Mapping and Solving Marketing-Informatics Challenges of Forthcoming Knowledge-Based Society Efficiently

by

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DOCTORAL THESIS EDITION

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Mapping and Solving Marketing-Informatics Challenges of Forthcoming Knowledge-Based Society Efficiently

Subtitle: Benefits of Putting Mathematics, Probability & Statistics, Informatics, and Typography Together

Mapování a efektivní řešení marketingově-informatických úkolů nastávající společnosti založené na znalostech

Podnázev: Přínosy matematiky, pravděpodobnosti & statistiky, informatiky a typografie skloubené v jeden celek

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Abstract

This doctoral dissertation deals with and analyses a questionnaire comparing knowledge of the faculty students with an average knowledge in the Czech Republic and in the European Union. The results are alarming. I am improving this situation by providing new study materials for the faculty courses.

Therefore the key objectives are to collect and solve difficult problems which arose in practical life. The side-effect is that the university and the faculty will get more public interest. These solved problems will be used as exercises and supplementary materials for various offered courses taught in the faculty in English and in Czech.

For solving these problems and tasks I needed algorithms and procedures from Mathematics, Probability & Statistics, Informatics (especially Programming), and Typography fields.

I use Monte-Carlo simulation and mathematical and robust statistics. I had to do some programming using programming and scripting languages such as Visual Basic for Applications, HTML, PHP, MySQL, ℝ and TEX.

The results are continuously published and presented at conferences.

Preface

Many people are facing difficult problems, aren't they?

In fields like Mathematics, Statistics, Informatics (especially Programming), and Typography, these have become an unavoidable part of my everyday life because they are saving me, my colleagues, and other people time and therefore they make many situations more effective.

There are still a lot of people who either do not like these fields or they are not well educated in them. This is a serious block for them when talking about solving hard problems. I would like to improve this situation in my dissertation. One way to do this is to present a series of truly difficult problems—where they come from, how to solve them and what kind of questions to discuss with the class. The second way is to analyse the faculty's options to create a new study programme specialised in Mathematics and Statistics or a new study programme completely taught in English.

Let us prepare forthcoming generations to solve difficult problems more easily.

Pavel Stříž : *November 2006*

Zusammenfassung {in German}

Diese Doktorarbeit behandelt und analysiert die Fragestellung, wie das Wissen der Studenten der Fakultät im Verhältnis zu dem durchschnittlichen Wissen in der Tschechischen Republik und in der Europäischen Union beschaffen ist. Die Ergebnisse sind besorgniserregend. Die Situation wird verbessert durch Bereitstellung von neuem Studienmaterial für den Fakultätsunterricht. Die wichtigsten Hilfsmittel sind die Erfassung und Lösungsfindung von schwierigen Problemen, die sich aus der Praxis ergeben. Als Nebeneffekt erlangt die Universität und die Fakultät ein höheres öffentliches Interesse. Die gelösten Fragestellungen werden als Übungen und ergänzendes Unterrichtsmaterial in verschiedenen angebotenen Kursen der Fakultät so wohl in tschechischer und englischer Sprache eingesetzt. Um diese Probleme und Aufgaben zu lösen wurden Algoritmen und Vorgehensweisen aus dem Bereich der Mathematik, Wahrscheinlichkeitsrechnung, Statistik, Informatik (insbesondere Programmierung) und Typographie eingesetzt. Es wurden die Monte-Carlo –Simulation, mathematische und anerkannte Statistiken benutzt. In der Programmierung kamen zum Einsatz Visual Basic Skripte in Anwendung, HTML, PHP, MySQL, ℝ und TEX. Die Ergebnisse werden fortlaufend publiziert und auf Konferenzen vorgetragen.

Vorwort {in German}

Viele Menschen stehen vor immer komplexer werdenden Aufgaben. Die wissenschaftlichen Felder, wie der Mathematik, Statistik, Informatik (im besonderen die Programmierung) und der Typographie, sind zu einem unverzichtbaren Teil des täglichen Lebens geworden und ermöglichen es, mir, meinen Kollegen und anderen Menschen Zeit einzusparen und machen hierbei viele Prozesse effizienter. Es gibt immer noch viele Menschen die für diese Bereiche kein Interesse zeigen oder deren Wissensstand nicht ausreichend ist. Für diesen Personenkreis ist es schwierig in einem Diskurs komplexe Probleme zu lösen. Ich möchte diese Situation durch diese Doktorarbeit verbessern. Eine Methode ist es, eine Anzahl von hoch komplexen Problemen vorzustellen, woher sie herkommen, wie man sie lösen kann und welche Fragen man mit der Unterrichtsklasse ausdiskutieren kann. Die zweite Möglichkeit ist zu analysieren in wie fern die Fakultät Möglichkeiten hat ein neues Studienprogramm aufzusetzen, das auf Mathematik und Statistik fokussiert oder ob es möglich ist das neue Studienprogramm komplett in Englischer Sprache zu lehren. Lassen Sie uns zukünftige Generationen komlexeren Fragestellungen einfacher lösen zu lassen.

Pavel Stříž : *November 2006*

Abstrakt {in Czech}

Tato disertační práce se zabývá a analyzuje dotazníkové šetření srovnávající znalosti studentů naší fakulty s průměrem v České republice a v Evropské unii. Výsledky jsou varující. Tuto situaci zlepšuji nabídkou nových studijních materiálů fakultním kurzům.

Hlavními cíli práce je sběr a řešení obtížných problémů, které přinesl život praxe. Vedlejším efektem je, že univerzita a fakulta budou lépe známy veřejnosti. Vyřešené problémy budou použity jako cvičení a podpůrné studijní materiály v různých fakultou nabízených kurzech vyučovaných v angličtině a češtině.

K řešení těchto problémů jsem potřeboval algoritmy a postupy z oblastí jako jsou matematika, pravděpodobnost & statistika, informatika (zvláště programování) a typografie.

