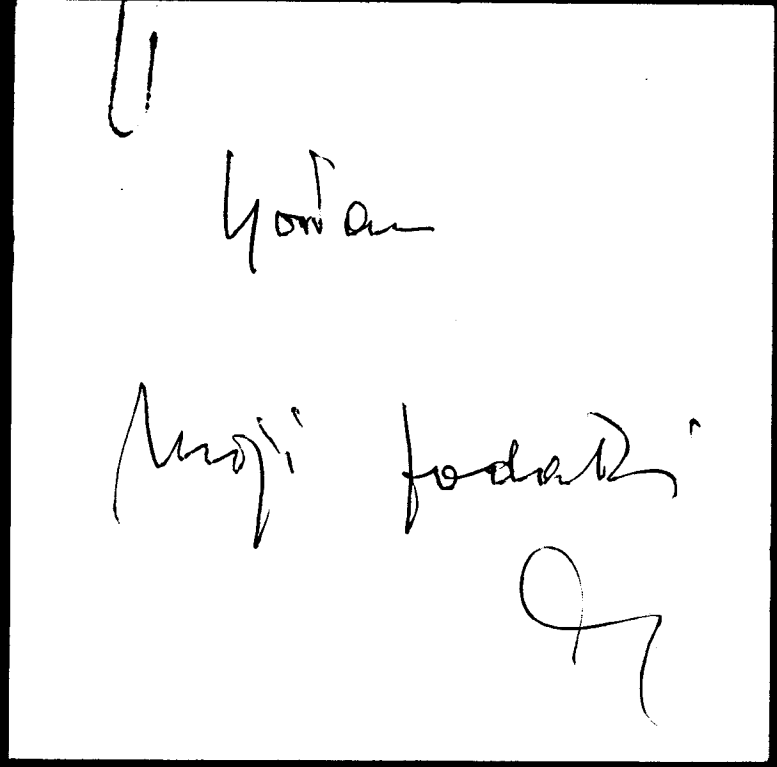
Razred A razred. ~~423~~ 378

Razred B " 423

1. razred: 567 u. (od 210–240)

FTE (full time equivalent)



CHORAFAS : Management Workstat.
GREEN : Automating your Office
FROEHLING : Electronic Office Procedures

RUPKM 210-395

Poslovna skupnost Avtoprevozništvo
d.
Zvezna 2a
tel. Božo KOVAČIČ

ICERIC 266856
služba 316763

INFORMACIJSKA BAZA ZA PLANIRANJE V PROIZVODNJI ORGANIZACIJI

UPRAVLJANJE : SAMOUPRAVLJANJE

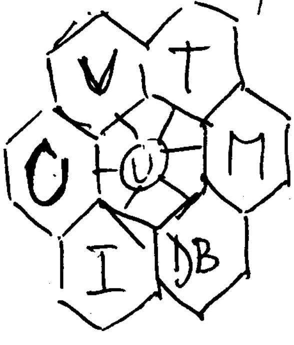
OSNOVNA RAZLIKA JE V DISTRIBUCIJI ODLOČITEV. ODTOD VSEBINSKA RAZLIKA V DRUŽBENIH ODNOSIH, V PREDPOSTAVLJENIH DITVI MOČI. TO ZAHTEVA DRUGAČNO ORGANIZACIJO ZBIRANJA, PRIPRAVE IN DISTRIBUCIJE INFORMACIJ

EPBK
FC1

PONUDBA

za izdelavo študije
Informacijski sistem poslovnega združenja
Avtotransport

- Temeljni pojmi
  - informacija – (kaj je, za kaj se potrebuje)
  - podatek
- Informacije po poslovnih funkcijah (Davies)
- Informacijski sistem o poslovnem sistemu
- 6 blokov IS
- Design
- Ponudba



UVOD
IZHODIŠČA PROJEKTA
~~PREDLOG~~ PONUDBA

140:3 = 45:2

EFBK
FCI
GR

Predlog za izdelavo projekta
INFORMACIJSKI SISTEM POSLOVNE SKUPNOSTI AVTOPREVOZNIŠTVO

Uvodne opredelitve

Tri temeljne vrste resursov mora vsak sistem (in tudi organizacija) izmenjavati s svojim okoljem, da sploh lahko obstaja in se razvija. Dve od teh temeljnih vrst resursov sta v naši družbi dobro znani in splošno priznani. To so materialni in energetski resursi. Tretja vrsta – informacijski resursi – pa so nekako stalno zapostavljeni in jim mnogokrat ne posvečamo tiste pozornosti in priznanja, ki ga zaslužijo. Tu vendar se informacijski resursi akumulirajo v tista znanja in spoznanja, na katerih se zasnujejo obstoj in nadaljnji razvoj katerega koli sistema, tudi organizacije v združenem delu.

Informacijski resursi so podatki in informacije. Podatek je neko dejstvo v zvezi s sistemom oz. njegovim okoljem, informacija pa je pomen tega dejstva za uporabnika. Kadar opazujemo oz. proučujemo organizacijo kot sistem, so podatki objektivna slika dogajanja v organizaciji in okolici nje, informacije pa so subjektivna vrednost tega dogajanja za delavce v organizaciji in za družbeno okolje, v katerem organizacija deluje. Tako opredeljeni informacijski resursi predstavljajo torej izredno pomembno in dragoceno nematerialno dobrino vsake organizacije.

Informacije so element splošnega znanja, so pa tudi osnova za sprejemanje odločitev, s katerimi usmerjamo delovanje organizacije in vplivamo na obnašanje njenega okolja. Ker pa je odločanje in odločitev rezultanta procesa upravljanja, je brez ustreznih informacij iluzorno govoriti o upravljanju, pa naj gre za upravljanje v samoupravnem, ali pa funkcionalno-birokratskem sistemu.

EFBK

Fcı

g. R.

