing can be found in *Appendix D: Test Procedure*.

2.2 Participants

Forty-eight people were approached of which 90% respondents, so forty-three respondents participated in the study ($n=43$). The respondents are business (white collar) users, who master the English language, but are mostly non-native speakers (98%). Approximately three-quarters (74%) of the respondents are male. Age was measured in four categories. Most participants are between 20 and 29 (40%). 26% has the age of 30-39, 14% the age of 40-49 and 21% of 50-59.

Furthermore XLdoc knowledge was measured, because it might be relevant. XLdoc knowledge is based on the experience with the application and determined by the experience of the management of XLdoc. The distribution among respondents was rather equal. Beginners (35%) don't have any experience, advanced users (35%) have experience with some sections of the applications and experts (30%) work daily with the whole application.

The results of the questionnaires measuring mental factors are shown in Table 2.2. Based on the limits presented in Chapter 1 the scores were converted into a high/low score. The analytical cognitive style was distributed equally. However, Self-Efficacy and Need for Cognition were not. This may be influenced by the population, because (potential) XLdoc users are mostly people who work daily with computers and therefore their self-efficacy may be relatively high. There was no significant relation between XLdoc knowledge and Self-Efficacy score ($F=1,816$; $p=0,17$), because the self-efficacy questionnaire was focusing on general computer self-efficacy. The distribution in need for cognition might be influenced by the fact they want to participate in a study.

The mental factors are independent of each other, so they don't need to be equally distributed when combined, but the more equal the better. It appeared the distribution was rather equal, especially taking into account the unequal distribution of self-efficacy and need for cognition.

Table 2.2: Distribution of mental factors among respondents

	High	Low	Total
Analytical Cognitive Style	51% (n=22)	49% (n=21)	100 % (n=43)
Self-Efficacy	79% (n=34)	21% (n=9)	100 % (n=43)
Need for Cognition	84% (n=36)	16% (n=7)	100 % (n=43)

2.3 Materials

The manuals describe two different sections of the application, related to two different tasks.

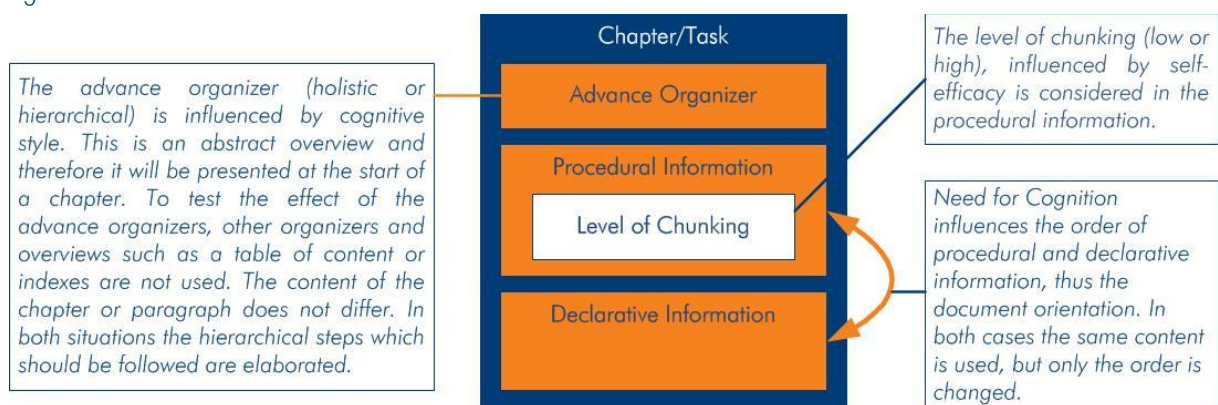
Each participant initially received a manual, in which one section was totally optimized and one which was totally not optimized on all three elements, based on the results of the questionnaire. The relation between the questionnaires and the elements in the manual is not very straightforward which decreases the change on hypothesis guessing. Furthermore the optimization was not told upfront, so the respondents will not give desirable answers to please the researcher.

A within-subjects design was used because appreciation and preferences can be measured for an individual. Furthermore it decreases the number of required respondents.

2.3.1 Tailored Manuals

The basic manual can be found in Appendix H: Test Manual. Based on this manual, eight variants were created. The tailored elements were influencing independent manual sections. Therefore the results can be measured very well at once. The structure is presented in Figure 2.1.

Figure 2.1: Structure of tailored elements in manuals



Based on the combined mental factors, one of the eight manual variants was presented. Each manual started with the General chapter and ended with a Glossary. The content of these chapters aren't tailored: no procedural screenshots, conceptual information or advance organizers were used.

Three rather small chapters were tailored for the ordering task: Library, Ordering and Address Book. One rather large chapter was tailored for the creation task: Create Documents.

Based on the cognitive style, the holistic or hierarchical advance organizer was placed at the begin of the chapter.

Based on the self-efficacy level, the procedural screenshots were placed or removed and steps were shortened. For the ordering task seven steps and nineteen screenshots were changed and for the creation task six steps and nine screenshots.

Based on the level of need for cognition, the conceptual information blocks were moved to the beginning or end of the paragraph. For the ordering task nine information blocks (three for each chapter) and for the creation task seven.

The optimized tasks in the manual were distributed equally over the respondents. For example, half of the respondents with a high analytical cognitive style received the optimized creation task and half received the optimized ordering task.

2.3.2 Tasks to stimulate usage of the Manual

To stimulate the usage of the manual, two tasks were developed. This made it easier to get an idea of the manual.

One task was *to make an item orderable and submit an order*, which is focusing on XLdoc Ordering. The other task was focusing on the XLdoc Creation Studio and is *to create a document with alternative pages*. A detailed description can be found in *Appendix E: Tasks*.

The tasks were defined rather complete and structured, by using predefined texts to make sure that certain problems appeared and the complexity of the tasks was ensured. In this way the tasks and related instructions should have equal complexity.

To get a valid result, the order of text and tasks was changed to exclude the influence of the order on the results. The distribution of order of tasks and optimization varied from 23% to 26% and thus was rather equal. A more detailed distribution among the mental factors of the respondents was shown in *Table 2.3*, showing the optimization and subject of the first task.

Table 2.3: Distribution of first task among mental factors

		Creation – Optimized	Creation – Not Optimized	Ordering – Optimized	Ordering – Not Optimized	Total
Analytic Cognitive Style	<i>Analytical (High)</i>	12% (n=5)	12% (n=5)	12% (n=5)	16% (n=7)	51% (n=22)
	<i>Intuitive (Low)</i>	14% (n=6)	14% (n=6)	12% (n=5)	9% (n=4)	49% (n=21)
Self-Efficacy	<i>High</i>	21% (n=9)	21% (n=9)	19% (n=8)	19% (n=8)	79% (n=34)
	<i>Low</i>	5% (n=2)	5% (n=2)	5% (n=2)	7% (n=3)	21% (n=9)
Need for Cognition	<i>High</i>	21% (n=9)	21% (n=9)	21% (n=9)	21% (n=9)	84% (n=36)
	<i>Low</i>	5% (n=2)	5% (n=2)	2% (n=1)	5% (n=2)	16% (n=7)

3 Results

The hypotheses were tested in several ways and the results are presented in this chapter. The results were recoded into optimized/not optimized for analysis. An optimized manual/task is the combination between user characteristics and manual/task, which means that one manual/task can be optimal for one user and not optimal for another.