Používám simulaci Monte Carlo a matematickou a robustní statistiku. Musel jsem také využít programování a to jazyků jako jsou Visual Basic for Applications, HTML, PHP, MySQL, ℝ a TEX.

Výsledky jsou průběžně publikovány a prezentovány na konferencích.

Předmluva {in Czech}

Celá řada lidí čelí obtížným problémům, není tomu tak?

Oblasti jako jsou matematika, statistika, informatika (obzvláště programování) a typografie, se staly neoddělitelnou součástí mého každodenního života, protože šetří mně, mým kolegům a dalším lidem spoustu času a tím se stává řada situací efektivnější.

Ovšem je zde nespočet lidí, kteří buď tyto obory nemají rádi, nebo v nich nejsou dostatečně vzdělaní. Mluvíme-li o řešení složitých problémů, tak se jedná o závažnou překážku. Rád bych ve své disertační práci zlepšil tuto situaci. Jedna možnost je ukázat řadu obtížných problémů – kde vznikají, jak je řešit a jaké otázky diskutovat na cvičení. Druhou možností je analyzovat fakultní možnosti na vytvoření nového studijního oboru se zaměřením na matematiku a statistiku nebo nový studijní obor v angličtině.

Připravme nadcházející generace lépe na řešení složitých problémů.

Pavel Stříž : *Listopad 2006*

Motto

Story voice > What are your conclusions, your Majesty author? [84]
Author > None, they are none here. [85]
Story voice > Why? I want to be of some meaning – to be helpful to this world. [86]
Author > E, e, e, . . . look at the title. You are not a story, you are a bunch of notes. So don't worry about saving the world. [87]

"I'm not a story; I'm just subjective notes on names!"
From unpublished *Series of Informal Introductions,*
Theatre Play Tries by Pavel Stříž

Dedication {Věnování}

To my family.

Mým rodičům a sourozencům.

Acknowledgements

I'd like to gratefully thank all my family members and friends.

Last, but not least, my thanks belong to my supervisor Assoc. Prof. Rudolf Pomazal, M.Sc., Ph.D.

Poděkování {in Czech}

Rád bych srdečně poděkoval celé mé rodině a přátelům.

Na závěr, ale ne nejméně, bych poslal mé poděkování svému školiteli docentu Pomazalovi z Ústavu informatiky a statistiky FaME UTB ve Zlíně.

Copyright Statement

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Pavel Stříž, M.Sc.

Zlín, November, 1, 2006

Čestné prohlášení {in Czech}

Prohlašuji, že jsem tuto předloženou disertační práci zpracoval samostatně na základě studia, citovaných literárních a internetových zdrojů a vlastních výzkumů.

Ing. Pavel Stříž

Ve Zlíně dne 1. listopadu 2006

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Added Czech letters: ěščřžýáíéóúůťd'ň and ĚŠČŘŽÝÁÍÉÓÚŮŤĎŇ.

Added Slovak letters: äĺôŕľ and ÄĹÔŔĽ.

Added German letters: äöü, ÄÖÜ and ß.

Added Russian letters: бдзйльэщчюж, ... and БДЗЙЛЬЭЩЧЮЖ, ...

And, of course, Greek alphabet: $\alpha\beta\chi\delta\varepsilon$, ... and $ABX\Delta E$, ...

Mathematical and Typography Conventions

`x, y, ...`	Regular variables in programming languages.
$x, y, \ldots$	Ordinary mathematical variables. I neither use nor work with matrices in my paper.
`<http:// ...`	URLs, file extensions, emails, some numbers and codes.
TEX, IR, ...	Programs and software products. IR is name of software.
␣	This is space in typewriter mode.
12 `LET ...`	Numbered source code.
cz en	This means language specification, written for Czechs or for Englishmen.
'x'	In quotes are specific letters or digits.
(Ltd.) or '/'	In parenthesis are alternatives, notes and mathematical formulae.
{9.9, 8.2}	Particular point in two-dimensional space.
[AS]	In brackets are definitions, abbreviations, price units, How published and Key combinations.
[[35]]	Author's paper № 35 found in Publications.
[[Xxx00]]	Bibliography. One author and year.
[[XX00]]	Bibliography. Two authors and year.
[[XXX00]]	Bibliography. More then two authors and year.
[[XX+00]]	Bibliography. Two authors *et al.* and year.
$^{a}, ^{b}, ^{c}, \ldots$	Footnotes in minipage.
$^{\alpha}, ^{\beta}, ^{\gamma}, \ldots$	Footnotes in regular text.

~~~~~~~~~~~~~~~~~ These are leader lines. First level.
. . . . . These are leader lines. Second level.

List of Abbreviations and Acronyms

B.Sc. Econ.	Bachelor of Science in Economics.
B.Sc.	Bachelor of Science.
M.Sc. Econ.	Master of Science in Economics.
M.Sc.	Master of Science.
Ph.D.	Doctor of Philosophy.
$_{cz}$CSc.	Candidate of Sciences, *see* Ph.D.
$_{cz}$Doc.	Associate Professor; $_{cz}$Docent.
$_{cz}$Ing.	Engineer. For equivalent, *see* M.Sc. or M.Sc. Econ.
$_{cz}$RNDr.	General doctor. rerum naturalium doctor.
ISBN	International Standard Book Number.
ISSN	International Standard Serial Number.
GD	Graphics Draw. <`http://www.boutell.com/gd/`>.
HTML	HyperText Markup Language.
MySQL	My Structured Query Language.
PHP	Pre HyperText Processor.
ℝ	The R Project for Statistical Computing, <`http://www.r-project.org/`>.
URL	Uniform Resource Locator.
VBA	Visual Basic for Applications.
WWW	World Wide Web.
CUNI	Charles University.
DIS	Department of Informatics and Statistics.
FaME	Faculty of Management and Economics
IMSA	Illinois Mathematics and Science Academy.
IPA	*see* TIPA.
MENDELU	Mendel University of Agriculture and Forestry in Brno.
MUNI	Masaryk University in Brno.
TBU	Tomas Bata University in Zlín.
~~~~~~~~~~~~~~~~~