Tov. Božo Kovačič
direktor
Poslovna skupnost avtoprevozništvo...
Zvezna 2a
61000 Ljubljana

g.

Spoštovani tov. direktor,

v prilogi pošiljam predlog za izdelavo projekta Informacijski sistem poslovne skupnosti avtoprevoz, kot smo se dogovorili na našem srečanju septembra letos.
Če se bomo dogovorili za sodelovanje bomo morali razčistiti vsa vprašanja o vsebini, obsegu in načinu dela ter določiti ~~[illegible]~~ vašega predstavnika, ki bo odgovarjal za projekt.

Lep pozdrav

g. R.

Priloga 1x

Informacije se porajajo v sistemu, ki ima pravimo informacijski sistem in je vpojen v matični sistem – organizacijo. Namen informacijskega sistema je, da obkroži svoj matični sistem in njegovo okolje z informacijami, ki dovolj natančno odražajo stanje in obnašanje matičnega sistema, kakor tudi njegov pomen in položaj v širšem denarnem kontekstu. Informacijski sistem sprejema podatke iz svojega matičnega sistema in njegovega okolja, jih dodeluje, predeluje, selektira, zbranje, arhivira in končno posreduje uporabnikom. V njem se generira, obdržuje, shranjuje in predaja informacije, ki odražajo dogajanja v matičnem sistemu in njegovem okolju. Te informacije služijo uporabnikom pri sprejemanju odločitev, s katerimi regulirajo procese, pomembne za obstoj in razvoj matičnega sistema. Informacija je torej produkt informacijskega procesa in obstoja kot vhodna veličina v proces odločanja in upravljanja.

Izhodišča projekta

Informacijski sistem sestavlja 6 temeljnih sklopov, ne glede na vrsto matičnega sistema ter velikost in obseg njenega delovanja. To so:

- vhodni blok
- banka metod (blok modelov)
- izhodni blok
- tehnološki sklop
- sklop baze (ali banke) podatkov
- kontrolni blok

Vhodni blok zajema numerične in tekstualne podatke ter grafične glasovne ali kakršnekoli druge zapise, ki vstopajo v informacijski proces. To so razne transakcije, zahtevki, priporočanja, navodila in sporočila, ki jih uporabniki pošiljajo v informacijski sistem z namenom da se tam obdelajo. Kadar se te obdelave izvajajo z računalnikom imamo na voljo širok izbor možnosti za vnašanje podatkov: tastatura, na dotik občutljiv zaslon, svetlobno pero, „miška" in podobno.

Blok modelov je sestavljen iz kombinacije procedurnih, logičnih in matematičnih metod s katerimi se obdelujejo podatki da bi se dobili želeni rezultati. Z metodami iz tega bloka se izvaja celoten informacijski proces.

Izhodni blok zajema vse kar se kaže kot rezultat informacijskega procesa, to je dokumente in informacije za različne uporabnike storitev

Pomudlog:

Poslovna skupnost Avtoprevoznikov je asociacija združenega dela, v katero se združuje ~~[illegible]~~ vrsta samostojnih poslovnih subjektov. ~~Poslovna~~ skupnost opravlja za svoje člane različne storitve in zastopa njihove interese v družbenem in poslovnem okolju. ~~Zato mora imeti skupnost svoj lasten informacijski sistem.~~ V tem smislu mora imeti skupnost svoj informacijski sistem, ki sloni na informacijskih sistemih članov skupnosti.

Fakultetni center za informatiko (FCI) EFBK je s svojimi sodelavci pripravljen sodelovati pri rekonstrukciji obstoječega oz. načrtovanju novega informacijskega sistema skupnosti. V FCI bi lahko izdelali idejni osnutek informacijskega sistema skupnosti in sodelovali pri načrtovanju in realizaciji sistema kot izvajalci posameznih projektov ali kot svetovalci, kar bi bil predmet posebnih ~~[illegible]~~ aktivnosti dogovorov. Predstavnik FCI pri tem projektu bi bil mag.

G.R.

informacijskega sistema. V veliki meri zavisi ~~oblikovanje~~ načrtovanje vseh ostalih blokov informacijskega sistema ravno iz zahtevkov, ki se oblikujejo v tem bloku. Če izhodni blok ne zadovolji uporabnikovih potreb je pomen ostalih blokov izničen.

Tehnološki sklop omogoča dejansko izvedbo transformacije podatkov. Fizično sprejema podatke iz vhoda, jih prenaša, preoblikuje, shranjuje, oblikuje vsebino izhodnega bloka ter pomaga pri izvajanju kontrole nad celotnim sistemom.

Sklop baze podatkov je tisti del informacijskega sistema, kjer so zbrani vsi podatki, potrebni za zadovoljevanje informacijskih potreb uporabnika. To je temeljni blok informacijskega sistema. Najpomembnejše vprašanje ki se mora razrešiti v okviru tega bloka je, kako izpeljati logično povezavo ogromne množice podatkovnih elementov, da bodo pravočasno zagotovljene informacijske potrebe za različne uporabnike.

Kontrolni blok je neke vrste skrbnik nad informacijskim sistemom. Ta je podvržen različnim nevarnostim in grožnjam kot so naravne nesreče, požar, sabotaža, zlorabe, napake v sistemu in podobno. Zato morajo biti v sistem vgrajeni kontrolni mehanizmi, ki naj zagotovijo zavarovanje, zaščito, integriteto in nemoteno delovanje sistema.

To je torej šest sklopov iz katerih bi moral biti sestavljen vsak informacijski sistem. Kako povezati posamezne sklope v učinkovito celoto je seveda naloga načrtovalcev in graditeljev informacijskega sistema. Načrtovanje in izgradnja novega, kakor tudi rekonstrukcija obstoječega sistema (zlasti v primeru modernizacije z uvajanjem sodobne informacijske tehnologije) pa je kompleksna in zahtevna naloga, ki pogosto traja tudi do nekaj deset tednov/let. Sam projekt je sestavljen iz več faz, v katerih se izvaja veliko različnih aktivnosti.