For the analysis, first of all the appreciation score was analyzed (See 1. *Appreciation Score in 2.1.4 Measuring Appreciation by an Interview*), using the related samples Wilcoxon signed rank test, tested on independency. A t-test cannot be used, because not all appreciation scores were distributed normally. Based on a Shapiro-Wilk test the average appreciation score of the optimized manual was distributed normally, but the appreciation score of the not optimized manual was not.

The reliability of the appreciation score was rather high, as shown in Table 3.1. This shows that the appreciation score could be considered as one construct, over all versions as well as each version. However, there was no large difference between the different versions, because the reliability of all items (both optimized and not optimized) was also rather high. Based on an analysis of the separate items, not relevant differences appeared and therefore appreciation score was used as one construct when analyzing the results.

Table 3.1: Reliability of appreciation score in cronbach's alpha (α)

Total (all manual results) (n=12)	0,841
Not optimized manual (n=6)	0,844
Task not optimized (n=2)	0,873
Optimized manual (n=6)	0,783
Optimized task (n=2)	0,761

Subsequently it was tested whether the spontaneous remarks (See 2. *Spontaneous Remarks in 2.1.4 Measuring Appreciation by an Interview*) or preferred elements and manual supports the hypotheses (See 3. *Preferred Elements in 2.1.4 Measuring Appreciation by an Interview*), using the related samples Wilcoxon signed rank test or one-sample binomial test. Another analysis focused on which variant of the tailored elements was mostly preferred. This might result in some implications for practice.

It was also tested whether the preferred tailored element influenced the manual appreciation, by comparing the manual with the preferred tailored element with the preferred manual. When the results match in most situations, the tailored element might influence the preferred manual.

Also the influence of the expected result from the questionnaire was analyzed. When a strong effect appears, the questionnaire might result in the wrong value. It was also tested whether there was a relation between the value of the questionnaire and the preference. This was done to test the used limits for determining the score on the mental factor.

Finally the consequences for the hypotheses are summarized.

3.1 The Effect of Tailoring to Mental Factors (H1)

First of all the effect of tailoring manuals on all three factors, based on the results of the questionnaires were measured. Hypothesis 4 examines the effect of tailoring the elements based on the results of the questionnaires. It was expected that *users would appreciate the manual more when the manual is optimized for their situation*.

Analysis of Appreciation Score

For this hypothesis the means (μ) of the appreciation score of the (not) optimized manual as shown in Table 3.2 were compared. Using the related samples Wilcoxon signed rank test it appeared that the difference between average score of the two variants (optimized vs. not optimized) was not statistically significant ($p=0,69$). When comparing the score by task, no relevant differences appear, indicating that the tasks had equal complexity.

Table 3.2: Average appreciation score for (not) optimized manuals by task

Optimized Task	Optimized		Not Optimized	
	μ	σ	μ	σ
Creation (n=22)	5,37	0,84	5,75	0,74
Ordering (n=21)	5,48	0,77	5,30	0,87
Total (n=43)	5,43	0,80	5,53	0,83

Based on the appreciation score the optimized manual was preferred in 37% of all cases, in 40% the not optimized manual and in 23% there is no difference. In 49% of all cases ordering was preferred, and in 28% creation.

When determined which of the optimized or not optimized manual had the best appreciation score, there was no significant difference on the best appreciated manual. Based on a chi-square test the difference was not statistically significant ($p=0,36$). Based on the analysis of the appreciation score the hypothesis was not supported.

Analysis of the Preferred Manual

Participants preferred the optimized manual in 47% of the cases and when compared to task complexity the optimized manual is preferred in 49% of the cases (see Table 3.3). The difference in preferences for the optimized or not optimized manual are not significant based on a one-sample binomial test ($p=0,76$).

Table 3.3: Preferred manual for (not) optimized manuals corrected by first tasks

Optimized Task	Preferred Manual			Preferred Manual by task complexity		
	Optimized	Not Optimized	Total	Optimized	Not Optimized	Total
Creation	27% (n=6)	73% (n=16)	100% (n=22)	50% (n=11)	50% (n=11)	100% (n=22)
Ordering	67% (n=14)	33% (n=7)	100% (n=21)	48% (n=10)	52% (n=11)	100% (n=21)
Total	47% (n=20)	53% (n=23)	100% (n=43)	49% (n=21)	51% (n=22)	100% (n=43)

The ordering section was preferred in most situations (optimized ordering was preferred in 14 cases and not optimized creation in 16 cases, so totally 70%). When it is compared to task complexity it was distributed almost equally (Ordering 49% and Creation 51%).

The results of the appreciation score and preferred manual, indicates the same result in 35% of all cases.

In 21% of the cases the same manual was preferred in total as all preferred tailored elements for an individual.

Summary

Concluding, no support could be found for hypothesis 1, meaning that appreciation did not enhance when the three elements used in this study were optimized. The difference between the creation and ordering tasks was not very large, indicating the tasks had equal complexity and did not influence the results.

3.2 The Effect of Tailoring to Cognitive Style (H2)

Hypothesis 2 examines the effect of tailoring advance organizers based on their cognitive style. It was expected that users would appreciate a manual more when advance organizers were optimized for their situation. More specific it was expected that intuitive users would appreciate a holistic advance organizer in the manual more than a hierarchical advance organizer (H2a) and analytical users would appreciate a hierarchical advance organizer in the manual more than a holistic advance organizer (H2b).

Analysis of Appreciation Score by Cognitive Style

Based on the analysis of the average appreciation score for analytical and intuitive cognitive style no significant influences could be found for task complexity or manual optimization, because the means were very close. The means (μ) and standard deviations (σ) were presented in Table 3.4.

Table 3.4: Average appreciation score for (not) optimized manuals by score on the cognitive style index by tasks

Cognitive Style	Optimized Task	Optimized		Not Optimized	
		μ	σ	μ	σ
Analytical	Creation (n=12)	5,30	1,03	5,72	0,79
	Ordering (n=10)	5,60	0,87	5,40	0,98
	Total (n=22)	5,43	0,95	5,57	0,88
Intuitive	Creation (n=10)	5,46	0,58	5,80	0,71
	Ordering (n=11)	5,37	0,70	5,21	0,80
	Total (n=21)	5,42	0,63	5,49	0,80

Analysis of Spontaneous Remarks about Advance Organizers

Spontaneously, 95% said nothing about the advance organizer or did not prefer one of the variants explicitly and 5% preferred the not optimized version. In all cases the hierarchical advance organizer was preferred, equally distributed over the ordering and creation section.