TIPA	The International Phonetic Alphabet.
$_{cz}$CDIV	Centre for Distance Learning, $_{cz}$Centrum distančního vzdělávání.
$_{cz}$GAČR	Czech Science Foundation of the Czech Republic, $_{cz}$Grantová agentura České republiky.
$_{cz}$JČU	University of South Bohemia in České Budějovice, $_{cz}$Jihočeská univerzita v Českých Budějovicích.
$_{cz}$KPMS	Department of Probability and Mathematical Statistics, $_{cz}$Katedra pravděpodobnosti a matematické statistiky.
$_{cz}$MFF	Faculty of Mathematics and Physics, $_{cz}$Matematicko-fyzikální fakulta.
$_{cz}$MŠM	Ministry of Education, Youth and Sports, $_{cz}$Ministerstvo školství, mládeže a tělovýchovy.
$_{cz}$MZLU	*see* MENDELU, $_{cz}$Mendelova zemědělská a lesnická univerzita v Brně.
$_{cz}$ÚIS	*see* DIS, $_{cz}$Ústav informatiky a statistiky.
$_{cz}$UK	*see* CUNI, $_{cz}$Univerzita Karlova.
$_{cz}$UPOL	Palacký University Olomouc, $_{cz}$Univerzita Palackého v Olomouci.
$_{cz}$UTB	*see* TBU, $_{cz}$Univerzita Tomáše Bati ve Zlíně.
ANN	Artificial Neural Network.
ANOVA	Analysis of Variance.
GE	General Electric Matrix.
ICSE	International Classification of Status in Employment.
ISCO-88	International Standard Classification of Occupations.
PBL	Problem-Based Learning.
PBLN	Problem-Based Learning Network.
SPC	Statistical Process Control.
$_{cz}$KZAM	National version of ISCO-88, $_{cz}$Klasifikace zaměstnání.
CompStat	Conference on Computational Statistics.
CZSO	Czech Statistical Office in Prague.
IASC	International Association for Statistical Computing.
ILO	International Labour Organization.
ISI	International Statistical Institute.

Robust	Conference on Robust Statistics.
TUG	TEX Users Group.
CSTUG	Czechoslovak TEX Users Group, $_{cz}$Československé sdružení uživatelů TEXu.
$_{cz}$ČStS	Czech Statistical Office, $_{cz}$Česká statistická společnost.
$_{cz}$ČSÚ	*see* CZSO, $_{cz}$Český statistický úřad v Praze.
$_{cz}$JČMF	Union of Czech Mathematicians and Physicists, $_{cz}$Jednota českých matematiků a fyziků.
$_{cz}$Stakan	Conference for Statistics Teachers, $_{cz}$Statističtí kantoři.
cm	centimetre(s).
DPI	Dots Per Inch(es).
pt	point(s).
sq	squared or square.
EVENE	Erasmus Virtual Economics & Management Studies Exchange
DEP	DTP and Electronic Publishing course.
DTP	Desktop Publishing. Digital Typography.
enDEP	DEP course taught in English.
ezDTP	DTP and Electronic Publishing course taught using e-learning principles. Hometown of the lecturer is Zlín.
KMR	*see* QMMDM, $_{cz}$Kvantitativní metody v rozhodování.
QMMDM	Quantitative Methods for Managerial Decision Making.
RIUS	Preliminary version of full inter-universities studies, $_{cz}$Rozběh interuniverzitních studií.
AS	Author's Sheet(s).
$_{cz}$Vm	Big Visual Basic for Applications macro, $_{cz}$Velké makro.
$_{cz}$Vp	Big generator of assessments, $_{cz}$Velký předlohovač.
ASCII	American Standard Code for Information Interchange.
CD	Compact Disc.
DVD	Digital Versatile Disc or Digital Video Disc.
GUI	Graphical User Interface.
IS	Information System.

IT	Information Technology.
ICTs	Information and Communications Technologies.
MS	Microsoft Corporation.
OCR	Optical Character Recognition.
OS	Open Source.
OSS	Open Source Software.
PC	Personal Computer.
TCP/IP	Transmission Control Protocol / Internet Protocol.
USB	Universal Serial Bus.
UTF-8	Unicode Transformation Format, 8-bit encoding form.
CMS	Content Management System.
CV	Curriculum Vitae.
e-Book	Electronic Book.
e-Business	Electronic Business.
e-Learning	Electronic Learning.
e-Mail	Electronic Mail.
.ca	Country code for Canada.
.com	Commercial site.
.cz	Country code for the Czech Republic.
.de	Country code for Germany; Deutschland.
.edu	Educational site.
.eu	European Union code.
.fi	Country code for Finland.
.hu	Country code for Hungary.
.int	International site.
.nl	Country code for the Netherlands.
.org	Non-Profit Organization.
.uk	Country code for United Kingdom.
Corp.	Corporation.
Ltd.	Limited company.
*cz*a. s.	*see* Corp. *cz*Akciová společnost.
*cz*s. r. o.	*see* Ltd. *cz*Společnost s ručením omezeným.

CZ,	cz, *cz*	Written in Czech. The Czech Republic.
EN,	en, *en*	Written in English. Native Englishman.
FI,	fi, *fi*	Written in Finnish. Finland.

DOC	(Microsoft) Document text file.
PDF	Adobe Portable Document Format.
PS	Postscript file (text/graphics) (ASCII).
RTF	Rich Text Format text file.
TEX	TeX text file (Scientific Word).
TXT	Text file.

1 Extended Abstract {in Czech}

Informační společnost, společnost založená na znalostech, přichází, profiluje se a krystalizuje ve všech barvách a kráse.

To všichni vítají a v článcích a příspěvcích na konferencích opěvují.

Náš život snad bude zase o něco snazší, příjemnější a méně stresující.

Kdepak, opak je pravdou.