Glavne faze projekta so:
- načrtovanje projekta
- sistemska analiza
- razvijanje sistema
- preverjanje in uvajanje sistema
- vzdrževanje.

Najpomembnejša je izdelava idejnega osnutka sistema (prva in del druge faze projekta), ki služi kot orientacija in generalni plan načrtovanja in gradnje sistema. Ko je enkrat doseženo soglasje o predlogu idejnega načrta, lahko nadaljevanje projekta teče po ustaljenih (klasičnih) metodah ali pa pospešeno, sam sistem pa se lahko gradi celovito ali pa postopoma z uvajanjem delnih [illegible]

Tri temeljne vrste resursov mora organizacija izmenjavati s svojim okoljem, da sploh lahko obstane in se razvija. To so materialni, energetski in informacijski resursi. Medtem ko so pri nas materialni in energetski resursi dobro znani in priznani, pa so informacijski nekako zapostavljeni in jim ~~ni nas~~ nikakor ne posvečamo take pozornosti in priznanja, kot ga zaslužijo. Ti vendar so informacijski resursi temelj na katerem se gradi razvoj in zagotavlja obstoj katerega koli sistema, tudi delovne organizacije.

Informacije so ~~element~~ splošnega znanja, so pa tudi osnova za sprejemanje odločitev, s katerimi usmerjamo delovanje organizacije in vplivamo na obnašanje okolja. Brez ustreznih informacij si ~~tega sploh~~ ne moremo zamisliti procesa upravljanja, pa najsi gre za upravljanje v samoupravnem ali funkcionalno-poslovnem smislu.

Informacijski resursi so podatki in informacije. ~~P~~ Podatek je neko dejstvo ~~a~~ v zvezi s sistemom ~~(organizacijo)~~ oz. njegovim okoljem, informacija pa je pomen tega dejstva za uporabnika. ~~Podatki~~ Kadar opazujemo oz. proučujemo organizacijo kot

IS - namen, sestava in funkcija
IS - v podrobnem sistemu
Informacije po poslovnih funkcijah
6 blokov IS

AT kot aparaturi zdiferenciranega dela namen in funkcija

Projekt načrtovanja IS AT

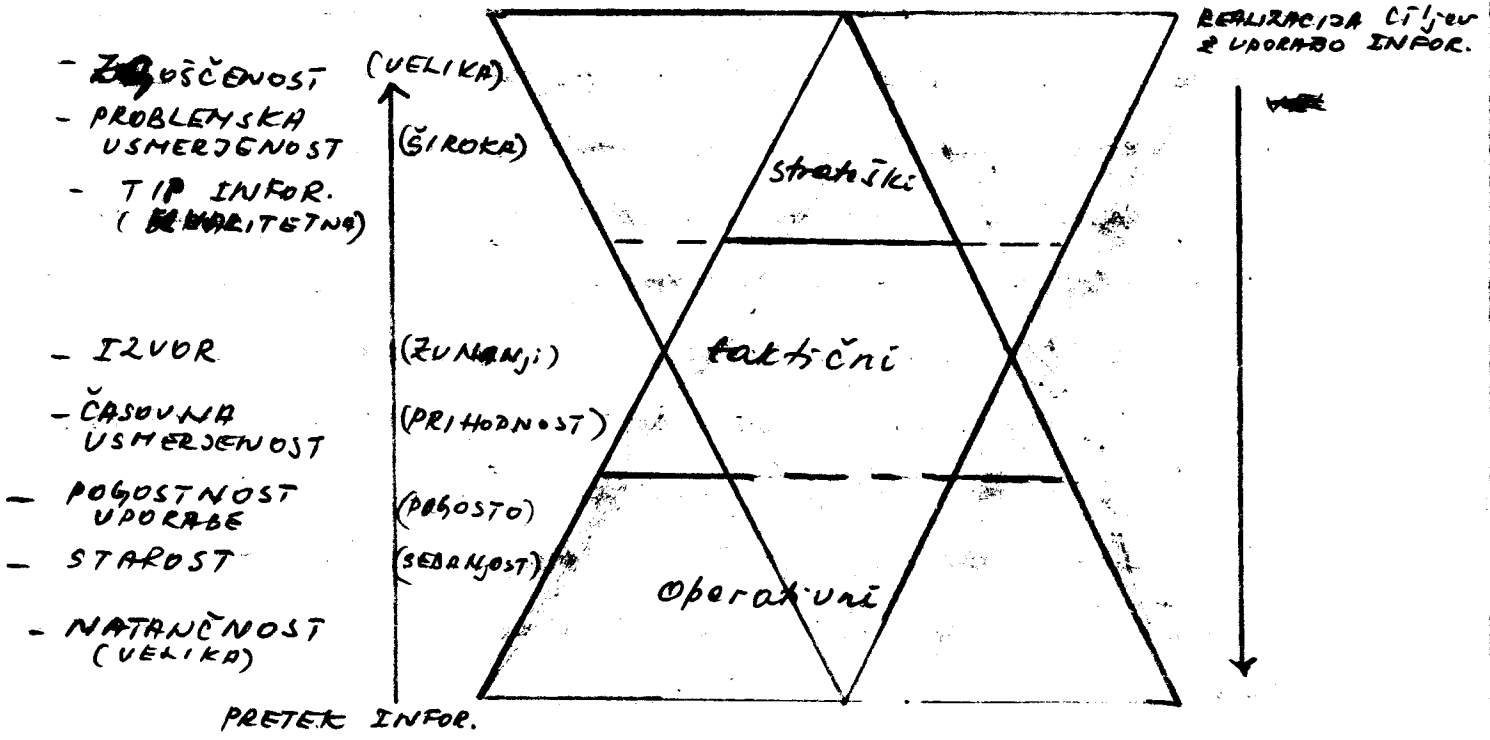
ciljem, so podatki objektivna slika dogajanja v organi- ~~so hitro ob~~ zaciji in okolji nje, informacije pa velikost in nujnost teh dogajanj za delavce v organizaciji in družbeno okolje v katerem organizacija dela.