Quite remarkable, all spontaneous preferences of advance organizers were made by intuitivists, who preferred the hierarchical advance organizer. Surprisingly, because it was expected that intuitivists wouldn't like flow charts, thus advance organizers very much. However, this disliking might be the cause of noticing.

Analysis of Preferred Advance Organizer

The optimized manual was preferred in 42% of the cases. So in most cases the not optimized manual was preferred and thus no support was found for the hypothesis.

However, it was remarkable that 68% of the respondents with a analytic cognitive style preferred the optimized manual. Tested by a one-sample binomial test, $p=0,001$, so the difference was significant. From the results in Table 3.5 it could be concluded that people with a analytical style preferred the optimized manual more often. This supports hypothesis 2b: *analytical users will appreciate a hierarchical advance organizer in the manual more than a holistic advance organizer.*

For people with a intuitive cognitive style there was no significant effect ($p=0,13$) and thus no support could be found for H2a.

The data in Table 3.5 does show small differences between preference for the tasks, indicating that the tasks had equal complexity. The preference was distributed almost equal over the ordering (n=21; 51%) and creation (n=22; 49%) sections.

Table 3.5: Distribution of analytical cognitive style and preferred manual by optimizing the advance organizer

Cognitive Style	Optimized Task	Optimized	Not Optimized	Total
Analytical	Creation	67% (n=8)	33% (n=4)	100% (n=12)
	Ordering	70% (n=7)	30% (n=3)	100% (n=10)
	Total	68% (n=15)	32% (n=7)	100% (n=22)
Intuitive	Creation	10% (n=1)	90% (n=9)	100% (n=10)
	Ordering	18% (n=2)	82% (n=9)	100% (n=11)
	Total	14% (n=3)	86% (n=18)	100% (n=21)
Total	Creation	61% (n=9)	59% (n=13)	100% (n=22)
	Ordering	42% (n=9)	58% (n=12)	100% (n=21)
	Total	42% (n=18)	58% (n=25)	100% (n=43)

The hierarchical advance organizer (optimized for analytical and not optimized for intuitive score) was preferred in 33, thus 77% of the cases. Using a one sample binomial test there was a significantly larger group who preferred the hierarchical advance organizer ($p=0,001$). Therefore it is recommended to use this type of advance organizer. However, this effect decreases the relevance of the support for H2b, because not only people with an analytical style prefer the hierarchical advance organizer, but almost everyone does.

Effect of Preferred Advance Organizer on Manual Appreciation

It was analyzed whether it was likely that the preference of the advance organizer would influence total appreciation. The preference matches in 53% of the cases, but when tested on equal distribution by a one-sample binomial test there was no significant effect ($p=0,76$). This means that the preference of the manual was not influenced by the advance organizer.

Influence of Expected Cognitive Style on Preference

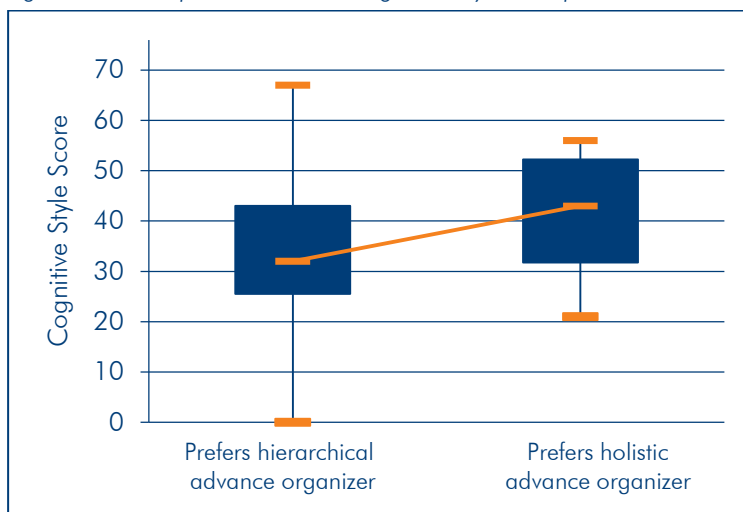
The expected cognitive style matches in 65% of the cases the measured style. Using a one-sample binomial test, it appeared the accuracy of cognitive style was disputable. Measuring the expected style and related preferred advance organizer, the optimized manual was preferred in 53% of the cases, compared to 42% when the measured cognitive style is used. There is no significant effect ($p=0,76$) using a one-sample binomial test. Meaning there was no effect between expected cognitive style and preferred advance organizer.

Limit for Determining Score of Cognitive Style

In Paragraph 1.3 a limit was presented for both a analytical and intuitive cognitive style which was used to determine an optimized variant of the advance organizers: Respondents scoring equal or below 37 ($CS \leq 37$) were considered as Intuitivists, respondents scoring equal or above 38 ($CS \geq 38$) as Analytics.

In Figure 3.1 the preferred advance organizer is presented among the score on the cognitive style index. This shows the difference was very small and even the other side around. It could be concluded that it was almost impossible to determine an optimal advance organizer based on the cognitive style.

Figure 3.1: Box plot of score of cognitive style and preference for advance organizer



Summary

Concluding, little support was found for hypothesis 2. On principle the hypothesis should be rejected, because the difference in appreciation between the optimized and not optimized version was not significant, meaning that appreciation would not be enhanced when the advance organizer was optimized in all situations. A part could be supported because people with an analytical cognitive style appreciated the optimized variant, thus the hierarchical advance organizer more. However, it appeared that people with an intuitive cognitive style also preferred the hierarchical advance organizer.

3.3 The Effect of Tailoring to Computer Self-Efficacy (H3)

Hypothesis 3 examines the effect of tailoring the level of chunking based on the level of self-efficacy. It was expected that users would appreciate a manual more when the level of chunking was optimized for their situation. More specific it was expected that users with low self-efficacy would appreciate content with a high level of chunking more than content with a low level of chunking (H3a) and users with high self-efficacy would appreciate content with a low level of chunking more than content with a high level of chunking (H3b).

Analysis of Appreciation Score by Self-Efficacy

Based on the analysis of the average appreciation score for high and low self-efficacy no significant influences could be found for task complexity or manual optimization, because the means were very close. The means (μ) and standard deviations (σ) are presented in Table 3.6.

Table 3.6: Average appreciation score for (not) optimized manuals by score on self-efficacy by tasks

Self-Efficacy	Optimized Task	Optimized		Not Optimized	
		μ	σ	μ	σ
High	Creation (n=17)	5,52	0,58	5,96	0,48
	Ordering (n=17)	5,51	0,71	5,34	0,81
	Total (n=34)	5,51	0,64	5,65	0,73
Low	Creation (n=5)	4,90	1,43	5,06	1,09
	Ordering (n=4)	5,37	1,11	5,12	1,23
	Total (n=9)	5,11	1,24	5,09	1,08

Analysis of Spontaneous Remarks about the Level of Chunking

Spontaneously, 79% said nothing about the level of chunking or did not prefer one of the variants explicitly, 9% preferred the optimized version and 12% the not optimized version. Most people (19%, compared to 2%) preferred the high level of chunking, the optimized variant for people with a low level of self-efficacy.