Mé dotazníkové průzkumy provedené na půdě FaME a srovnávané s ostatními zeměmi a s ideálním stavem hovoří jasnou a srozumitelnou řečí.

Jsme pozadu – já, vy, Zlín, Česká a Slovenská republika, Evropa, Afrika; mnoho, mnoho z nás – ve všech směrech, které mě jen napadají a poněvadž nevlastníme mnohé, tak se náš zrak upírá na získávání a využívání znalostí, zkušeností a lidského kapitálu.

Může být ještě něco horšího?

Nestačíme záplavu nových hardwarových a softwarových technologií vstřebávat a jen mírně držíme krok na našich přednáškách, cvičeních a seminářích, pokud dané, většinou komerční technologie, vůbec vlastníme.

Matematické, simulační a statistické programy, programovací a databázové systémy, DTP systémy, ...

Nemáme? Nenaučíme se. *Třeba existuje Open Source alternativa ...*

Nenaučíme se? Nenaučíme jiné. *Bude třeba proškolit se ve světě ...*

Nenaučíme sebe a jiné?

Tedy nevyřešíme novodobé problémy. *Inu, třeba řešení jen nevidíme ...*

Firmy se obracejí na akademickou půdu s problémy, které bychom měli být schopni vyřešit. Nikdo neví, jak a čím na některé těžké problémy, problémy nadcházející informační společnosti nebo také známé pod termínem společnosti založené na znalostech.

Problémy, které z nejrůznějších důvodů nikdo nevyřešil, vyřešil jen částečně ručně a nezautomatizoval, nebo vyřešil, ale řešení nenabídl celé společnosti, a třeba zrovna z dobrého důvodu.

V této chvíli má smysl začít číst tuto disertační práci a inspirovat se řešením těžkých problémů z reálného prostředí. Ano, právě takové problémy, které jste třeba nevyřešili vy, vaši známí, známí vašich známých, ...

Řešené a diskutované problémy z praktického života

Ve své disertační práci bych rád ukázal vybrané, mnou řešené netriviální problémy, kterým jsem čelil v dobách dřívějších a které přinesl sám život. Také tyto problémy diskutuji a rozebírám v podobném duchu, v jakém si to dokáži představit na přednáškách, seminářích a cvičeních nebo také přes Internet za pomoci e-learningového serveru.

V této chvíli mohu říci, že nepřipravuji cvičebnici, spíše se snažím z pohledu kantora na vysoké škole poukázat na koncept řešení některých typů obtížných problémů vyskytujících se u absolventů FaME. Řešení těchto problémů je ukázáno v disertační práci. Přehled řešených problémů lze nalézt v Tabulce 1.1 na straně 28.

Ve stručnosti lze mé počínání a motivy vysvětlit následujícím způsobem. Z nejrůznějších důvodů se na mě lidé obracejí s netriviálními problémy, na které sami nestačili. Pokud se mi takový problém podaří vyřešit včas a nejlépe s úplnou automatizací, tak daný zadavatel šetří čas a peníze a je spokojen. Univerzita a fakulta je na tom zase o něco lépe v očích firemního i akademického prostředí – záleží odkud byl problém vznesen.

Já si tedy dělám sbírku úloh z praktického života, které vedle toho, že řešení mohu použít na podobný problém v budoucnu, jsou výbornou studijní pomůckou pro mé studenty.

To znamená, že mám zásobu kvalitních materiálů do skript, cvičebnic a na e-learningové servery. To je jedna strana, jak lze mou práci zúročit. Studenti se nejen učí takové problémy sami řešit, ale pokud si nedokáží sami s jistou alternativou problému poradit, ví, kam se obrátit.

Druhá možnost je seznámit odbornou i neodbornou veřejnost s existencí řešení takového problému. K tomu je výborný nástroj publikovat o daném problému v článcích a na konferencích. Je to jistá forma reklamy o výsledcích naší práce.

Nyní již následují jednotlivé kategorie problémů a jejich popisy.

Úvodní problém: počty znaků v UTF-8 kódovaném dokumentu pro firmu Jaroslav Zaviačič – TEXT-Zaviačičovi

Čas od času potřebujete vědět, kolik máte znaků v jistém dokumentu. Samozřejmě můžete potřebovat počty *jednotlivých* znaků v takovémto dokumentu. Tento druh problému jsem potřeboval vyřešit v řadě situací. Hlavním důvodem bylo, a téměř vždy je, že zde neexistovala dostatečná automatizace a vše muselo být počítáno ručně nebo poloručně. Takto náročné výpočty můžete udělat ručně jednou nebo dvakrát, ale rozhodně ne stokrát.

Jednodušší varianta tohoto problému u českých dokumentů byla vyžadována Centrem distančního vzdělávání se sídlem v Olomouci[α] a výpočet byl vyžadován tak, aby bylo možné dopočítat tzv. FOG index (v literatuře také znám jako Gunning-Fog index).

Hlavní funkcí testů na zjištění obtížnosti textu[β] je dát zběžný přehled o náročnosti a čitelnosti textu. Bohužel testy na zjištění obtížnosti textu nám nemohou říci jak rychle dokáže čtenář daný text vstřebat a s jakou rychlostí partiím dokáže porozumět.