Vsak sistem je sestavljen iz različnih elementov, oziroma podsistemov. Enako velja za OZD, ki je sestavljen iz TOZD-ov. Če gledamo TOZD kot eno celoto, takrat so podsistemi posamezne delovne funkcije.

Fukcije so, gibalna sila usmerjena v realizacijo zastavljenih ciljev. Z organizacijskega aspekta delovni proces ni nič drugega kot realiziranje ciljev poslovanja. Poslovni sistem znotraj sebe (funkcija nabave, prodaje, proizvodnje, kadrov, upravljanja z osnovnimi sredstvi, financ, računovodstva, planiranja, razvoja in raziskovanja) ter v interakciji z svojim okoljem (nabavno in prodajno tržišče, združene inštitucije, javno mnenje, ekonomski sistem, zakonodaja in podobno) ustvarjajo vrsto podatkov, ki predstavljajo rezultat različnih aktivnosti, poslovnih operacij in drugih transakcij, ki postajajo vhodne velikosti za nekatere druge podsistem informacijskega sistema OZD.

Informacija, kot vhodna velikost informacijskega sistema z svoje strani postaja vhodna velikost v sistemu samoupravljanja in odločanja vodilnega značaja, kot podlaga upravljanja in vodenja. Če je poslovni proces usmerjen v realizacijo ciljev poslovanja, oziroma zastavljene cilje organizacije, takrat se ti cilji

Strateški
Lahko razdelijo (razčlenijo) na nivoje ~~Strategijski~~,
taktični in operativni. Drugače povedano, Smoter
poslovanja je predpostavka strateškega načrtovanja,
strateški cilji so predpostavka taktičnega načrtovanja,
taktični cilji so predpostavka operativnega načrtovanja.
Torej, taktični cilji izhajajo iz strateških ciljev,
operativni cilji pa iz taktičnih ciljev. Torka operativni
cilji so po drugi strani sredstvo za ostvaritev
taktičnih ciljev in taktični cilji sredstvo za
ostvaritev strateških ciljev. Za realizacijo teh
ciljev so pomembni podatki in informacije.



Piramida ciljev in pretek informacije/podatki
za realizacijo ciljev.

Ne da bi pojasnjevali aktivnosti informacijskega sistema [zbiranja, obdelave, shranjevanja podatkov in informacij, in dostavljanje uporabnikom], informacijski sistem je sistem ki proizvaja informacije za potrebe organa samoupravljanja in vodenja. Torej, je cilj izgradnje informacijskega sistema da oskrbuje organe samoupravljanja in vodenja z relevantnimi in adekvatnimi informacijami kot podlogo za odnošanje poslovnih in ostalih odločb. Drugače povedano, prava informacija v pravem času in na pravem mestu z minimalnimi stroški.

Ampak, informacijski sistem mora temeljiti na sistematično vzpostavljenim in uporabljenem obsegu organizacijskih pravil v zvezi z nosilcim nalog informiranja. Potrebno je ugotoviti potr informiranja, pravice i obveznosti informiranja, načine prezentiranja informacij, za koga katera informacija, kdaj in kje ter načine obdelave informacij, kateri končno služi nosilcem posameznih delovnih nalog kot podloga za odločanje poslovnih, samoupravnih in ~~strog~~ neizogibnih odločb. Zato je potrebno imeti informacijski sistem zasnovano z računalnikom. Uporaba računalnika lahko poveča vloga informacijskega sistema v smislu povratne zveze v procesu odločanja. Saj uporaba računalnika razširi možnost hranjenja

izboljšano.

[intuicija in izkušnja]

4. Več komuniciranja pomeni boljše funkcioniranje poslovnega sistem.

[konflikti in konkurenca v sistemu]

5. Za uporabnike informacijskega sistema ni nujno da bi vedeli kako deluje, ampak le kako se uporabi

[uporabnik ni sistem analitik ali programer]

Torej, da bi smo diskreditirali takšne postavke, potrebno je vzpostaviti sistem ki je ima moč odstranit te dileme. Zato je nujno prej vsega izvršiti študij — procesa poslovanja ~~[illegible]~~ OZD-a da bi mogli izgradit informacijski sistem ki odgovarja poslovnem sistemu in uporabniku.

informacijske potrebe različnih uporabnikov.
Kontrolni blok je neke vrste ščitnik nad informacijskim sistemom, ki je podvržen različnim nevarnostim in grožnjam, kot so naravne nesreče, požar, sabotaže, zlorabe, napake v sistemu in podobno. Zato morajo biti v sistem vgrajeni kontrolni mehanizmi, ki naj zagotovijo zaverovanje zaščito, integriteto in celovitost delovanja sistema.
To je torej šest temeljnih sklopov iz katerih bi moral biti sestavljen vsak informacijski sistem. Kako povezati posamezne sklope v učinkovito celoto je seveda naloga načrtovalcev in graditeljev informacijskega sistema. Načrtovanje in izgradnja novega sistema, kakor tudi rekonstrukcija obstoječega sistema (zlasti kar zadeva modernizacijo sistema z vgrajenim sodobne informacijske tehnologije) je kompleksna in zahtevna naloga, ki pogosto traja tudi do nekaj deset ljudi/let. Sam projekt je sestavljen iz več faz, v okviru katerih se izvaja veliko različnih aktivnosti.
Glavne faze projekta so
- načrtovanje projekta
- sistemska analiza
- razvijanje sistema
- preverjanje in vgajanje sistema
- vzdrževanje

Vhodni blok zajema numerične in tekstualne podatke, ter grafične, glasovne ali kakršne koli druge zapise, ki vstopajo v informacijski proces. To so razne transakcije, zahtevki, potrjevanja, naročila in sporočila, ki jih uporabniki pošiljajo v informacijski sistem z namenom, da se tam ~~na nek način~~ obdelajo. Kadar se te obdelave izvajajo z računalnikom imamo na voljo široko izbor možnosti za vnašanje podatkov: tastatura, na dotik občutljivi zaslon, svetlobno pero, „miška" in podobno.

