Inženjerstvo upotrebljivosti

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

... iterativni proces za unapređenje upotrebljivosti sistema tokom njegovog razvoja.

When the cook tastes the soup, that's formative assessment.
When the guests taste the soup, that's summative assessment.

Robert E. Stake (PhD in Psychometrics), 1976

Usability - mera dobrog interfejsa

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić

USABILITY (Part 11 of the **ISO 9241**, 1998) "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."
"u kojoj meri se proizvod može koristiti od strane određenog korisnika da postigne specifične ciljeve u datom kontekstu upotrebe sa maksimalnom efektivnošću, efikasnošću i zadovoljstvom."

EFFECTIVNESS "is the accuracy and completeness with which specified users can achieve specified goals in particular environments."
"je tačnost i potpunost sa kojima korisnici mogu da ostvare specifične ciljeve u određenom okruženju."

EFFICIENCY "the resources expended in relation to the accuracy and completeness of the goals achieved."
"resursi za dostizanje ciljeva sa datom tačnošću i potpunošću."

SATISFACTION "the comfort and acceptability of the work system to its users and other people affected by its use."
"komfor i prihvatljivost sistema u pogonu koje imaju njegovi korisnici i ostali na koje utiče rad tog sistema."

Usability kao atribut prihvatljivosti sistema

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

NN/g Nielsen Norman Group
Evidence-Based User Experience Research, Training, and Consulting

http://www.nngroup.com/

Nilsenova taksonomija prihvatljivosti sistema

- **PRIHVATLJIVOST SISTEMA** System acceptability
  - **PRAKTIČNA PRIHVATLJIVOST** Practical acceptability
    - Korisnost (usefulness)
      - Cena (cost)
      - Performansa
      - Kompatibilnost
      - Pouzdanost
    - Korisnost (utility)
    - Upotrebljivost (usability)
      - Effectiveness
      - Learnability
      - Efficiency
      - Memorability
      - Errors
      - Satisfaction
  - **SOCIOLOŠKA PRIHVATLJIVOST** Social acceptability

Kada se ne misli o nazivu proizvoda

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

Chevrolet Nova, 1962

Za Špansko govorno područje kao Chevrolet Shevy

No va -> ne ide

Metode za evaluaciju upotrebljivosti

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

Exploratory		**Diary study,** **SW logging,** **Observational Study**
Predictive	**KLM-GOMS**	
Formative	**Heuristic Evaluation,** **Guideline Checking,** **Cognitive Walkthrough**	**Thinking aloud**
Summative	**Guideline Scoring**	**Questionnaires,** **Formal Experiment,** **A/B Testing**
	Inspection sprovode specijalisti/eksperti	**Testing** obavezno uključeni korisnici

KLM ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

- **prediktivne teorije/modeli kao kvantitativni ukazatelj na bolje rešenje!**
- **na nivou motorike – Keystroke Level Modeling**

  Card, Moran, & Newell, "The keystroke-level model for user performance time with interactive systems" July 1980.
- **sračunava vreme potrebno za interakciju kao sumu elementarnih akcija koje je potrebno načiniti,**
- **pomoću narednih 5 operatora :**
  - **Keying - 0,12s dobar (90 r/m); 0,28 srednji (40 r/m) ili 1,20 početnik,**
  - **Button press - 0,10s (tj. 0,20s),**
  - **Pointing – prosečno 1,10s, za tačno Fitts's law,**
  - **Homing - 0,36s,**
  - **Mental preparation- 1,35s (odnosno 1,2s da bi za repeated pao na 0,95s),**
  - **Respoding – vreme čekanja korisnika na reakciju sistema za neki unos,**
- **starosni multiplikatori (40–55 sa 1.4, 55–60 sa 1.7 i 65+ sa 2.2).**

... KLM ...

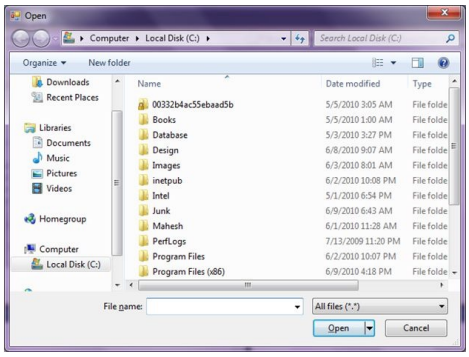
INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

- **operator R (> 0,1s zahteva feedback, 0,25s korisnik će ponoviti unos, >1s?),**
- **operator M izazovan za umetanje, pravila:**
  1. **Postavi M pre svakog K i svakog P (samo za pointiranje na komandu, ali ne i njene parametre),**
  2. **Izbriši M ako je anticipirano u prethodnom operatoru (PMK → PK),**
  3. **Izbriši M unutar kognitivne jedinice ("Dragan⏎"→ MKKKKKK MK),**
  4. **Izbriši M pre uzastopnih terminatora ("Dr⏎ ⏎"→ MKK MK K),**
  5. **Izbriši M koji je terminira komandu ("del⏎"→ MKK K),**
  6. **Izbriši preklapajuće M (R MK → R K),**

... KLM ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

PRIMER: Otvoriti fajl pomoću aktivnog Open dijaloga, tekst kursor u polju za unos naziva fajla. Koliko traje (kada su ruke na tastaturi, odnosno na mišu) zavisno od dužine naziva fajla?