FOG index je jedním z mnoha existujících testů, které Centrum distančního vzdělávání využívá u dokumentů psaných v českém jazyce. Naprogramoval jsem jádro programu, který tento index, na základě přesně specifikovaných lexikálních a syntatických požadavků specifikovaných v matematické formuli, dokáže automaticky dopočítat[γ]. Toto jádro bylo dále rozšířeno a upraveno a program je nabízen zdarma studentům Distančního minima. Distanční minimum je nabízeno řadě českých universit. Když kurzem

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[α] <http://www.cdiv.upol.cz/>

[β] <http://juicystudio.com/services/readability.php>

[γ] <http://www.cdiv.upol.cz/www/autori_obtiznost.htm>

Tabulka 1.1: Seznam vybraných nesetříděných úkolů doktorských studií

- **Úvodní problém:** počty znaků v UTF-8 kódovaném dokumentu
  pro firmu Jaroslav Zaviačič – TEXT-Zaviačičovi ~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$27
- Výherní hra se dvěma druhy žolíků pro Semma, s. r. o.‡ ~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$30
- Problém obchodního cestujícího řešen pro TOR Cheb, s. r. o. ~~~~~~~~~~~~~~~~~ $_{cz}$31
- Odborné párové srovnání pro Český statistický úřad ~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$31
- Statistické analýzy pro Baťovu nemocnici ve Zlíně‡ ~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$31
- Kontrola kvality softwarových produktů[a] ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$32
- Statistické výpočty v reálném čase ~~~~~~ $_{cz}$32
- Využití metaprogramování na konferenci CompStat 2004 ~~~~~~~~~~~~~~~~~~~~ $_{cz}$32
- Využití neparametrické statistiky ~~~~~~ $_{cz}$33
- Automatizované vyhodnocování elektronických dotazníků ~~~~~~~~~~~~~~~~~~~ $_{cz}$33
- Analýza bitmapové grafiky:
  hledání středu kulky v terči ~~~~~~ $_{cz}$34
  problémy statistické kontroly kvality ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$34
- Statistické analýzy pro firmu Jaroslav Zaviačič – TEXT-Zaviačičovi ~~~~~~~~~~ $_{cz}$34
- Úpravy obrovských souborů se strukturovanými daty ~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$35
- Nový vývojový směr soutěže v korekturách [Vm][b] ~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$35
- Příprava zadání pro soutěže v korekturách [Vp][c] ~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$35
- Příprava dvojjazyčného slovníčku s výslovností ~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$36
- Příprava a sazba proměnného záhlaví a zápatí ~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$36
- Automatizace sazby knižní záložky ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$36
- Šablony pro diplomové práce pro UTB ve Zlíně[d] ~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$37
- Čisticí makro pro Centrální knihovnu UTB ve Zlíně[e] ~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$37
- Automatizované srovnávání studentských prací‡ ~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$37
- Výpočet autorských honorářů pro FaME UTB ve Zlíně ~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$38
  Jádro řešení tohoto problému je rozebráno v těchto tezích
  v kapitole 9.4 na stranách 139–152 jako vzorově vyřešený problém.
- Zhodnocení programů na optické rozpoznávání znaků[f] ~~~~~~~~~~~~~~~~~~~~~ $_{cz}$38
- **Závěrečný problém:** hledání maximálního společného obsahu ~~~~~~~~~~~~~~ $_{cz}$38

‡ Zadání úkolu ani řešení uvedené v mé disertační práci nesmí být poskytnuto veřejnosti.

[a] Ve spolupráci s Ing. Janem Firichem.
[b] Ve spolupráci s Martinem Střížem.
[c] Ve spolupráci s Michalem Poláškem.
[d] Ve spolupráci s Ing. Jozefem Říhou.
[e] Ve spolupráci s Michalem Poláškem.
[f] Ve spolupráci s Lukášem Řezníčkem.

Table 1.2: List of solved unsorted tasks during Ph.D. studies

- **An Introduction Problem:** Numbers of Different Characters in a UTF-8 Coded Document for Jaroslav Zaviačič – TEXT-Zaviačičovi ~~~~~~~~~~~~~~ $_{cz}$27
- Lottery Ticket Game with Two Kinds of Jokers‡ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$30
- Travelling Salesman Problem for TOR Cheb, s. r. o. (Ltd.) ~~~~~~~~~~~~~~~~~~ $_{cz}$31
- Expertise in Pairwise Comparison for the Czech Statistical Office ~~~~~~~~~~~~ $_{cz}$31
- Statistical Analysis for Bata's Hospital in Zlín‡ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$31
- Quality Assurance and Software Testing of Software Products[a] ~~~~~~~~~~~~~~~ $_{cz}$32
- Real-Time Statistical Computing~~~~~~ $_{cz}$32
- Metaprogramming in Use for the CompStat 2004 Conference ~~~~~~~~~~~~~~~~ $_{cz}$32
- Nonparametric Statistics in Use~~~~~~ $_{cz}$33
- Automation in Evaluation of Electronic Forms~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$33
- Bitmapped Graphics Analysis:
  - Centre of a Bullet on the Target ~~~~~~ $_{cz}$34
  - Statistical Quality Control Problem ~~~~~~ $_{cz}$34
- Statistical Analysis for firm Jaroslav Zaviačič – TEXT-Zaviačičovi ~~~~~~~~~~~ $_{cz}$34
- Modifications to Huge Structured Data ~~~~~~ $_{cz}$35
- New Mainstream for the *Competition in Correcting Text* Event [Vm][b] ~~~~~~~~ $_{cz}$35
- Preparing Tasks for the *Competition in Correcting Text* Event [Vp][c] ~~~~~~~~~~ $_{cz}$35
- Preparing a Bilingual Dictionary with Pronunciation~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$36
- Preparing and Typesetting Variable Headings and Footings ~~~~~~~~~~~~~~~~~~ $_{cz}$36
- Automation in Typesetting Contents Strip~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$36
- Templates for Theses for the TBU in Zlín[d] ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$37
- Document Clearing Macro for the TBU in Zlín Central Library[e] ~~~~~~~~~~~~~~ $_{cz}$37
- Automation in Comparing Students' Works‡ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$37
- Author's Fees Problem Solved for the FaME of the TBU in Zlín~~~~~~~~~~~~~~~ $_{cz}$38
  The core of solution of this problem is shown in Section 9.4 on pages 139–152 in this doctoral thesis summary as a sample problem.
- Evaluating the OCR Software Products[f]~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ $_{cz}$38
- **An Enclosing Problem:** Seeking For a Maximum Measure ~~~~~~~~~~~~~~~~~~ $_{cz}$38

‡ Neither the problem nor the solution may be seen by a third party.