Blok modelov (ali banko metod) sestavlja kombinacija proceduralnih, logičnih in matematičnih metod, s katerimi se ~~manipulirajo~~ obdelujejo podatki da bi se dobil željen rezultat. Z metodami iz tega bloka se izvaja celoten informacijski proces.

Izhodni blok zajema vse, kar se kaže kot rezultat informacijskega procesa, t.j. dokumente in informacije za ~~vse vrste~~ različne uporabnike storitev informacijskega sistema. V veliki meri zavisi oblikovanje vseh ostalih blokov informacijskega sistema ravno od zahtevkov, ki se oblikujejo v tem bloku. Če ta blok ne zadovolji uporabnikovih potreb, je pomen ostalih blokov izničen.

Tehnološki sklop omogoča dejansko izvedbo transformacije podatkov. Fizično sprejema podatke iz vhoda, jih prenaša, preoblikuje, shranjuje, oblikuje vsebino izhodnega bloka in pomaga pri izvajanju kontrole nad celotnim sistemom.

Sklop podatkovne baze je tisti del informacijskega sistema, kjer so ~~[illegible]~~ zbrani vsi podatki potrebni za zadovoljevanje informacijskih potreb uporabnikov. To je temeljni blok informacijskega sistema. Najpomembnejše vprašanje ki se mora razrešiti v okviru tega bloka je, kako izvršiti logično povezavo ogromne množice podatkovnih elementov ~~tako~~, da bi lahko pravočasno zadovoljili

~~1. Cilj~~

Razvoj informacijske tehnologije

1. Cilj raziskave

V tem delu raziskave projekta želimo proučevati, zasnovati in razviti model za računalniškega programskega sistema za pomoč upravljalcem pri odločanju na temelju strukturirane baze podatkov in odločitvenih tabel, ki združene predstavljajo – prototipno primer informacijskega orodja strategije ~~[illegible]~~ razvoja in uporabe bo ~~[illegible]~~ temeljilo na najnovejših dosežkih in trendih razvoja [illegible] sistemov za upravljanje BP, to je relacijskih ter objektno usmerjenih BP. S povezovanjem le-teh z ~~tabelami~~ odločitvenimi tabelami v okviru jedrskih hierarhičnih modelov, z vključitvijo grafičnih podatkovnih struktur (drevesa in ploskovnih grafov), bo realizirana multidimenzionalnost na tem pristopu zasnovanega ~~[illegible]~~ programskega orodja.

Tako zasnovana baza podatkov bo vsebovala vse potrebne podatke, ki jih potrebujejo vsi nivoji uporabe (operativni, taktični, strateški), od ~~[illegible]~~ elementarnih podatkov o dnevnih transakcijah do visoko agregiranih (grafična [illegible]

2. Metodološke dele

- proučevanje literature programske opreme in njene uporabe
- analiziranje problema standardizacije tega področja v okviru EU in ZDA
- ~~oblikovanje~~ zasnova modela BP/odločitev in operacij, ki bodo morale ustrezati podatkov in odločitev v modelu (simulacije, optimizacija)
- analiza normaliziranja celotnega sistema s ciljem odpravljanja problemov (anomalij) pri delu s tem modelom: odstranitev podvajanja (multiplikacije) podatkov
- sinteza predhodnih korakov v oblikovanje končnega modela podatkov in odločitev.

3. Sodelavci

EF:
- dr. Janez Grad
- ~~mag. Janez~~
- mag. Jerneja Žabkar
- ~~dr. Andrej Kovačič~~
- ~~mag. Jože Zupančič~~
- dipl. ing. Mojca Indihar-Štemberger

izven EF:
- ~~mag. Janez Bole, KB~~
- dr. Andrej Kovačič, PRIS
- mag. Jože Zupančič, UM FOV
- dr. Ivan Rozman, UM FERI

4. Oprema

- centralni računalnik RCU (UKG)
- osebni računalniki in mreže na UKG ter UM
- internet
- programska oprema: za delo z BP (relac., obj. usm., mikro BP), odločitvene tabele, FORTRAN 90, za simulacije, za optimizacijo (LP,

I. Vědecká činnost / celkem /:

a) dílo posluchačů:

b) program oponenta !

c) vědecké aparáty operace;

d) literatura;

e) studentské vedení (konference seminářů / diplomové /

f) ostatní: ___

4. PROJECT DESCRIPTION

4.1. The Nature of the Research Problem

* . . *

It is estimated that the market for computer graphics software in the years to come will be several billions dollars (Hester, 1985). Some experts (Friend, 1982) assert that computer graphics may do as much to enhance productivity as the computer itself. Therefore, the choice of front to guide information system designers in the selection and use of computer graphics technology is of great importance. Indeed, it has been established in US that the form and colour in which information is presented affects decision making performance, what has generally been ignored in past empirical research (Desanctis, ...). Many researchers (Benbasat, 1973, (1973), Desanctis, (1984), Benbasat and Schroeder, 1977) have pointed out the importance of controlling for task characteristics when performance with different forms of presentation is examined. In the project the task is defined in terms of the question to be answered with an information presentation. Performance is measured by the time required to extract a question-answer from an information presentation and the accuracy of that information presentation answer.