Analysis of Preferred Level of Chunking

The optimized manual was preferred in 53% of the cases. The difference between both situations is not significant enough to support the hypothesis ($p=0,76$), using a one sample binomial test.

However, it was remarkable that 80% of the respondents with a low self-efficacy score preferred the optimized manual. Tested with a one-sample binomial test, $p=0,03$. From the results in Table 3.7 it could be concluded that people with a low level of chunking preferred the optimized manual more often. This supports hypothesis 3a: users with low self-efficacy will appreciate content with a high level of chunking more than content with a low level of chunking.

For people with a high self-efficacy there was no significant effect ($p=0,60$) and thus no support could be found for H3b.

Table 3.7: Distribution of self-efficacy and preferred manual by optimizing the level of chunking

Self-Efficacy	Optimized Task	Optimized	Not Optimized	Total
High	Creation	53% (n=9)	47% (n=8)	100% (n=17)
	Ordering	35% (n=6)	65% (n=11)	100% (n=17)
	Total	44% (n=15)	56% (n=19)	100% (n=34)
Low	Creation	80% (n=4)	20% (n=1)	100% (n=5)
	Ordering	100% (n=4)	0% (n=0)	100% (n=4)
	Total	89% (n=8)	11% (n=1)	100% (n=9)
Total	Creation	60% (n=13)	40% (n=9)	100% (n=22)
	Ordering	48% (n=10)	52% (n=11)	100% (n=21)
	Total	53% (n=23)	47% (n=20)	100% (n=43)

The creation task was preferred in 57% of the cases (optimized for creation and not optimized for ordering). This was only a small difference and not relevant to analyze in more detail.

The high level of chunking (optimized for low self-efficacy score and not optimized for high self-efficacy score) was preferred in 27, thus 63% of the cases. Using a one sample binomial test there was no significantly larger group who preferred a level of chunking ($p=0,12$).

From these results it could be concluded that people with a low self efficacy prefer a high level of chunking and that the level of chunking does not matter for people with high self-efficacy. In this sample more respondents had a high self-efficacy, which may have influenced the results.

Effect of Preferred Level of Chunking on Manual Appreciation

It was analyzed whether it was likely that the preference of the level of chunking would influence total appreciation. The preference matches in 70% of the cases. Using a one-sample binomial test there is a significant effect ($p=0,01$). Therefore it could be assumed that an optimized level of chunking would influence the total appreciation.

Influence of Expected Level of Self-Efficacy on Preference

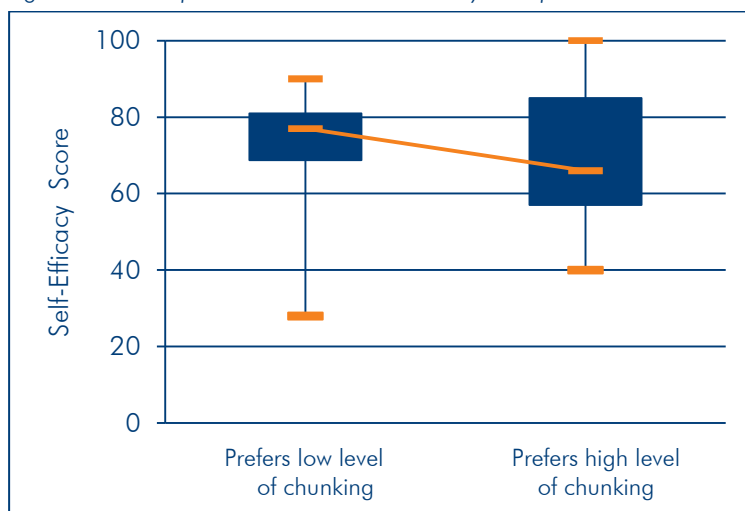
The expected self-efficacy matches in 84% of the cases the measured self-efficacy. When the expected self-efficacy is related to the preferred level of chunking, the optimized manual is preferred in 51% of the cases, compared to 44% when the measured level of self-efficacy is used. Using a one-sample binomial test there was no significant effect ($p=1,00$). Meaning that there was no effect between expected self-efficacy and preferred level of chunking.

Limit for Determining Score of Self-Efficacy

In Paragraph 1.4 a limit was presented for both a high and low self-efficacy which was used to determine an optimized variant of level of chunking: Based on the scale from 1 to 10 it is expected that 5 would mean insufficient and 6 sufficient. Therefore respondents scoring equal or below 59 ($SE \leq 59$) were considered as having a low self-efficacy, respondents scoring equal or above 60 ($SE \geq 60$) were considered as having a high self-efficacy.

In Figure 3.2 the preferred level of chunking is presented among the score on computer self-efficacy. This shows there was there a difference and in the right direction for the median, but not significant. It could be concluded that it was almost impossible to determine an optimal level of chunking based on the level of self-efficacy.

Figure 3.2: Box plot of score of self-efficacy and preference for level of chunking



Summary

Concluding, little support was found for hypothesis 3. On principle the hypothesis should be rejected, because the difference in appreciation between the optimized and not optimized version was not significant. However, a part could be supported because people with low self-efficacy appreciated the optimized variant better, thus the high level of chunking. Furthermore, the level of chunking seems influenced the total appreciation. Subsequently, the asymmetric distribution of self-efficacy in the sample might have influenced the results.

3.4 The Effect of Tailoring to Need for Cognition (H4)

Hypothesis 4 examines the effect of tailoring the document orientation based on the level of need for cognition. It was expected that users would appreciate the manual more when the document orientation is optimized for their situation. More specific it was expected that users with low need for cognition would appreciate a task oriented manual more than a concept oriented manual (H4a) and users with high need for cognition would appreciate a concept oriented manual more than a task oriented manual (H4b).

Analysis of Appreciation Score by Need for Cognition

Based on the analysis of the average appreciation score for high and low need for cognition no significant influences could be found for task complexity or manual optimization, because the means were very close. The means (μ) and standard deviations (σ) are presented in Table 3.8.

Table 3.8: Average appreciation score for (not) optimized manuals by score on need for cognition by tasks

Need for Cognition	Optimized Task	Optimized		Not Optimized	
		μ	σ	μ	σ
High	Creation (n=18)	5,54	0,58	5,72	0,80
	Ordering (n=18)	5,51	0,74	5,30	0,87
	Total (n=36)	5,53	0,66	5,51	0,85
Low	Creation (n=4)	4,62	1,46	5,91	0,39
	Ordering (n=3)	5,27	1,11	5,27	1,11
	Total (n=7)	4,90	1,26	5,64	0,77

Analysis of Spontaneous Remarks about Document Orientation

Spontaneously, 91% said nothing about the document orientation or did not prefer one of the variants explicitly and 9% preferred the optimized version. In all cases the concept oriented manual was preferred. In 7% of the cases this was the creation section and in 2% the ordering section.

It was quite remarkable that all spontaneous preferences of document orientation were the optimized variants preferred by people with a high need for cognition, thus the concept orientation. This was important to notice because spontaneous remarks were likely to influence the overall appreciation more.