tastatura

M+n*K+K=1,2+n*0,28+0,28=1,48+n*0,28s

miš i OpenBtn

M+P+2*B+M+P+2*B=2(1,2+1,1+0,2)=5s

Dvoklik mišem

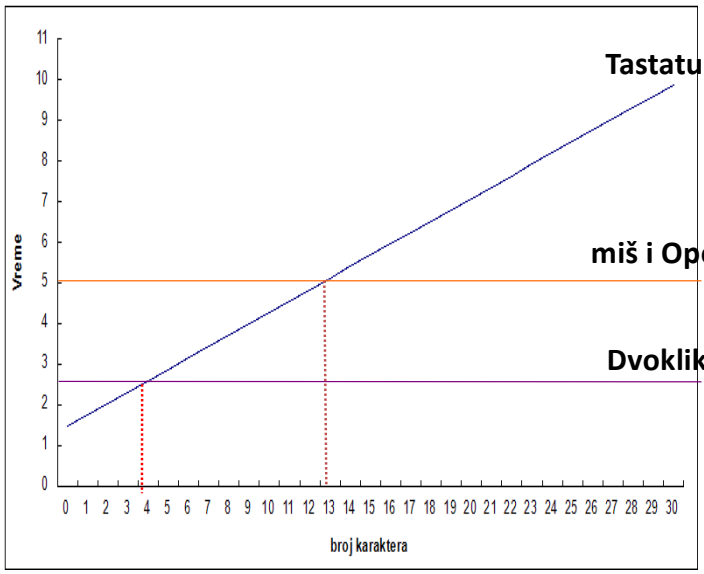
M+P+2*B+2*B=1,2+1,1+0,2+0,2=2,7s

Naziv tastaturom i klik na OpenBtn? ....

Potreban skrol na naziv fajla?

... KLM

Predikcija efikasnosti otvaranja fajla zavisno od dužine naziva.



Tastatura 1,48+n*0,28s

miš i OpenBtn 5s

Dvoklik mišem 2,7s

GOMS ...

- **prediktivna/eksplinatorna teorija iz 1983. od Stuart Card, Thomas Moran i Allen Newell (CMN-GOMS)**

Goals – korisnikov cilj, šta namerava da obavi, ali i podcilj,

Operators – akcije koje se sprovode do (pod)cilja, mogu biti izražene na:

konceptualnom nivou – mentalni model i slike,

semantičkom nivou – nivo komandi (uneti PIN, ukucati PIN ili ...),

sintaksnom nivou – kada se prepoznaje struktura komande (imenica-glagol, glagol-imenica, objekt-op...)

leksičkom nivou – nivo samog uređaja i korisnika, GOMS-KLM.

Methods – sekvenca operacija koje treba obaviti do cilja, moguće da postoji više metoda koje vode istom cilju (kako zatvoriti prozor),

Selection_rules – (ako je potrebno) definišu koju metodu koristiti da se u datom slučaju stigne do (pod)cilja,

... GOMS ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

KLM-GOMS primer za brisanje nekog fajla,

```
GOAL: DELETE-FILE
.   GOAL: SELECT-FILE
.   .   [select#:  GOAL: KEYBOARD-TAB-METHOD
.   .              GOAL: MOUSE-METHOD]
.   .   VERIFY-SELECTION

.   GOAL: ISSUE-DELETE-COMMAND
.   .   [select*: GOAL: KEYBOARD-DELETE-METHOD
.   .                .   PRESS-DELETE
.   .                .   GOAL: CONFIRM-DELETE
.   .              GOAL: DROP-DOWN-MENU-METHOD
.   .                .   MOVE-MOUSE-OVER-FILE-ICON
.   .                .   CLICK-RIGHT-MOUSE-BUTTON
.   .                .   LOCATE-DELETE-COMMAND
.   .                .   MOVE-MOUSE-TO-DELETE-COMMAND
.   .                .   CLICK-LEFT-MOUSE-BUTTON
.   .                .   GOAL: CONFIRM-DELETE
.   .              GOAL: DRAG-AND-DROP-METHOD
```

#Selection rule for GOAL: SELECT-FILE

If hands are on keyboard, use KEYBOARD-TAB-METHOD, else use MOUSE-METHOD

*Selection rule for GOAL: ISSUE-DELETE-COMMAND

If hands are on keyboard, use KEYBOARD-DELETE-METHOD, else if Recycle bin is visible, use DRAG-AND-DROP-METHOD, else use DROP-DOWN-MENU-METHOD.

... GOMS ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

```
.   .              GOAL: DRAG-AND-DROP-METHOD
.   .                .   MOVE-MOUSE-OVER-FILE-ICON
.   .                .   PRESS-LEFT-MOUSE-BUTTON
.   .                .   LOCATE-RECYCLING-BIN
.   .                .   MOVE-MOUSE-TO-RECYCLING-BIN
.   .                .   RELEASE-LEFT-MOUSE-BUTTON]
```

$KLM_{DRAG\text{-}AND\text{-}DROP\text{-}METHOD}$ = M+P + B + M+P + B = 1,35+1,1 + 0,1 + 1,35+1,1 + 0,1 = 5,1 s

$KLM_{DROP\text{-}DOWN\text{-}MENU\text{-}METHOD}$ = M+P + B+B + M+P + B+B + M+P+B+B = = 1,35+1,1 + 0,2 + 1,35+1,1 + 0,2 + 1,35+1,1 + 0,2 = = 7,95 s (6,6s)

$KLM_{KEYBOARD\text{-}DELETE\text{-}METHOD}$ = M+K + M+K = 1,35+0,2 + 1,35+0,2 = 3,1 s