* A significant amount of accounting research ((Edwards and Bell, 1967), (Brown and Kennelly ...), (Tomassini, 1977)) has been done in an effort to determine what information should be provided to decision makers. Little effort has been focused on examining the issue of how that information should be presented to individual decision makers. The researchers at the Graduate School of Business, Indiana University state that the effects of different forms of information presentation on performance is an important

4.2. Significance of the Research

managers and accountants generally present financial information (Jarett, 1984) to users in tabular form. The two reasons for this are (1) managers (accountants) do not possess the training necessary for the manual preparation of graphic presentations and (2) in terms of both time and money, the use of graphics presentations costs more than the use of tabular presentations. However, the computer technology necessary to prepare graphic presentations of information is commonly available in today's business (Ives, 1982) environment. Graphic forms of presentation are now a practical alternative for the communication of financial information. Therefore, it is important that the effects of presenting information in different forms be investigated.

Information system technology has advanced to the point where it is now economical to design information systems to support the decision making of individual system users. This type of system is typically referred (Sprague and Carlson, 1982) to as a Decision Support System (DSS). Single-user systems are most often designed to support the strategic decision making of upper-level management. At that level of an organization, incorrect decisions, resulting from the extraction of incorrect information from the system, may have significant bad consequences. Single-user systems allow the management information system (MIS) to be designed to the needs of an individual decision-maker for a specific

can be designed to fit a specific interaction is the form in which the information is presented. Many single-user systems designed to support strategic decision making provide the user with the ability to display and use ~~~~ information. Thus, it is essential that the limited body of knowledge regarding the interface between an individual decision maker and an information system be expanded. The form in which information is presented to a decision maker is a significant aspect of that interface.

Proponents of graphic forms of presentation claim that graphics, as opposed to tabular presentations enable users to make faster and better decisions. Graphic presentations allow the display of large quantities of information in a compact, meaningful, and easily understood form (Scott-Morton, 1971). The empirical evidence regarding the effects of graphic and tabular information presentations on performance is equivocal. One set of studies (Mariarity, 1979; Zmud, 1979; Benbasat and Schroeder, 1977; Lucas, 1981; Lucas and Nielsen, 1980; Watson and Driver, 1983) indicates that graphic presentations result in superior performance, another set indicates that there is no difference between performance with graphics and tabular presentations (Lusk, 1979; Ghani and Lusk, 1981; Lusk and Kerpsack, 1979), and a third set indicates that tabular presentations are superior. Regardless of the results, all of these studies suffer from at least one of two weaknesses: (1) ~~Most~~ were done in an ad hoc fashion ← they were done without a theoretical foundation. Consequently, there is a failure to systematically specify, control and study the variables which affect performance with information presentations. For instance, few researchers have recognized that task characteristics influence performance with an information presentation. Lack of a shared theoretical model also results in little theory

basis for a comparison of results ~~across~~ studies and no way to reconcile the conflicting findings. (2) Many of these studies involved complex experimental tasks which mask the effects of different information presentations: In these experiments, numerous uncontrolled variables, such as decision models used by the subjects, intervene between the ~~treatments, the~~ information presentations and the measurement of performance, (i.e., the number of firms for which outcome is correctly predicted). Clearly, there is a need for theoretically and experimentally sound research on the effectiveness of different forms of information presentation

In different countries ~~the~~ decision makers generally come (stem) from different educational and social environments. Their capabilities of understanding complex graphic information presentations may differ in many ways. There is a need for a similar research on the effectiveness of different forms of information presentation in both highly developed countries (~~USA~~) and developing (~~and socialist~~) countries (~~[illegible]~~), respectively.

4.3. Hypotheses and Theoretical Background

One of the difficulties of investigating the interface between a decision maker and IS is that there is no well developed theory concerning that interface to guide the research. In such a situation, Blalock (1969) recommends the use of a four-step theory-building strategy:

(1) Formulate a general framework to guide research in the area.

(2) Narrow the focus of the research by identifying the variables in the general framework which are relevant to the research question addressed.

(3) Empirically investigate the relationships among the variables identified in step (2).

(4) Revise the general framework based on the results of the empirical work in step (3).

In this project these four steps will be accomplished by:

(1) defining the user/system interface in terms of a model proposed by Jenkins to guide research in the area.

(2) Using Bertin's theory regarding the design and use of information presentations to identify the variables in Jenkin's model which affect performance with an information presentation.

(3) Investigating the relationships among the variables identified in step (2) with a set of interlocking experiments.

(4) Conducting further research based on the findings of the studies in step (3) and revising the user/system interface

~~6.6.1 Hypothesis~~

Jenkin's model of the User/System Interface is the general framework used to guide the research in this project. The conceptual model is composed of four classes of interrelated variables: (1) Human Decision Maker, (2) Information System, (3) Task, and (4) Performance. The first three classes of variables are treated experimentally as independent variables, and Performance variables are dependent variables. The model is too complex to deal with in its entirety in any one study.

Bertin's theory is primarily one of graphic design. The designer selects such a form of information presentation which allows the user to extract the desired information with the least amount of effort. The amount of effort expended in isolating and extracting the information from the presentation is measured by the time required to do so. The information to be extracted is defined by the question the user wishes to answer. The information to be presented is taken as a given. Bertin describes three levels of questions: (1) Elementary questions require an answer based on one datapoint in the presentation. (2) Intermediate questions require an answer based on more than one, but not all, of datapoints presented. (3) Comprehensive questions require an answer based on all of the information presented. Information sets consist of components (variables) and an invariant. The invariant describes the relationship among the variables.

Characteristics of the information set limit the number of forms which can be used to effectively display it. The most efficient form should be chosen and used. Qualitative and quantitative aspects of the information (are important and are) answers to different types of questions. In this respect, based on the consistency of Bertin's and Ehrenberg's (1977) assertions, tables ~~are to be~~ treated as an additional form of presentation to which Bertin's theory is applicable.