[a] In cooperation with Jan Firich, M.Sc.

[b] In cooperation with Martin Stříž.

[c] In cooperation with Michal Plášek.

[d] In cooperation with Jozef Říha, M.Sc.

[e] In cooperation with Michal Plášek.

[f] In cooperation with Lukáš Řezníček.

projdete a získáte *Certifikát o úspěšném složení kurzu,* můžete připravovat studijní pomůcky kombinovaným studentům, studentům celoživotního vzdělávání a také můžete připravovat e-learningové kurzy.

Druhá varianta byla už těžší. Pan Zaviačič měl stovky dokumentů z několika zemí a potřeboval vědět, kolik různých znaků se tam vyskytuje. Potřeboval znát tyto počty k dopočítání četností znaků, které nejsou samozřejmě rovnoměrné v psané komunikaci v jednotlivých zemích. Na základě této informace mohl efektivně připravit cvičení pro studenty učící se a trénující psaní všemi deseti.

Vezměme si turecké nebo ruské dokumenty v elektronické podobě – pak použití znaků z ASCII tabulky nám rozhodně nebude stačit. Musíme proto použít dokument v UTF-8 kódování a analyzovat takový dokument již vyžaduje jisté programátorské úsilí a práci s textovými řetězci a `FOR` nebo `WHILE` cykly.

Výherní hra, Šťastná písmenka, s dvěma druhy žolíků pro Semma, s. r. o.

Skutečný svět potřebuje skutečnou matematiku a statistiku. Tento problém je typickou situací cílení na zákazníkovu loajálnost a snaha o zvýšení frekvence nákupů.

Tento problém byl jedním z nejtěžších, který jsem v poslední době řešil. Celá hra je marketingovým nástrojem, který má motivovat nově příchozí zákazníky a velké zákazníky k častějšímu používání služeb a zaměřuje se na zvýšení frekvence nákupů služeb firmy TNT Holding N. V. – TNT Express Česká republika.

Zákazník, hráč této hry, skládá dohromady jednotlivé kartičky, na každé je vždy jedno písmenko abecedy. Po nasbírání dostatečného počtu kartiček má zákazník šanci složit některé z výherních slov nebo frází a v té chvíli získává jednu z výher.

Úkolem bylo spočítat, kolik se má na hru vytisknout písmenek, speciálních kartiček, černobílých a oranžových žolíků (zlatá barva byla zmíněna v úvodu spolupráce nad touto hrou, ale zlatá není barvou hlavního zadavatele), a to

tak, aby to na jedné straně stálo co nejméně, a abychom si byli jisti, že se přesný počet výher bude pravidelně odebírat během kalendářního roku.

Problém obchodního cestujícího řešen pro TOR Cheb, s. r. o.

TOR Cheb, s. r. o.,[δ] zaměstnává řadu obchodních prodejců po celé České republice. Každý z těchto prodejců je zodpovědný za své zákazníky v určité geografické oblasti naší země. Management firmy potřeboval nástroj k optimalizování jejich obchodních cest. To samozřejmě znamenalo minimalizovat náklady a cestovní výlohy.

Odborné párové srovnání pro Český statistický úřad

Český statistický úřad, regionální správa ve Zlíně, mě požádala o odborný posudek při párovém srovnávání a stanovení vah u demografických ukazatelů.

Párové srovnávání ukazatelů je široce používaná metoda a spadá pod kategorii rozdělitelných problémů. Umožňuje stanovit pořadí ukazatelů v jisté jejich skupině vzájemným srovnáváním. Je to jedna z úvodních metod při přiřazování vah kritériím použitelných u různých výzkumů.

Statistické analýzy pro Baťovu nemocnici ve Zlíně

Na chvíli si představme, že máme dvě experimentální skupiny: zdravé a nemocné. Zároveň jsme schopni měřit jisté lékařské charakteristiky. Chceme srovnat obě skupiny a říci, které faktory dobře vystihují nemoc pacientů.

Také nás zajímá, zda-li osoba nezařazená do zkoumaných dvou skupin, je objektivně zdravá, nebo nemocná.

[δ] <http://www.tor.cz/>

Kontrola kvality softwarových produktů

Tato kapitola popisuje zajišťování kvality softwarových produktů a očekávání kvality na straně zákazníka a výrobce softwaru. Relativně stručně popisuje moderní nástroje na testování softwaru.

Kapitola vysvětluje běžné postupy a praktiky během zajišťování kvality a testování sofwaru u komplexních softwarových produktů. Autoři, v tomto případě já a pan Ing. Firich, rozepisujeme možnost automatizace testování. Dalším úkolem této řešené oblasti je poskytnout rozšířený seznam dostupných knih a internetových zdrojů o této problematice.

Statistické výpočty v reálném čase

Systémy varování a včasného hlášení v reálném čase jsou nezbytným nástrojem v metodách na získávání zkušeností z dat (data mining). Jedna z nejlevnějších alternativ je ukázána u statistické analýzy dat. Tento problém co nejobecněji řeším za pomoci programovacích nástrojů `HTML` a `PHP`.

Využití metaprogramování na konferenci CompStat 2004

Byl jsem dobrovolníkem na konferenci CompStat 2004[ε] (Computational Statistics; výpočetní statistika), šestnácté mezinárodní sympózium IASC[ζ] (International Association for Statistical Computing; mezinárodní společnost zaměřená na výpočetní statistiku), které se konalo v Praze ve dnech 23. – 27. srpna 2004.

Vypomáhal jsem se zpracováním dat. Poněvadž jsem nebyl schopen si vyvinout svůj vlastní skriptovací jazyk, ani na takové zpracování nestačil jeden programovací jazyk, musel jsem využít principů metaprogramování, abych úkoly stihl včas.