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

Rbr	GOMS opis	KLM op	Vreme op	Vreme 1	Vreme 2	Vreme 3
0	GOAL: DELETE-FILE					
1	GOAL: SELECT-FILE					
1.1	GOAL: KEYBOARD-TAB-METHOD		3,5	3,5		
1.2	GOAL: MOUSE-METHOD		4,8		4,8	
1	VERIFY-SELECTION	M	1,35			
	Ukupno 1			**4,85**	**6,15**	
2	GOAL: ISSUE-DELETE-COMMAND					
2.1	GOAL: KEYBOARD-DELETE-METHOD			3,1		
	PRESS-DELETE	M+K	1,55			
	GOAL: CONFIRM-DELETE	M+K	1,55			
2.2	GOAL: DROP-DOWN-MENU-METHOD				7,95	
	MOVE-MOUSE-OVER-FILE-ICON	M+P	2,45			
	CLICK-RIGHT-MOUSE-BUTTON	B	0,1			
	LOCATE-DELETE-COMMAND	M	1,35			
	MOVE-MOUSE-TO-DELETE-COMMAND	P	1,1			
	CLICK-LEFT-MOUSE-BUTTON	B+B	0,2			
	GOAL: CONFIRM-DELETE	MP2B	2,65			
2.3	GOAL: DRAG-AND-DROP-METHOD					5,1
	MOVE-MOUSE-OVER-FILE-ICON	M+P	2,45			
	PRESS-LEFT-MOUSE-BUTTON	B	0,1			
	LOCATE-RECYCLING-BIN	M	1,35			
	MOVE-MOUSE-TO-RECYCLING-BIN	P	1,1			
	RELEASE-LEFT-MOUSE-BUTTON	B	0,1			
	Ukupno sa 1.1			**7,95**	**12,8**	**9,95**
	Ukupno sa 1.2			**9,25**	**14,1**	**11,25**

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

Evaluacija po heuristikama ...

EVALUACIJA PO HEURISTIKAMA (usability inspection)

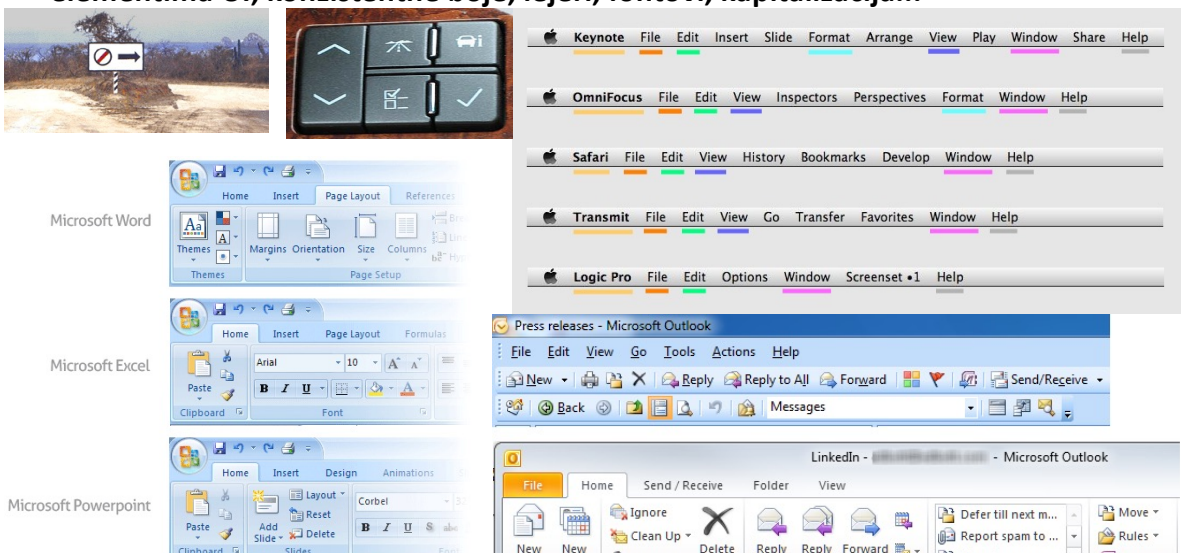
- **odrediti slaganje sa listom projektantskih heuristika (npr. 8 zlatnih pravila) verbalnog ili papirnog modela rešenja, prototipa ili gotovog rešenja,**
  - **tim od 3-5 članova, jedan član otkrije do 35% a 5 članova i do 75%,**
  - **upoznati evaluatore sa potrebnim domenskim znanjem,**
  - **interfejs se istražuje u dva prolaza - prvo da se upozna s tokom, a drugi da posmatra detalje i beleži slaganja/neslaganja,**
  - **za jednostavan interfejs oko 1h,**
  - **zatim lične liste opažanja integrisati u jednu listu.**

No.	*Problem*	*Novice*	*Regular*	*Double*
Major Usability Problems				
1.	Error message appears too late.	68%	84%	100%
2.	Do not require dollar amount to be entered in cents.	68%	74%	79%
3.	The error message is not precise.	55%	63%	64%
4.	The error message is not constructive.	6%	11%	21%
5.	Replace term "primary account" with "checking account".	10%	47%	43%
6.	Let users choose account from a menu.	16%	32%	43%
7.	Only require a # where it is necessary.	3%	32%	71%
8.	Give feedback as name of chosen account.	6%	26%	64%
Average for major problems		**29%**	**46%**	**61%**
Minor Usability Problems				
9.	Read menu item description before action number.	3%	11%	71%
10.	Avoid gap in menu numbers between 1 and 3.	42%	42%	79%
11.	Provide earlier feedback.	42%	63%	71%
12.	Replace use of 1 and 0 for accept and reject with # and *.	6%	21%	43%
13.	Remove the field label "number" when no number is given.	10%	32%	36%
14.	Change prompt "account" to "account number".	6%	37%	36%

Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

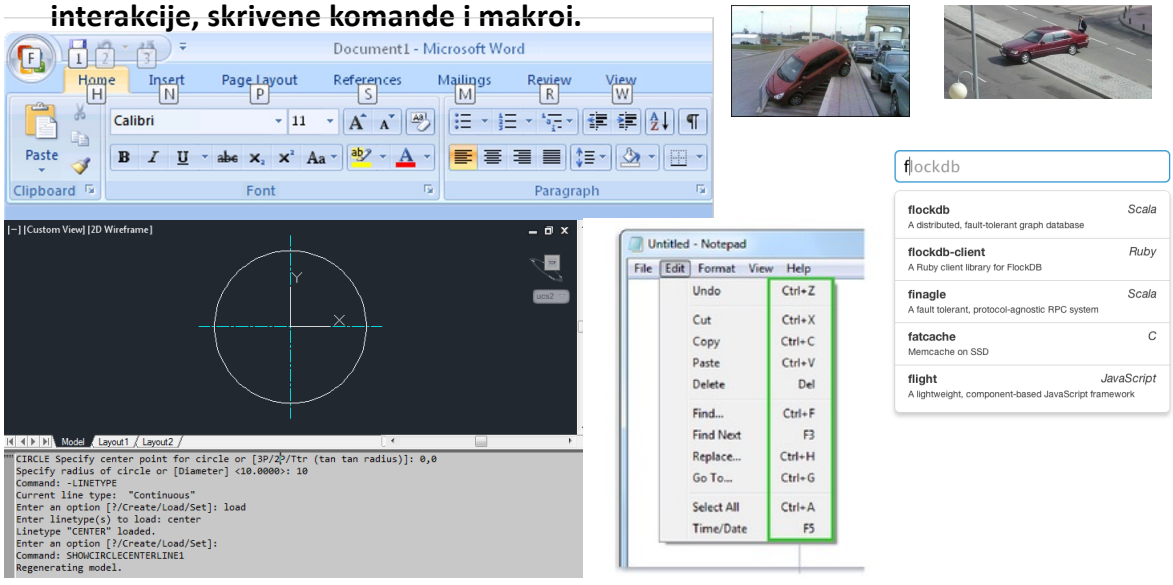
1. TEŽITI KONZISTENTOSTI – najčešće prekršeno, identična terminologija u svim elementima UI, konzistentne boje, lejeri, fontovi, kapitalizacija...



... Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

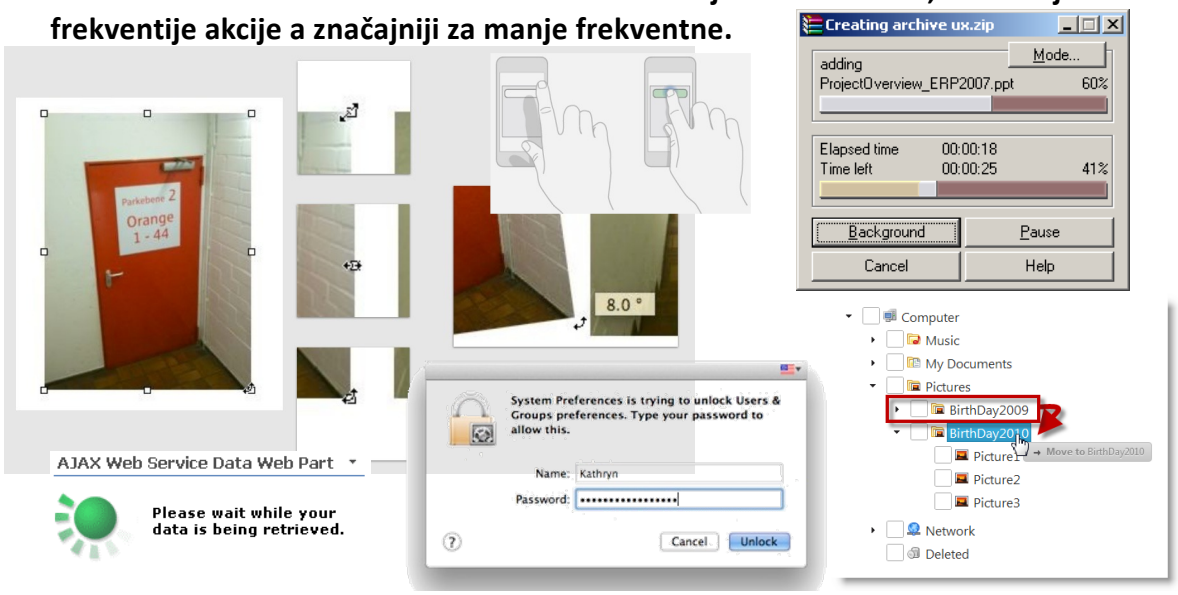
2. OMOGUĆITI FREKVETNIJIM KORISNICIMA UPOTREBU PREČICA – veća brzina interakcije, skrivene komande i makroi.



... Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

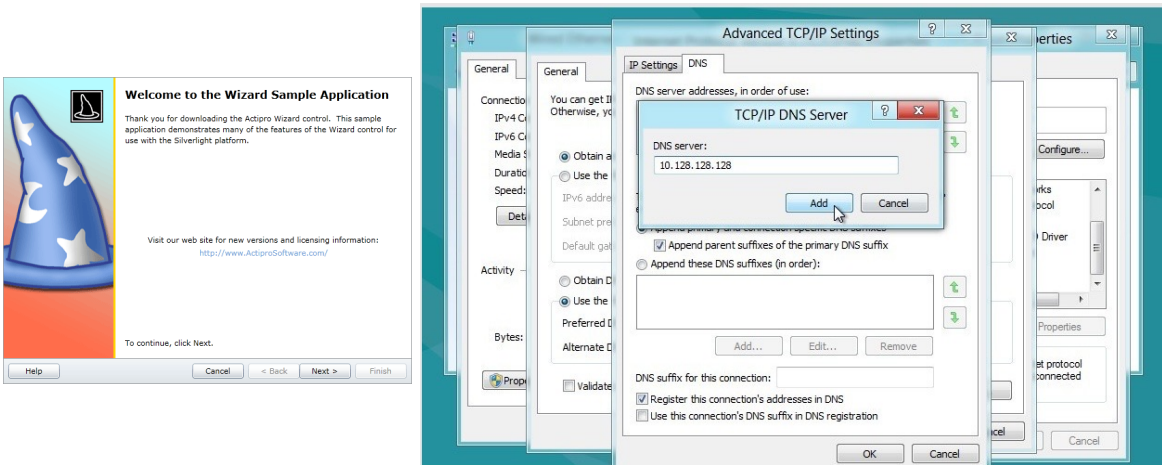
3. DAVATI INFORMATIVNI FEEDBACK – za svaku akciju dati feedback, skromniji za frekventije akcije a značajniji za manje frekventne.



... Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

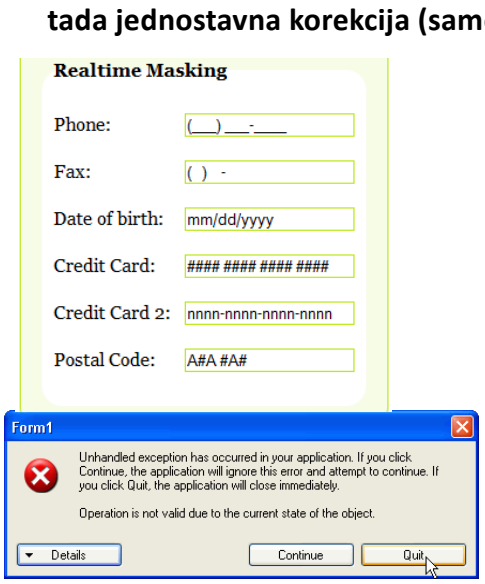
4. PROJEKTOVATI DIJALOGE NAGLAŠENE ZATVORENOSTI – sekvence akcija grupisati da imaju početak i kraj, kao i sve korake do kraja (@kupovina).



... Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

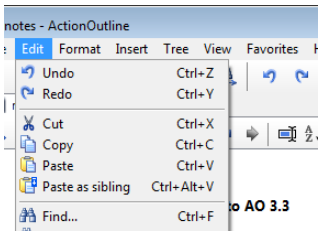
5. PONUDITI PREVENCIJU I RUKOVANJE GREŠKOM – input line guard, ako pogreši tada jednostavna korekcija (samo što je loše a ne sve).

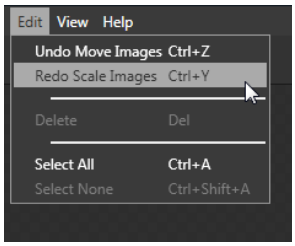


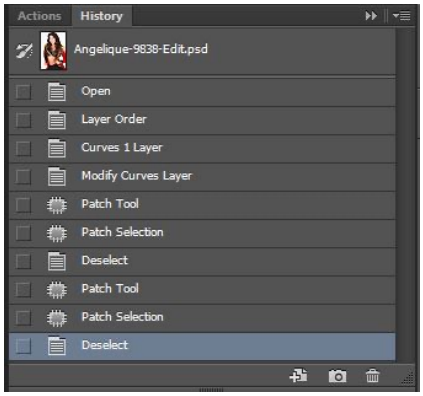
... Shneiderman-ovih osam zlatnih pravila ...

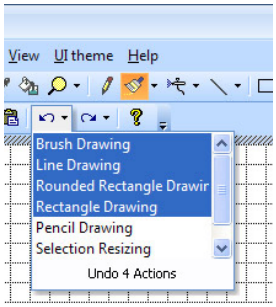
INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

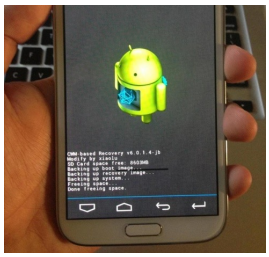
6. DOZVOLITI PONIŠTAVANJE EFEKATA AKCIJE (UNDO) – veliko olakšanje kod početnika – sami istražuju.







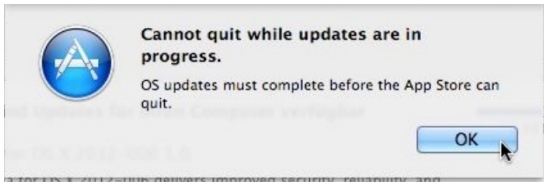


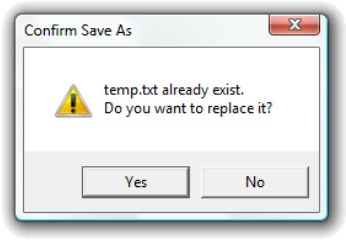


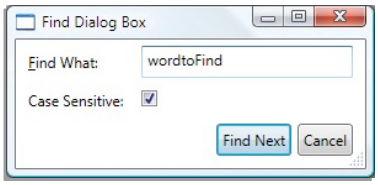
... Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

7. INTERNO PODRŽAVATI KONTROLU – frekventni korisnici vole da imaju osećaj pune kontrole sistema, bez iznenađujućih akcija sistema, kreirati UI tako da se korisnici osećaju kao inicijatori aktivnosti a ne da ih slede...



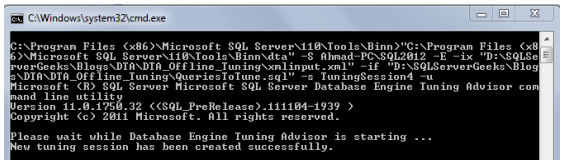


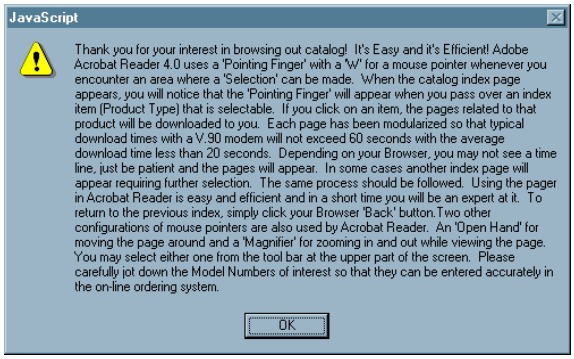


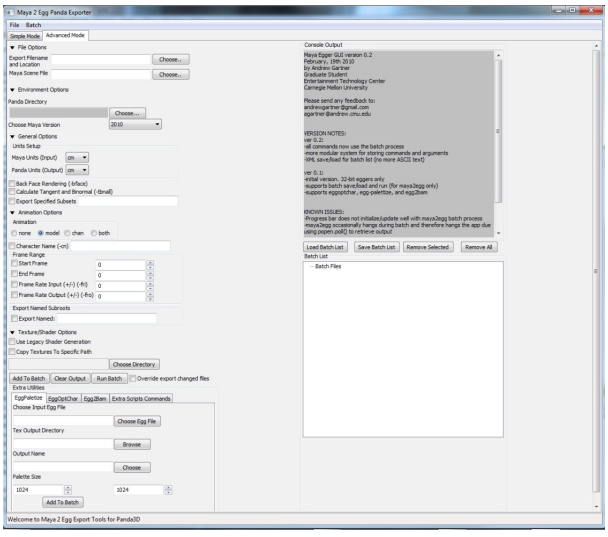
... Shneiderman-ovih osam zlatnih pravila ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

8. REDUKOVATI OPTEREĆENJE RADNE MEMORIJE – 7 ± 2, jednostavan prikaz, konsolidovati višeprozorske prikaze, uvoditi skraćenice.