Human Decision maker Variables: Bertin does not identify any individual differences as affecting performance with different forms of presentation. For these reasons, individual differences are not an independent variable in this study. However, there is empirical evidence suggesting that individual differences influence behaviour with an information presentation (Lusk and Kerstwick, 1979). Because a within subject experimental design is used in the project, individual differences will not confound the results (Keppel and Saufley, 1980).

Task Variables: The answering of questions is identified as an appropriate task for the examination of performance with an information presentation. This helps to avoid the confounding effects of a complex decision making environment. Simon (1977) identifies four stages in the decision making process: intelligence, design, choice, and review. In the design stage, the decision maker extracts information relevant to his decision from the available IS (question-answer approach). Bertin deals only with the actual extraction of information from the system and does not deal ~~but~~ with the operationalization of the question and ~~the~~ use of the information.

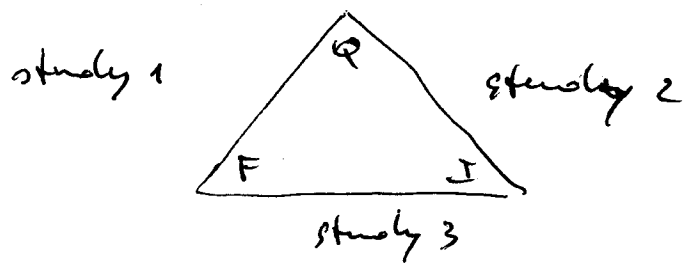
Information System Variables are the form of presentation and the information set presented. Performance Variables (the performance measures) in this research are time and accuracy. Berlin defines performance in terms of time only. But accuracy also is an important dimension of performance to IS researchers and designers.

Step (3) of a four step theory-building strategy may be interpreted in the following functional form

$$P = f(Q, I, F)$$

where P is a performance (measured by the time required to extract the answer to a specific question from an information presentation), Q is the question to be answered with the information, I is the information presented, and F is the form in which the information is presented.

In the proposed studies the three variables (Q, F, I) hypothesized to affect performance P with information presentations will be systematically investigated two at a time in Yugoslav environment and the obtained results will be compared with those obtained in the USA (Indiana University, Bloomington, Indiana). Studying the variables two at a time will allow the effects of each to be better isolated and removes the potentially confounding effects of varying all three variables simultaneously. The studies will help to confirm the theory regarding the use of information presentations as decision aids. The relationships among the studies with respect to the independent variables is illustrated by the following triangle



where Q denotes the complexity of the question to be answered, F denotes the form in which the information is presented, and I denotes the complexity of the information set presented. To the extent possible, the experimental procedures and instruments are identical across experiments. This process assures the comparability of the studies' results. Programs of research, such as the above stated studies, have several significant advantages over isolated, individual studies: (1) the amount of "nuisance" variance is greatly reduced (Beaver, 1981); (2) the partial replication of each study by the other studies provides independent verification of the results and greatly increases the reliability of the findings (Tukey, 1969); (3) programs of research also offer the possibility of synergy with respect to the amount of useful information which is produced by a given amount of research. When data from several experiments is combined, a larger number of hypotheses may be tested with greater statistical power than would be possible with the same number of uncoordinated, individual experiments.

These studies are an experimental test of Berlo's theory. ~~The~~ His operationalization of two important constructs - questions and information sets - lacks sufficient detail and is too ambiguous for experimental control. But it is not the theory itself which is inadequate; rather, it is the operationalization of constructs which is

inadequate for experimental testing of the theory. It is the intermediate level of function that Bertin's function taxonomy suffers from the greatest lack of detail. A more detailed, unambiguous taxonomy is needed for adequate experimental control of functions, ~~In commenting on the work of Wainer, et al.~~ Davis, et al. (1985) analyze this problem in greater detail. In commenting on the work of Wainer, et al. (1982), Bertin asserts that ~~it~~ it is only with relatively complex information sets that the advantages of graphic forms of presentation are apparent. To insure that the results of these studies are not biased against graphic information presentations it is important that relatively complex information sets are used (Lauer, et al., 1985).

Revision of Framework.

The final step in Blalock's theory building strategy is to integrate the findings from the empirical investigation of the relevant variables into the general framework and preceding research. This project is part of PRIMIS: the Program of Research in MIS. The objective of the program of research is to increase the understanding of the interface between a decision maker and an IS. Increased understanding of the User/System interface will facilitate the improvement of IS. PRIMIS consists of a set of related, interlocking experiments with a common conceptual model of the User/System interface. These studies constitute ~~the first of~~ several experiments planned to investigate the effects of different forms of presentation in the User/System interface ~~and contribute to the body of knowledge in three respects~~. (1) the effects which task characteristics have on performance with a given form of information presentation. This problem was generally ignored in previously conducted research which examined the effects of different forms of information presentation. (2) The research is grounded in theory, while past research has not been based on theory. (3) the experiment is conceptually sound. An experimental task which does not confound the measurement of performance with different forms of presentation is used. Most past management studies of this kind have utilized complex experimental tasks which masked and confounded the effects of different forms of information presentation.

4.5. Methodology

Laboratory experiments utilizing a microcomputer to present the experimental treatments and record subject responses are chosen as the methodology for this project. These experiments are primarily theory-building in nature, with the primary objectives to investigate the nature of the relationships among a set of variables. To do this, the research methodology chosen must have a high degree of internal validity. When human are used as subjects, the required degree of internal validity can best be obtained in the laboratory. According to (Stone, 1978), three of the primary advantages of laboratory experiments are: (i) measurement is more precise; (ii) the independent variable(s) of a study can be precisely and unambiguously defined; (iii) laboratory experiments can be replicated.