Analysis of Preferred Document Orientation

The optimized manual was preferred in 77% of the cases. When tested statistically with a one sample binomial test the difference between both situations, $p=0,001$. This indicates there was a statistically significant difference between the preference of the optimized and not optimized manual. This was distributed almost equal over the ordering (n=21; 49%) and creation (n=22; 51%) sections. The results as presented in Table 3.9 indicate the optimized manual was preferred in more (n=33) cases. This was significant enough to support the hypothesis, meaning that users would appreciate the manual more when the document orientation was optimized for their situation.

Table 3.9: Distribution of need for cognition and preferred manual by optimizing the level of chunking

Need for Cognition	Optimized Task	Optimized	Not Optimized	Total
High	Creation	83% (n=15)	17% (n=3)	100% (n=18)
	Ordering	78% (n=14)	22% (n=4)	100% (n=18)
	Total	81% (n=29)	19% (n=7)	100% (n=36)
Low	Creation	50% (n=2)	50% (n=2)	100% (n=4)
	Ordering	67% (n=2)	33% (n=1)	100% (n=3)
	Total	57% (n=4)	43% (n=3)	100% (n=7)
Total	Creation	77% (n=17)	23% (n=5)	100% (n=22)
	Ordering	76% (n=16)	24% (n=5)	100% (n=21)
	Total	77% (n=33)	23% (n=10)	100% (n=43)

Based on the results as presented in Table 3.9 it was analyzed whether users with low need for cognition would appreciate a task oriented manual more than a concept oriented manual (H4a) and users with high need for cognition would appreciate a concept oriented manual more than a task oriented manual (H4b).

74% preferred the concept orientation (optimized for high need for cognition score and not optimized for low need for cognition score) and 26% the task orientation. It appeared that there was a significant relation for H4b between high need for cognition and preferred document orientation ($p=0,00$) using a one-sample binomial test. No significant relation exists for low need for cognition ($p=1,00$). Therefore the support for hypothesis 4 was totally explained by respondents with a high need for cognition and the asymmetric distribution of need for cognition.

When analyzed for the whole group with a one sample binomial test, it appeared that there was a significantly larger group who preferred the concept orientation ($p=0,002$), meaning that organizations should use this type and most people would appreciate it.

Effect of Preferred Document Orientation on Manual Appreciation

It was analyzed whether it was likely that the preference of the document orientation would influence total appreciation. The preference matches in 51% of the cases, but there is no significant effect ($p=1,00$) using a one-sample binomial test. This means that the preference of the manual was not influenced by the document orientation.

Influence of Expected Level of Need for Cognition on Preference

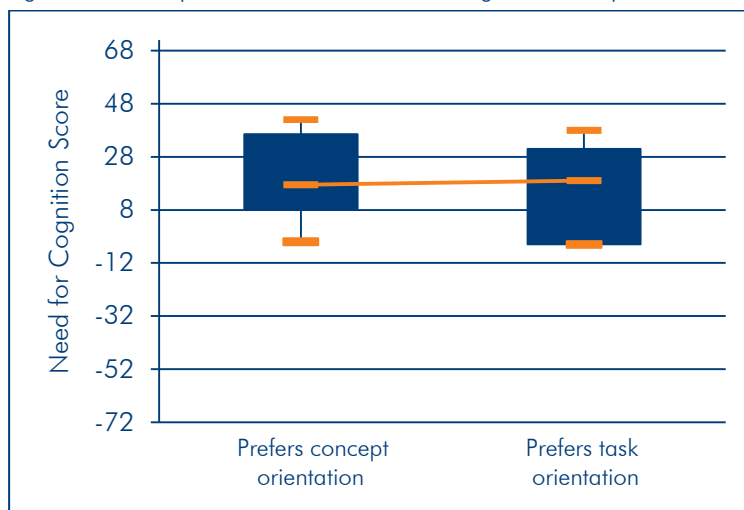
The expected need for cognition matches in 79% of the cases the measured need for cognition. When the expected need for cognition was related to the preferred document orientation, the optimized manual was preferred in 70% of the cases, compared to 77% when the measured need for cognition was used. Meaning that the measured need for cognition matches the preferred document orientation for this sample better.

Limit for Determining Score of Need for Cognition

In Paragraph 1.5 a limit was presented for both a high and need for cognition which was used to determine an optimized variant of document orientation: Respondents scoring below 0 ($NfC < 0$) were considered as having a low need for cognition, respondents scoring equal or above 0 ($NfC \geq 0$) were considered as having a high need for cognition.

In Figure 3.3 the preferred document orientation was presented among the score on need for cognition. This shows the difference was very small and even the other side around. Therefore it was almost impossible to determine an optimized document orientation based on the level of need for cognition.

Figure 3.3: Box plot of score of need for cognition and preference for document orientation



Summary

Concluding, based on this study hypothesis 4 was supported, meaning that users will appreciate the manual more when the document orientation is optimized for their situation. When tested in more detail support was found for users with high need for cognition will appreciate a concept oriented manual more than a task oriented manual (H4b).

Some preferences appeared spontaneously, but there was no significant effect on total appreciation. Subsequently, the asymmetric distribution of need for cognition in the sample might have influenced the results.

3.5 The Effect of User Characteristics

The Effect of Age, Gender & XLdoc Familiarity

Analyzing the most important descriptive user characteristics (age, gender and XLdoc knowledge) indicates no effect for females or age, but found effects for males and XLdoc familiarity.

Males had a statistically significant higher need for cognition, based on a chi-square tests with a reliability of 95%. Furthermore it appeared that they prefer the optimized variant for document orientation more often. People with more XLdoc knowledge also had a higher need for cognition. This was caused by the sample, because it was distributed oblique: more people with a higher XLdoc knowledge were male. It is not expected there was a causal relationship, but it may influence the results. This distribution in descriptive variables of the respondents, have influenced the results of the study. No cause could be found for this effect and to prevent bias by gender or system knowledge, a follow-up study should focus on a more equal distributed sample and test the effects.

Based on remarks of the respondents another influencing factor on the preference for level of chunking might be the XLdoc knowledge. The data is presented in Table 3.10. When the system is not familiar, people might prefer more screenshots. However, this might appear in the remarks, but no statistical relation could be found (Chi-Square analysis, $p=0,54$).

Table 3.10: Distribution of preferred level of chunking and XLdoc familiarity

	High	Low	Total
Beginner	27% (n=4)	73% (n=11)	100% (n=15)
Advanced	40% (n=6)	60% (n=9)	100% (n=15)
Expert	46% (n=6)	54% (n=7)	100% (n=13)
Total	37% (n=16)	63% (n=27)	100% (n=43)

From other remarks of respondents appeared that XLdoc familiarity might influence the amount in which the conceptual information was read. People who do not know the system, might focus on procedural information. However, it is indicated by the respondents, no relation could be found.

The Effect of Mental Factors on each other

Based on the remarks of the respondents was analyzed whether people with an intuitive cognitive style focus on executing actions and therefore prefer the conceptual information at the end of the paragraph (a task orientation). No proof was found for this relation.