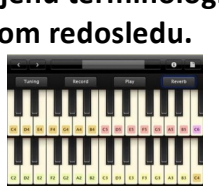




Nilsenovi principi ... http://www.nngroup.com

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

1. **NALIKOVATI STVARNOSTI – koristiti uobičajenu terminologiju, koncepte i fraze za korisnika, informacije u prirodnom i logičkom redosledu.**

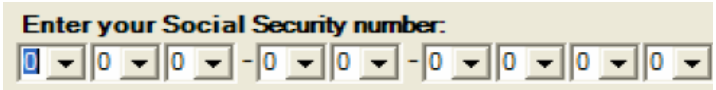


2. **KONZISTENTNOST I STANDARDI – Least Surprise princip – slične stvari izgledaju i delaju isto na interfejsu, imenica-glagol / glagol-imenica sintaksa interakcije, slediti standard platforme.**
3. **HELP i DOKUMENTACIJA – on / off line, zadatak-orijentisani help.**
4. **KORISNIKOVA KONTROLA I SLOBODA – obezbediti undo, dugačke operacije moraju biti prekidive (sa/bez nastavka), dijalog i cancel dugme.**
5. **VIDLJIV STATUS SISTEMA – korisnik uvek svestan stanja sistema (promena kursora, selekcija objekta, status bar...), BEZ PRETERIVANJA, vreme odgovora (<0.1s, .1s – 1s, 1s – 10s sa ⌛, a za > 10s progress bar).**

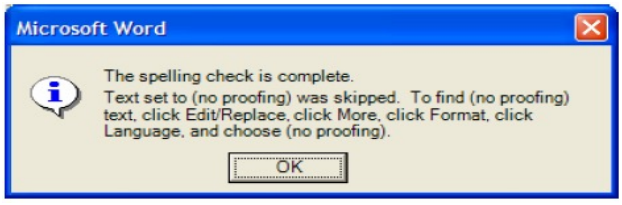
... Nilsenovi principi ...

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

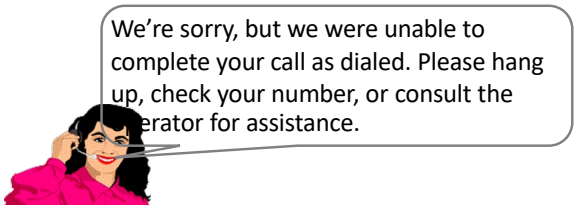
6. **FLEKSIBILNOST i EFIKASNOST – kratice i ostala ubrzanja interakcije.**
7. **PREVENCIJA GREŠAKA, bez preterivanja.**

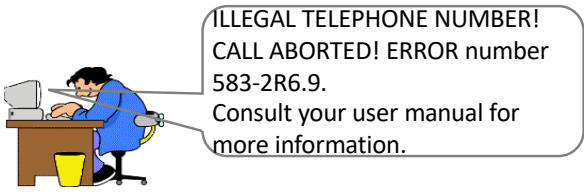


8. **PREPOZNAJ, NE DA SE PAMTI – štednja radne memorije korisnika.**



9. **PRIJAVA GREŠKE, DIJAGNOSTIKA, OPORAVAK – biti precizan, konstruktivan, ljubazan, bez blamiranja i tehničkih detalja.**





... Nilsenovi principi

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

10. ESTETIČAN i MINIMALISTIČKI DIZAJN – manje je više.

Weinschenk-Barker klasifikacija

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

1. User Control: heuristics that check whether the user has enough control of the interface.
2. Human Limitations: the design takes into account human limitations, cognitive and sensorial, to avoid overloading them.
3. Modal Integrity: the interface uses the most suitable modality for each task: auditory, visual, or motor/kinesthetic.
4. Accommodation: the design is adequate to fulfill the needs and behaviour of each targeted user group.
5. Linguistic Clarity: the language used to communicate is efficient and adequate to the audience.
6. Aesthetic Integrity: the design is visually attractive and tailored to appeal to the target population.
7. Simplicity: the design will not use unnecessary complexity.
8. Predictability: users will be able to form a mental model of how the system will behave in response to actions.
9. Interpretation: there are codified rules that try to guess the user intentions and anticipate the actions needed.
10. Accuracy: There are no errors, i.e. the result of user actions correspond to their goals.
11. Technical Clarity: the concepts represented in the interface have the highest possible correspondence to the domain they are modeling.
12. Flexibility: the design can be adjusted to the needs and behaviour of each particular user.
13. Fulfillment: the user experience is adequate.
14. Cultural Propriety: user's cultural and social expectations are met.
15. Suitable Tempo: the pace at which users works with the system is adequate.
16. Consistency: different parts of the system have the same style, so that there are no different ways to represent the same information or behavior.
17. User Support: the design will support learning and provide the required assistance to usage.
18. Precision: the steps and results of a task will be what the user wants.
19. Forgiveness: the user will be able to recover to an adequate state after an error.
20.Responsiveness: the interface provides enough feedback information about the system status and the task completion.