For these experiments computer programs will be written or adapted to present the subjects with sets of information presentations and questions via video output from a microcomputer. The subject is required to answer the question shown before the next question and information presentation are displayed. Time is measured with the computer. The microcomputer used is an IBM PC AT compatible PC equipped with a high resolution, Professional Graphics monitor and Professional Graphics Adapter.

There are two independent and two dependent variables in these experiments. The two independent variables are the questions the subjects are asked to answer and the forms in which the information is presented. The two dependent variables are the

accuracy of the question-answers and the time required to answer the questions. The questions range from simple to complex. Different forms of presentation are used ~~(bar charts, line graphs, tables, etc.)~~ which are available in data management software (bar charts, line graphs, tables, pie charts). The same information set is presented in all four forms of presentation used. The information set consists of a set of financial measures for different companies for more than one time periods. A full factorial, within subject experimental design is used. The results of the experiments are analyzed with Analysis of Variance (ANOVA). Both main effects and interactive effects are tested. Planned and post hoc comparisons of cell means are used to further investigate the nature of the relationships among the variables.

The purpose of this research is to investigate the circumstances under which different forms of presentation should be used to present information to decision makers. However, this experiment does not involve an actual decision making task. The subjects are merely asked to answer a set of questions with different information presentations. It is contended that the answering of questions with an information presentation is one step in the decision making process. It is assumed that if the extraction of information from the system can be facilitated, decision making will be improved.

4.4. Objectives of the Research

The purpose of this research is to examine the interface between a management (financial?) information system and an individual system user. Specifically, the issue of how best to present accounting (______!) information to a decision maker with a specific information need is studied (analyzed). The information needed by a decision maker is a characteristic of the task to be performed. The effects of task characteristics on the appropriateness of a given form of presentation have already been studied by some researchers at the Graduate School of Business, Indiana University, USA. Within the project some of the research done in USA will be reflected in [illegible] different ( ) environment but further generalized problems in this and more complex area will be tested too. In particular we plan to analyze the following broad research areas and problems, respectively:

- the effects of question complexity and form of presentation on the time required to extract question-answers from an information presentation and the accuracy of those answers

Hester, 1985
Friend, 1982
Desanctis, 1984
Bertin, 1973, 1983
Benbasat and Schroeder, 1977
Edwards and Bell, 1967
Brown and Kennelly, 1972
Tomassini, 1977
Jarett, 1981
Ives, 1982
Sprague and Carlson, 1982
Scott-Morton, 1971
Moriarity, 1979
Emund, 1979
Lucas, 1981
Lucas and Nielsen, 1980
Watson and Driver, 1983
Lusk, 1979
Ghani and Lusk, 1981
Lusk and Kersnick, 1979
Blalock, 1967
Jenkins, 1977, 1983
Ehrenberg, 1977
Keppel and Saufley, 1980
Simon, 1977
Beaver, 1981
Tukey, 1969
Davis, et al., 1985
Lauer, et al., 1985

3. Research team, place of research, and time schedule

Participants in the research project are:

(i) members of the teaching? ~~research~~ - staff at the Graduate School of Business, Indiana University, Bloomington, Indiana;

(ii) members of the teaching? ~~research~~ - staff at the B.K. Department of Economics ~~Ekonomske~~ ~~Indiana~~ E.K. University of Ljubljana fakultete Borisa Kidriča, Univerze Edvarda Kardelja v Ljubljani;

Research activities are taking ~~will take~~ place both in Bloomington and Ljubljana respectively. ~~Such experiments have taken place~~ ~~at IRMIS~~ (Institute for Research on the Management of Information Systems) ~~Indiana, Bloomington~~ ~~has conducted~~ ~~these~~ and completed ~~advanced~~ ~~different~~ ~~research~~ experiments

Several experiments have been ~~started, conducted and~~ successfully completed within IRMIS (—), Bloomington. The investigators at EFBK have got

Stone, 1978

Hester, 1985
Friend, 1982
Desanctis, 1984
Bertin, 1973, 1983
Benbasat and Schroeder, 1977
Edwards and Bell, 1967
Brown and Kennelly, 1972
Tomassini, 1977
Jarrett, 1981
Ives, 1982
Sprague and Carlson, 1982
Scott-Morton, 1971
Mariarty, 1979
Emmd, 1979
Lucas, 1981
Lucas and Nielsen, 1980
Watson and Driver, 1983
Luck, 1979
Ghani and Luck, 1981
Luck and Kernick, 1979
Blalock, 1967
Jenkins, 1977, 1983
Ehrenberg, 1977
Keppel and Saufley, 1980
Simon, 1977
Beaver, 1981
Tukey, 1969
Davis, et al., 1981
Lauer, et al., 1981

PROPOSAL TO THE US-YUGOSLAV JOINT BOARD

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Is this proposal also being submitted to another US Agency?
Yes ___
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Name and full address of submitting organization:
Univerza Edvarda Kardelja v Ljubljani
Ekonomska fakulteta Borisa Kidriča
Kardeljeva ploščad 17
61000 LJUBLJANA, Yugoslavia

TITLE OF ~~PROPOSED~~ ~~PROJECT~~

THE EFFECTS OF QUESTION COMPLEXITY, FORM OF PRESENTATION AND COLOUR ON THE DECISION-MAKER

Total Requested Amount: ? Dinars/Dollars
Total Requested Duration: THREE YEARS
Requested Starting and Alternate:
1. ~~September~~ August 1, 19
2. October 1, 19

1988+89 (1st year): ? Dinars/Dollars
1989+90 (2nd year): ? Dinars/Dollars
1990+91 (3rd year): ? Dinars/Dollars

~~PRINCIPAL~~ PRINCIPAL INVESTIGATOR (P.I.)
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Date October 15 1987	Date October 15 1987	Date October 15 1987