[ε] <http://compstat2004.cuni.cz/>

[ζ] <http://isi.cbs.nl/iasc.htm>

Využití neparametrické statistiky

Neparametrická statistika je odolná vůči odlehlým pozorováním a je vylepšením současných parametrických metod. V obecné rovině můžeme říci, že existuje alespoň jedna neparametrická metoda pro každý parametrický test.

V disertační práci poukazuji na analýzu marketingového výzkumu/dotazníkového průzkumu, kde jsem byl Ústavem ekonomie přizván jako statistik.

Vedle jiných softwarových produktů používám poměrně hodně i program StatXact[η] a získal jsem povolení publikovat užitečný vnitřní materiál: *Mapa statistických metod v programu StatXact 7* (A Road Map to the Exact Procedures in StatXact 7).

Před dvěma lety, v roce 2004, kdy probíhala změna struktury webových stránek, se přestal tento soubor publikovat na Internetu. Svůj nesouhlas spolu s argumenty, proč tento soubor i nadále publikovat pro širokou statistickou veřejnost jsem sepsal v e-mailové zprávě firmě Cytel[θ]. Nejen, že tento soubor opět zveřejňují, ale také jsem získal souhlas tento soubor sám publikovat. Tomu říkám pocta.

Automatizované vyhodnocování elektronických dotazníků

Elektronický dotazník/formulář je jedna z výborných cest, jak získat data přes Internet. Z technického hlediska se skládá z následujících čtyř kroků:

- Za prvé. Připravit si elektronický formulář (také se mu někdy říká internetové rozhraní) za pomocí příkazu `<FORM>` a `</FORM>` jazyka `HTML`.
- Za druhé. Odeslat hodnoty proměnných do databázového systému a uložit je zde.
- Za třetí. Použít databázový příkaz `SELECT` a získat z databáze chtěné údaje.

[η] <http://www.cytel.com/Products/StatXact/>

[θ] <http://www.cytel.com/>

- Na závěr. Udělat si některé výpočty a statistické analýzy za pomoci jazyků PHP a ℝ.

Analýza bitmapové grafiky: hledání středu kulky v terči

Potřebujeme dělat efektivně analýzy hlavně ve chvíli, kdy trénujeme střelbu nebo zaměřujeme prakticky jakoukoliv střelnou zbraň.

Pro své soukromé účely jsem si vyvinul numericky efektivní a zajímavé řešení zjištění středu kulek po zásahu v terči využitím hledání symetrie objektů. Bohužel však toto řešení není nejpřesnější a robustní. V disertační práci chci ukázat, proč tomu tak je.

Analýza bitmapové grafiky: problémy statistické kontroly kvality

Grafická statistická analýza není úplně ojedinělý problém současného světa, se kterým se můžeme setkat. Můžeme si představit například automatickou analýzu výšky vodních hladin v povodňových monitorovacích stanicích.

Princip řešení těchto problémů ukazuji na jedné situaci ze statistické kontroly kvality (Statistical Process Control [SPC]).

Statistické analýzy pro firmu Jaroslav Zaviačič – TEXT-Zaviačičovi

Jak zjistit a nastavit obtížnost jednotlivých lekcí studentům trénujících psaní všemi deseti není zrovna náš každodenní problém.

Jsme schopni tento problém vyřešit za pomoci analýzy předchozích studentských výsledků, které jsou sbírány po celý kalendářní rok. Pokud máme těchto dat dostatek, můžeme udělat potřebné analýzy a říci zodpovědné osobě nezbytná doporučení. Jsme schopni doporučit změny u některých lekcí nebo navrhnout změnu pořadí lekcí.

Úpravy obrovských souborů se strukturovanými daty pro firmu Jaroslav Zaviačič – TEXT-Zaviačičovi

Pan Zaviačič měl obrovské soubory s daty a potřeboval v nich udělat velice přesné zásahy. Řada lidí byla překvapena a zjistila, že tyto změny nejsou schopni provést v Microsoft Excelu a tudíž nevěděli, jak panu Zaviačičovi pomoci, navíc ve velice svízelném termínu. Termín však nebylo možné posunout, protože změny musely být hotovy včas pro české soutěžící připravující se na významnou soutěž.

Použil jsem svých znalostí skriptovacího jazyka PHP, který není tak drasticky omezen jako Microsoft Excel. Úspěšně jsem provedl všechny změny, navíc v termínu. Všichni byli spokojení, včetně mě samotného. Od té doby mám v ruce poměrně běžný problém od velké firmy, který řada lidí není schopná vyřešit, pan Zaviačič měl své úpravy včas hotové a soutěžící se mohli v dostatečném časovém předstihu připravovat na významnou soutěž.

Nový vývojový směr soutěže v korekturách [Vm]

Já a můj bratr Martin Stříž jsme vyvinuli v roce 2005 makro naprogramované ve Visual Basicu (Visual Basic for Applications [VBA]) pro Microsoft Word. Toto makro je dovolenou soutěžní alternativou a drží krok s předchozími možnostmi oprav korektur v korekturních disciplínách.

Po roce a půl od začátku projektu můžeme říci, že toto makro se stalo jedním ze dvou vývojových proudů v těchto soutěžních disciplínách, dokonce i na nejvyšší světové úrovni.

Příprava zadání pro soutěže v korekturách [Vp]

Já a pan Michal Polášek vyvíjíme rychlejší způsob přípravy soutěžních předloh do korekturních disciplín.

V této chvíli víme, jak to technicky zrealizovat, ale nejsme v pracech dostatečně daleko, abychom výsledky mohli prezentovat zadavateli nebo publikovat veřejnosti.

Příprava dvojjazyčného slovníčku s výslovností

Tuto úlohu jsem řešil poprvé v době, kdy jsem pomáhal s přípravou skript *Informatika pro ekonomy* [**RSBJ04**] pro studenty předmětu *Informatika pro ekonomy.* My, autoři zmíněných skript, jsme potřebovali připravit anglicko → český slovníček. Samozřejmě slovníček bez výslovnosti není žádným slovníčkem, z mého pohledu.