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

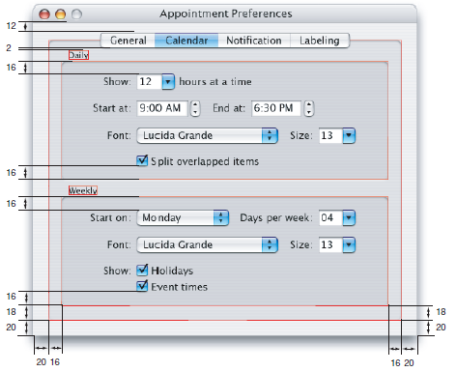
Smernice

smernice platformi na različitim nivoima:

Microsoft User Interface Design Guidelines
https://learn.microsoft.com/en-us/windows/win32/uxguide/guidelines

Apple OS X Human Interface Guidelines
https://developer.apple.com/design/human-interface-guidelines/guidelines/overview/

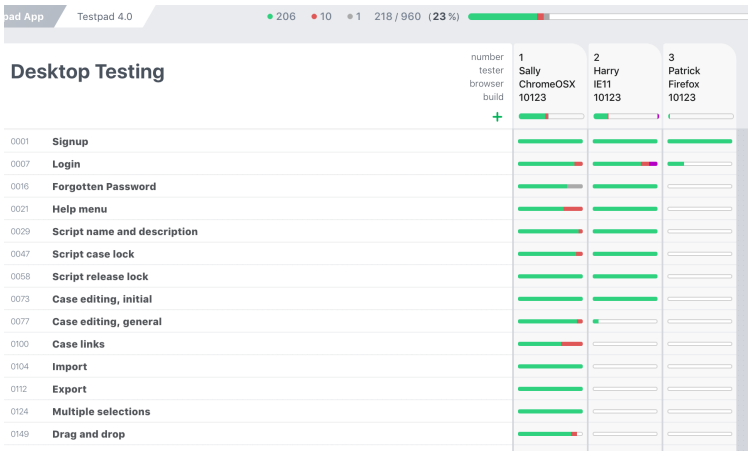
Adroid UI Overview
https://developer.android.com/design



INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

Guideline checking

- **evaluator proverava interfejs u odnosu na detaljnu listu smernica,**
- **pravi listu odstupanja od smernica,**
- **automatizovan pomoću različitih aplikacija, npr. https://testpad.com,**
- **jeftin, intuitivan, primenljiv u prvim fazama razvoja,**
- **zamara, zahteva vremena.**



Guideline Scoring

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

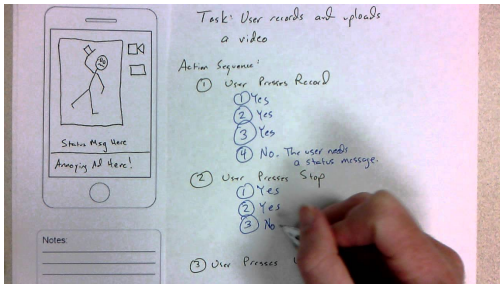
- **Interfejs se boduje u skladu sa njegovom usklađenošću u odnosu na ponderisanu listu odabranih smernica.**
- **dobijeni ukupni rezultat predstavlja stepen do kojeg interfejs prati smernice.**
- **jeftino, intuitivno,**
- **formiranje koreknih pondera i u skladu sa domenom.**

Nr	Topic	Recommended Design	Strength	Points	You
1	Download time	50 kB (<10 sec for your customer)	✶✶✶	3	
2	Window title	Start with Company Name	✶✶✶	3	
3	Title tag line	What about, Slogan	✶✶✶	3	
4	Readable URL	Hackable URL, URL is a UI part	✶✶	2	
5	Error page	Catch errors/dead links, to search	✶✶	2	
6	Meta tags	For search engines (trafficattack.de)	✶✶✶	3	
7	Alt Information	Images, accessibility, Lynx	✶✶	2	
8	Page width	770 pixel (620-1024)	✶✶	2	
9	• Liquid vs. frozen layout	Liquid is better	✶✶	2	
10	• Page length	<2 pages (1000-1600 px)	✶✶	2	
11	Frames	No, Don't use (search, bookmarks)	✶✶✶	3	
12	Logo placement	Upper left	✶✶✶	3	
13	• Logo size	Around 80x68 Pixel	✶✶	2	
14	**Search**	Yes, in a box, always	✶✶✶	3	
15	• Search placement	Upper part, right or left corner	✶✶	2	
16	• Search box color	White	✶✶✶	3	
17	• Search button	Call it "Search" or "Go"	✶✶	2	

Cognitive Walkthrough

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

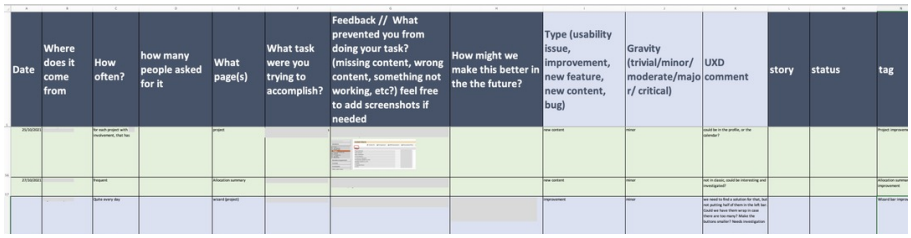
- **eksperti kao korisnici u tipičnom (ali i kritičnom) zadatku,**
- **the day in the life of the user,**
- **samostalni explore walkthrough,**
- **kasnije i javni sa ostalim ekspertima, projektantima i korisnicima radi projekcije novih walkthroughs ali i provociranja reakcije.**



Diary study

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

- **longitudinalna istraživačka metoda,**
- **prikupljanje kvalitativnih podataka,**
- **učesnici vode dnevnik kako bi zabeležili svoje misli, osećanja i ponašanje, dok koriste proizvod,**
- **sprovodi se u sledećim fazama:**
  - **Planiranje i priprema,**
  - **Predstudijski brifing,**
  - **Loginig podataka, in-situ ili snippet,**
  - **Poststudijski interjui,**
  - **Analiza podataka.**