The user characteristics (cognitive style, self-efficacy and need for cognition) were selected because it was assumed they were stable and general applicable and thus it was assumed that the effects measured in this study are rather stable. Based on remarks of the respondents it is questionable if this was the case. The respondents indicated they would normally read more conceptual information, were not able to work as good with the system as with other systems or would not use the manual at all. This might have influenced the results, because the expected optimization might not be optimized in this particular case.

Another assumption was that the user characteristics and the tailored elements were independent from each other. For example, the level of self-efficacy does not influence the preferred document orientation, or people with a low self-efficacy had also a low need for cognition. This was tested and no relationships were found. This means that the choice for a within-subject design was valid and the three user characteristics and tailored elements have not influenced each other significantly.

3.6 The Effect of Task Complexity

Two tasks were designed to have a reason to work with the system. The tasks should be equally complex. Therefore it was analyzed whether there were differences, caused by the task. This was also presented in the previous paragraphs. The appreciation score, spontaneous remarks and preferred manual were analyzed, but no significant differences between the tasks appear. Both tasks were preferred equally. Furthermore there was no significant relation between the task judgment and manual judgment.

However, the total appreciation of the manual is influenced by task complexity. The ordering section was significantly more appreciated ($p=0,01$). When compared to task complexity (which manual does most help in task execution) the manual sections were preferred equally (Creation 51%, Ordering 49%). This indicates the creation task was more complex, but people were able to separate this from manual appreciation.

From the remarks appeared that people found the ordering task itself more straightforward, but found it complex that the information are divided over two chapters. Maybe this equalizes the complexity of both tasks.

Another aspect which appeared from the remarks that people said they found the second task easier because they get to know the system. However, this does not appear in the results. Maybe because respondents corrected their opinion themselves for task order.

4 Discussion

This chapter presents the discussion on which factors may have influenced that certain hypotheses were supported and others were not.

4.1 Influence of Test Materials & Methodology

4.1.1 System

One of the test materials which might influence the results was the system: XLdoc. XLdoc is not a standard desktop application, which is most familiar to the respondents, but an online application used for specific tasks. Another system might had another result.

During testing it appeared that there was a mistake in the implementation of the system. Therefore it wasn't possible for all respondents to complete the tasks successfully. This might have influenced the results a little bit, but it appeared only in 10% of the tests and was the case for both tasks.

The influence of success on preferences (which is likely) could not be tested in this experiment. Therefore it might be possible that the respondent thought it was pretty successful, but actually it wasn't, so the manual helped not as good as expected.

4.1.2 Manual

When asked for remarks participants gave some about nice or unclear sections in the manual. Especially the unclear sections might have influenced the test results, because it might influence the task execution and thereby the appreciation. However, the unclear elements did not influence the tailored elements and were distributed equally about the ordering and creation sections. Therefore it was not very likely the results were much influenced. The total judgment differs from perfect manual to cannot use the system at all. Positive remarks which appeared often were the clear table of content, clear headings, nice length of paragraphs, distribution between conceptual and procedural information, clear references, the manual structure and the notes. Most people indicated they focus on procedural information and preferred to see step wise information. The critical remarks were about missing procedural information in one or both chapters (equally distributed) and missing error information.

However, for each manual some general remarks will appear, because it is almost impossible to make a perfect general manual. In further research it should be analyzed, as done above, if these remarks influenced the tailored elements.

4.1.3 Methodology

In methodology certain choices had been made. Because there was no valid instrument for manual quality the construct was made up. However, the reliability was high, no relations were found in the analysis. Therefore it was worth to test whether the 'appreciation score' measures the quality of manuals. It was not expected that another instrument found other results, because no relationship was found in the spontaneous remarks also, but it is worth to study this.

4.2 Remarks on Cognitive Style & Advance Organizers

By filling out the questionnaire of the cognitive style index, item 33: "I am the kind of person who casts caution to the wind" and item 38: "I find that 'too much analysis results in paralysis'" caused some uncertainty. However, the reliability would not be higher these items were removed.

During the creation of the tailored element, some problems appeared. First of all it appeared to be very hard to find a way to create two equal valuable advance organizers for analytics and intuitivists. Another operationalization of advance organizer may lead to other results. The researcher might have influenced the organizers, by being an analytic person. In theory no general way could be found for developing advance organizers, not to mention the difference between analytics and intuitivists.

Subsequently it appeared in other studies that advance organizers work best when the structure of the manual wasn't very clear. This manual uses a table of content and several headings and therefore the structure might be rather clear.

Furthermore it appeared that not all users read the advance organizer, because they focused on procedural information or the structure was clear without using the advance organizer. However, this isn't a problem because they could indicate their preference without using it, but as a consequence the effect on appreciation would be relatively small.

4.3 Remarks on Self-Efficacy & Level of Chunking

The results of the questionnaire to test self-efficacy were rather high, this might be because people were less likely to score insufficient on a scale from 1 to 10. Furthermore the scaling was rather straightforward and does not have reverse scored items.

During the creation of the tailored element, some choices had to be made. Some screenshots were more procedural and some were more conceptual. The purpose of changing the number of screenshots was to change the number of references and therefore only the procedural screenshots were in this scope.

Furthermore the conceptual screenshots were required to understand the system and to execute the tasks successfully. Based on these arguments only the procedural screenshots were changed, but there was a difference between both manual sections. The ordering task did not contain any conceptual screenshots and therefore no screenshots were available for the low level of chunking. Based on the results it cannot be excluded that this influenced the results.

4.4 Remarks on Need for Cognition & Document Orientation

By filling out the questionnaire for need for cognition, item 9: "I like tasks that require little thought once I've learned them" caused some uncertainty. However, the reliability would not be higher when this item was removed.

During the creation of the tailored element, some choices had to be made. On the one hand conceptual information could be defined as all information which is not procedural and on the other hand it could be defined as background information for the procedural information. In this case, the last approach was chosen, because it would make the manual more clear and information was structured better. Another operationalization of conceptual information might give other results.

Furthermore it appeared that not all users read the conceptual information, because they focused on procedural information. However, this isn't a problem because they could indicate their preference without using it, but the effect on appreciation or spontaneous remarks would be relatively small.

4.5 Remarks on Tailoring Manuals in General

The expectation of this study was that tailoring elements in the manual should enhance appreciation. This means there should be a causal relationship between the judgment of the tailored elements and the total manual. Based on the analysis it appeared that only the preference in level of chunking matches the manual which was judged best. So it is questionable whether the right elements were tailored, because when a perfect element does not lead to an enhancement in total manual appreciation, no effect could be found for tailoring manuals.

The result of larger appreciation, should be a better product use and thereby loyalty. However, to achieve this, the preference should appear spontaneously and this was not the case.

5 Conclusions

The conclusion presents the most important results and implications of this study.