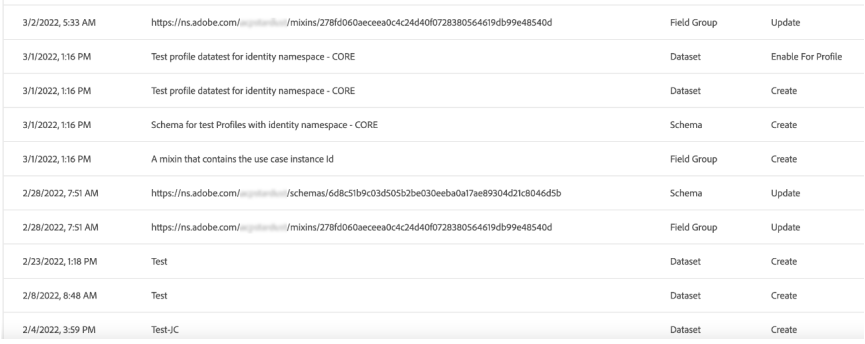


Date	Where does it come from	How often?	how many people asked for it	What page(s)	What task were you trying to accomplish?	Feedback // What prevented you from doing your task? (missing content, wrong content, something not working, etc?) feel free to add screenshots if needed	How might we make this better in the the future?	Type (usability issue, improvement, new feature, new content, bug)	Gravity (trivial/minor/ moderate/major/ critical)	UXD comment	story	status	tag
25/10/2021		for each project with involvement, that has		project				new content	minor	would be in the profile, or the calendar?			Project improvement
27/10/2021		frequent		Allocation summary				new content	minor	last in classic, could be interesting and investigated?			Allocation summary improvement
		Quite every day		award (project)				improvement	minor	we need to find a solution for that, but not pushing half of them in the left bar (could we have them we say in case there are too many? Make the buttons smaller? Needs investigation			Allocation improv

Softverski loging

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

- **instrumentirana verzija softvera beleži sve interakcije korisnika,**
- **korisnici moraju dati svoju saglasnost,**
- **veći uzorak korisnika testa (20–50+),**
- **prikupiti i integrisati različite datoteke logova,**
- **statistički analizirati dobijene podatke,**
- **softver od interesa mora biti instrumentiran,**
- **(ne)moguće zaključiti namere i motivaciju korisnika?**



3/2/2022, 5:33 AM	https://ns.adobe.com/[redacted]/mixins/278fd060aeceea0c4c24d40f0728380564619db99e48540d	Field Group	Update
3/1/2022, 1:16 PM	Test profile datatest for identity namespace - CORE	Dataset	Enable For Profile
3/1/2022, 1:16 PM	Test profile datatest for identity namespace - CORE	Dataset	Create
3/1/2022, 1:16 PM	Schema for test Profiles with identity namespace - CORE	Schema	Create
3/1/2022, 1:16 PM	A mixin that contains the use case instance Id	Field Group	Create
2/28/2022, 7:51 AM	https://ns.adobe.com/[redacted]/schemas/6d8c51b9c03d505b2be030eeba0a17ae89304d21c8046d5b	Schema	Update
2/28/2022, 7:51 AM	https://ns.adobe.com/[redacted]/mixins/278fd060aeceea0c4c24d40f0728380564619db99e48540d	Field Group	Update
2/23/2022, 1:18 PM	Test	Dataset	Create
2/8/2022, 8:48 AM	Test	Dataset	Create
2/4/2022, 3:59 PM	Test-JC	Dataset	Create

Opservacione studije

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

- snimiti jedan ili više tipičnih dana korišćenja, pa ponovo za nekoliko dana,
- obavezna saglasnost,
- analizirati/notirati snimke pa statistički analizirati dobijene podatke.
- korisnici često nerado učestvuju u studiji upotrebe,
  - razgovarati, dati garancije, sve objasniti,
- objektivna analiza upotrebe (ne samoprijavljivanje),
- teško pronaći voljne korisnike, obrada video sadržaja.

Razmišljanje naglas

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

- korisnici verbaliziraju svoje misli dok obavljaju zadatke,
- pripremiti korisnika (i sistem) zamolite da kažu:
  - šta pokušavaju da urade, stvari koje čitaju, pitanja koja se pojavljuju u njihovom umu, stvari koje smatraju zbunjujućim, odluke koje donose...,
- ako korisnik prestane da govori naglas, ohrabriti ga: „Možete li reći više?“, „Ne čujem šta govoriš“...,
- nikako konkretna pitanjima kao: "Zašto si to uradio?“, „Zašto nisi kliknuo ovde?“, „Između čega pokušavate da se odlučite?“...,
- pronalazi mnoge probleme upotrebljivosti i zašto se javljaju,
- mali broj test korisnika (3 do 5),
- potreba za razmišljanjem naglas može promeniti korisnikovo rešavanje problema,
- ne može da pruži podatke o učinku.

INŽ. UPOTREBLJIVOSTI u infrastrukturnim sis
Prof. dr Dragan Ivetić
2022/2023

A/B testiranje

- **kontrolisani eksperiment na veb lokaciji (ili app) sa korisnicima,**
- **postoje dve verzije rešenja (veb, app) sa izbalansiranim razlikama: ključne a da ih ne bude previše jer se neće znati šta je prevagnulo kod korisnika,**
- **% posetilaca je nasumično dodijeljena varijanta (B) veb stranice (app), ostali vide standardno rešenje (A, kontrolna grupa),**
- **za veb se dodeljuje kolačić, tako da korisnici uvek vide istu varijantu,**
- **beleži se stopa učestalosti klikova za svakog korisnika,**
- **ispituje se statistička značajnost,**
- **multivarijantno (multinomijalno) testiranje je slično (A/B/N, A/B/Z), ali može testirati više od dve verzije u isto vreme.**