5.1 The Effect on Appreciation by Tailoring Manuals to Mental Factors: Results of this Study

This research studied whether tailored manuals, based on mental factors (cognitive style, self-efficacy and need for cognition) enhances appreciation. The related hypotheses cannot all be supported, but some parts can be. Therefore this study found some proof for the effect of tailoring manuals based on mental factors.

Based on cognitive style, computer self-efficacy and need for cognition, respectively advance organizers, the level of chunking and the document orientation were optimized in the manual. It was expected that users *would appreciate the manual more when the manual was optimized for their situation*. No support could be found for this relation, meaning that based on the results of this study appreciation did not enhance when the three elements used in this study were optimized. Beside the total appreciation, it was also measured whether the three individual elements influenced appreciation.

First of all it was expected that *users would appreciate a manual more when advance organizers are optimized for their situation*. The type of advance organizer was determined by measuring cognitive style. Little proof could be found for this relation: *analytical users will appreciate a hierarchical advance organizer in the manual more than a holistic advance organizer*. But overall, appreciation will not enhance when the advance organizer is optimized. Furthermore most users preferred the hierarchical advance organizer and it was not possible to determine an optimal advance organizer based on the cognitive style. Therefore it can be concluded there is no relation between cognitive style and preferred advance organizer and almost everybody likes the hierarchical advance organizer.

Secondly it was expected that *users would appreciate a manual more when the level of chunking was optimized for their situation*. The level of chunking was determined by measuring their level of self-efficacy. A little proof could be found for this relation: *users with low self-efficacy will appreciate content with a high level of chunking more than content with a low level of chunking*. But overall, appreciation will not enhance when the level of chunking is optimized. However, the level of chunking to self-efficacy seems to influence the total appreciation. Furthermore it appeared it was not possible to determine an optimal level of chunking based on the level of self-efficacy, but this may be caused by a small number of respondents with a low self-efficacy.

Thirdly it was expected that *users would appreciate the manual more when the document orientation was optimized for their situation*. The document orientation was determined by measuring level of need for cognition. This relationship was statistically significant and therefore the hypothesis could be supported. But due to the asymmetric distribution in the sample, only proof could be found for *users with high need for cognition who will appreciate a concept oriented manual more than a task oriented manual*. Furthermore it appeared that some people with a high need for cognition noticed the difference spontaneously and preferred the optimized version. It is expected that it will influence overall appreciation, but no statistical proof could be found. Subsequently, it was not possible to determine an optimal document orientation based on the need for cognition. This may be influenced by a small number of respondents with a low need for cognition.

Despite the fact that not all hypotheses were support, it was found that users and their preferences do differ, though, not entirely in the expected way. Most people did not recall the tailored elements spontaneously, but when pointed on the elements, their preference differs. The used arguments were pretty strong for their preference and match the arguments found in theory. Therefore it can be concluded that tailoring manuals does effect the appreciation.

One of the reasons not all hypotheses could be supported is using mental factors to tailor elements. First of all, the results do not always cover the expectancies of the respondents, but also the expected results do not always match with the preferred element. What could be concluded is, it might be best when the different elements are presented to the respondent and the respondent could choose its own preference. This might work because it appeared that, as said above, people do have their preferences and at the same time they know exactly why they prefer a certain element. Finally, they indicate their appreciation will be enhanced when the preferred elements are used.

5.2 Recommendations for Further Research

Based on this study it could be concluded that it is relevant to study the effect of tailoring manuals to mental factors, because some evidence is found for a positive effect. Almost naturally it is relevant to study the effect of other mental factors than used in this study.

In further research it is interesting to have an equal distribution in gender, system familiarity, self-efficacy and need for cognition. These distributions weren't equal in this study and based on the results there were reasons to assume that it influenced the results.

It might also be interesting to test the effect in a real-life situation. In this study the respondents were asked to give an opinion about the manual in a rather short period. The results might be different when the manual is used in a natural way during a longer period. Especially the usage and thus preference of conceptual information can be measured better.

It is also interesting to study the relationship between manual appreciation and effectiveness of efficiency of the tasks. In this study it was assumed that manual appreciation would lead to better task execution, but this isn't tested.

Furthermore it might be interesting to use another system, because the nature of the system and the content of the manual might have influenced the results.

5.3 Practical Recommendations

Based on the results of this study it is recommended to manual writers to adapt sections of the manual to the wishes of the users.

Some users do think advance organizers, as developed in this study, are relevant, but most people don't use them. Most people prefer a hierarchical advance organizer, which starts with the first step and presents the required elements chronologically and therefore it is recommended to use these.

Furthermore, people with a low self-efficacy preferred a high level of chunking and the level of chunking does not matter to people with a high self-efficacy. Therefore it is recommended to use in a general manual a high level of chunking. When the level of chunking is matched to the preferences, the total manual appreciation will be enhanced. Some clear differences between individuals appeared and therefore it is relevant to ask which level of chunking is preferred. Some people do prefer a low level of chunking, especially when the same manual is used over and over again.

Finally, it is recommended to use a concept document orientation, which means that a paragraph should start with some conceptual information, followed by the procedural information. However, some clear differences between individuals appeared and therefore it is relevant to ask which document orientation is preferred.

Based on this study it is recommended to organizations to design several manual variants and ask which variant an individual prefers. It is expected that they will be more involved into the manual and appreciation will enhance. This will result in larger product appreciation and loyalty. This is expected based on the results, however not all statistically significant.

~~~~~

## 6 References

- Allinson, C., & Hayes, J. (1996). The cognitive style index: a measure of intuition-analysis for organizational research. *Journal of Management Studies* , 33 (1), 119-135.
- Ament, K. (2003). *Single Sourcing: Building Modular Documentation*. New York: William Andrew Publishing.
- Antonenko, P., & Niederhauser, D. (2010). The influence of leads on cognitive load and learning in a hypertext environment. *Computers in Human Behavior* , 26 (2), 140-150.
- Ausubel, D. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology* (51), 267-272.
- Bajraktarevic, N., Hall, W., & Fullick, P. (2003). Incorporating learning styles in hypermdia environment: Empirical evaluation. *Proceedings of AH2003, at the 12th World Wide Web Conference* , 41-52.
- Bandura, A. (1993). Perceived self-Efficacy in Cognitive Development and Functioning. *Educational Psychologist* , 28 (2), 117-148.
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control* . New York: W.H. Freeman.
- Blackwell, R., Miniard, P., & Engel, J. (2005). *Consumer Behavior*. Thomson South-Western.
- Boles, W., Pillay, H., & Raj, L. (1999). Matching Cognitive Styles to Computer-based Instruction: An Approach for Enhanced Learning in Electrical Engineering. *European Journal of Engineering Education* , 24 (4), 371-383.
- Boscolo, P. (2000). Prior knowledge, text coherence, and interest: How they interact in learning from instructional texts. *American Educational Research Association annual meeting*, (pp. 1-23). New Orleans.
- Cacioppo, J., Petty, R., Feinstein, J., & Jarvis, W. (1996). Dispositional Differences in Cognitive Motivation: The Life and Times of Individuals Varying in Need for Cognition. *Psychological Bulletin* , 2, 197-253.
- Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning : a systematic and critical review*. London: Learning and Skills Research Centre.
- Compeau, D., & Higgins, C. (1995). Computer Self-Efficacy: Development of a Measure and Initial Test. *Mis Quarterly* , 189-211.
- Compeau, D., Higgins, C., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly* , 23 (2), 145-158.
- Cools, E., & van den Broeck, H. (2007). Development and Validation of the Cognitive Style Indicator. *The Journal of Psychology* , 141 (4), 359-387.
- Craik, F., & Lockhart, R. (1972). Levels of processing: a framework for memory research. *Journal of Verbal Learning & Verbal Behavior* , 11, 671-684.
- Craik, F., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology* , 87 (4), 268-294.
- Davis, F. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal Man-Machine Studies* , 38, 475-487.
- Dishaw, M., Strong, D., & Bandy, B. (2002). Extending the Task-Technology Fit Model with Self-Efficacy Constructs. *Human-Computer Interaction Studies in MIS* , 1021-1027.
- Ganier, F. (2004). Factors affecting the processing of procedural instructions: implications for document design. *IEEE Transactions on Professional Communication* , 47 (1), 15-26.
- Gellevij, M., & van der Meij, H. (2002). Screen Captures to Support Switching Attention. *IEEE Transactions on Professional Communication* . , 45 (2), 115-122.

- Gravill, J., Compeau, D., & Marcolin, B. (2002). Metacognition and IT: the influence of self-efficacy and self-awareness. *Human-Computer Interaction Studies in MIS* , 1055-1064.
- Harris, R., Dwyer, W., & Leeming, F. (2003). Are Learning Styles Relevant in Web-based Instruction? *Journal for Educational Computing Research* , 29 (1), 13-28.
- Hayes, J., & Allinson, C. (1996). The Implications of Learning Styles for Training and Development: A Discussion of the Matching Hypothesis. *British Journal of Management* , 7, 63-73.
- Hodgkinson, G., & Sadler-Smith, E. (2003). Complex or unitary? A critique and empirical re-assessment of the Allinson-Hayes Cognitive Style Index. *Journal of Occupational and Organizational Psychology* (76), 243-268.
- Hsu, J., & Turoff, M. (2002). Targeting Computer Training: Improving learning by more effectively adapting training to meet user needs. *Human-Computer Interaction Studies in MIS* , 1065-1075.
- Jansen, C., & Balijon, S. (2002). How do people use instruction guides? Confirming and disconfirming patterns of use. Document design, Journal of research and problem solving in organizational communication. *Document Design* , 3 (3), 195-204.
- Johnson, R., & Marakas, G. (2000). Research Report: The role behavior modeling in computer skills acquisition - toward longitudinal study. *MIS Quarterly* , 402-417.
- Karreman, J., Ummelen, N., & Steehouder, M. (2005). Procedural and declarative information in user instructions. What we do and don't know about these information types. *IEEE International Professional Communication Conference Proceedings* , 328-333.
- Kraiger, K., Ford, J., & Salas, E. (1993). Application of cognitive, skill-based and affective theories of learning outcomes to new methods of training evaluation. *Journal of Applied Psychology* , 78, 311-328.
- Langan-Fox, J., Waycott, J., & Albert, K. (2000). Linear and Graphic Advance Organizers: Properties and Processing. *International Journal of Cognitive Ergonomics* , 4 (1), 19-34.
- Levine, T., & Donitsa-Schmidt, S. (1998). Computer Use, Confidence, Attitudes, and Knowledge: A Causal Analysis. *Computers in Human Behavior* , 14 (1), 125-146.
- Marzano, R., Pollock, J., & Pickering, D. (2004). *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement*. Upper Saddle River, New Jersey: Prentice Hall.
- Mayer, R. (1979). Can Advance Organizers Influence Meaningful Learning? *Review of Educational Research* , 49 (2), 371-383.
- Mayhew, D. (1999). *The usability engineering lifecycle: a practitioner's handbook for user interface design*. San Francisco, USA: Morgan Kaufmann.
- Nielsen, J. (1992). The Usability Engineering Life Cycle. *Computer* , 25 (3), 12-22.
- Pillay, H., Boles, W., & Raj, L. (1998). Personalizing the design of computer-based instruction to enhance learning. *Alt-J* , 6 (2), 17-32.
- Pillay, H., Boles, W., & Raj, L. (1998). Personalizing the design of computer-based instruction to enhance learning. *Research in Learning Technology* , 6 (2), 17-32.
- Popovic, V. (2000). Expert and novice user differences and implications for product design and useability. *Human Factors and Ergonomics Society Annual Meeting Proceedings* , 6 (4), 933-936.
- Redish, J. (1989). Reading to Learn to Do. *IEEE Transactions on Professional Communication* , 32 (4), 289-293.
- Reijnen, C. (2009, 05 07). Tailoring Manuals for XLdoc. (M. Woestenenk, Interviewer)
- Riding, R. (2001). The Nature and Effects of Cognitive Style. In R. Sternberg, & L. Zhang, *Perspectives on thinking, learning, and cognitive styles* (pp. 47-72). Mahwah, NJ: Lawrence Erlbaum Associates.
- Riding, R., & Sadler-Smith, E. (1997). Cognitive style and learning strategies: some implications for training design. *International Journal of Training and Development* , 1 (3), 199-208.
- Riding, R., & Sadler-Smith, E. (1992). Type of Instructional Material, Cognitive Style and Learning Performance. *Educational Studies* , 18 (3), 323 - 340.

- Riding, R., & Watts, M. (1997). The effect of cognitive style on the preferred format of instructional material. *Educational Psychology* , 17 (1), 179-184.
- Satterly, D., & Telfer, I. (1979). Cognitive style and Advance Organizers in Learning and Retention. *The British Journal of Educational Psychology* , 49 (2), 169.
- Schriver, K. (1997). *Dynamics in Document Design: Creating Texts for Readers*. NewYork/London: John Wiley & Sons .
- Steehouder, M. (2007). How helpdesk agents help clients. *Paper presented at the International Professional Communication Conference*. Seattle, WA.
- Sweller, J., Van Merriënboer, J., & Paas, F. (1998). Cognitive architecture and instructional design. *Educational Psychology Review* , 10, 251–296.
- Van der Meij, H. (1997). The ISTE Approach to Usability Testing. *IEEE Transactions on Professional Communication* , 40 (3), 209-223.
- van der Meij, H., & Carroll, J. (1998). Principles and heuristics for designing Minimalist instruction. In J. Carroll, *Minimalism beyond the Nurnberg funnel* (pp. 19-53). Cambridge MS: MIT Press.
- van der Meij, H., & Gellevij, M. (2004). The Four Components of Procedures. *IEEE Transactions on Professional Communication* , 47 (1), 5-14.
- Venkatesh, V. (2000). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. *Information Systems Research* , 11 (4), 342-365.
- Zimmerman, B. (2000). Self-Efficacy: An Essential Motive to Learn. *Contemporary Educational Psychology* , 25, 82-91.