Toho času poprvé jsem se rozhodl přidat výslovnost za každou cenu ke všem odborným termínům a výrazům. V disertační práci popisuji, jak jsem tento problém vyřešil. Použil jsem písmo/font vytvořený speciálně pro TEX/ LATEX mezinárodní organizací zabývající se výslovností (International Phonetic Association, [IPA] nebo [TIPA])[ϑ].

Příprava a sazba proměnného záhlaví a zápatí

Tato kapitola popisuje sazbu záhlaví a zápatí v dokumentech. Popisuje základní možnosti a způsoby, jak tuto sazbu provést. Používá k tomu standardní balík `fancyhdr` téměř na všech příkladech. Dále ukazuje způsoby, jak vysázet proměnné objekty, které jsou obvykle závislé na číslování stran dokumentu. V případě, kdy jsou navíc objekty logicky závislé i mezi sebou, článek navrhuje řešení generováním části nebo celého TEXového dokumentu pomocí `PHP` a `MySQL`.

Automatizace sazby knižní záložky

Tato kapitola se zabývá vysázením záložky v TEXovém dokumentu. Použil jsem k tomu možnosti automaticky vygenerovat část dokumentu při prvních bězích TEXu, který se v posledním běhu načte přes hlavní dokument.

Přemýšlel jsem o vložení ukázky přímo do disertační práce, ale nedávno jsem si to rozmyslel. Tohle pravděpodobně nepatří do disertačních prací, ale v každém případě to patří do rozsáhlejších skript a knih.

[ϑ] <http://www2.arts.gla.ac.uk/IPA/>

Šablony pro diplomové práce pro UTB ve Zlíně

Tato kapitola popisuje výstupy příprav šablon pro diplomové práce pro Univerzitu Tomáše Bati ve Zlíně v České republice a jak byly upravovány na základě studentských požadavků, které jsme získali během jednoho akademického roku. Univerzita vyžaduje výstup diplomové práce takový, aby byl dokument vhodně přeformátován bez chybějících pasáží pro dostatečné prezentování diplomantovy znalosti a zkušenosti.

To má nyní obzvláštní význam u jednoty a vzhledu diplomových prací, protože univerzita vyžaduje diplomové práce odevzdané v elektronické podobě. Kapitola uvádí přehled aktivit, které se staly za dobu, kdy jsme na těchto šablonách pracovali, a co by mělo v budoucnu snad ještě následovat.

Čisticí makro pro Centrální knihovnu UTB ve Zlíně

Jak automaticky pročistit elektronický rukopis od typografických chyb, gramatických chyb a překlepů je dosti problematická záležitost.

Já a pan Michal Polášek se snažíme alespoň o základní automatické pročištění a o správné umístění tvrdých mezer jak v anglickém, tak českém dokumentu. I tohle je pořádný kus práce, protože se snažíme o přípravu pro tři nejpoužívanější DTP systémy, a to: Microsoft Word, OpenOffice.org Writer a TEX.

Automatizované srovnávání studentských prací

Co je a co není kopie něčí práce je poměrně moderním problémem u elektronických dokumentů, seminárních a zápočtových prací a úkolů, které jsou odesílány kantorům.

I zde nutně potřebujeme automatizaci, protože bez ní nejsme ručně schopni efektivně a kvalitně srovnávat stovky, ba tisíce přijatých elektronických dokumentů každý rok. To nikdo nemá šanci zvládnout. Pokud se nad tím zamyslíme ještě o chvíli déle, tak můžeme říci, že je to v podstatě nemožné, aby jeden člověk pracující na tom ručně získal správné výsledky. Rozhodně potřebujeme efektivnější způsob a tím ušetřit lidem čas a peníze.

Tento druh problému řeší celá řada učitelů a kantorů na všech typech škol. V této kapitole představím své nápady a technické řešení, pokud jsou mezi sebou srovnávány dokumenty Microsoft Excelu.

Výpočet autorských honorářů pro FaME UTB ve Zlíně

Tento problém, některé řešení alternativ, přesné řešení, numerický výsledek ukázky a diskuze jsou podrobně rozebrány v těchto doktorských tezích, blíže v kapitole 9.4 na stranách 139–152.

Zhodnocení programů na optické rozpoznávání znaků

Ústřední knihovna Univerzity Tomáše Bati ve Zlíně potřebuje srovnání dosavadních OCR systémů, protože se očekává, že dojde k nákupu jednoho z nich. Potřebují vědět, které jsou v čem dobré, co vše umějí a podobně.

Já a pan Lukáš Řezníček srovnáváme dostupné OCR systémy z různých úhlů pohledu a na konci kapitoly navrhujeme doporučení a závěry vhodné pro Ústřední knihovnu UTB ve Zlíně.

Závěrečný problém: hledání maximálního společného obsahu objektů

Můj poslední, částečně řešený problém je hledání maximálního společného obsahu objektů.

Without the improvement and use of automation
we would be back in the distant past.

Bez rozvoje a využívání automatizace bychom byli zpátky na stromech.

Author discussing `authorindex` package.
8:35 p.m. 27th May 2005.

2 Introduction: Terms Definition

The basic concept of knowledge storing, extraction and data-flow as seen by the author is represented in Figure 2.1. All stages cost precious time. The aim is to solve as many problems as possible in the most effective way, whenever possible. Here comes a process automation.

Data → Information → Metadata → Knowledge (explicit and tacit) → Understanding ↗ Enlightening

Figure 2.1: Data flow and processing

2.1 Time Management

Time is a resource, a precious and valuable one. Time is and must be managed like other resources. We have to save time whenever possible.

A traditional way of time management can be defined this way:[α]

Definition 1 ... *Time management* is not about doing many things in less time but doing the right things at the right time in the right way.

[α] ⟨http://www.effective-time-management.com/time-management-basics.htm⟩

This is a classical approach and we can read more about it in an e-book *How to Live on 24 Hours a Day*[β] written by Arnold Bennett or in articles[γ] published on his server. A modern way of time management can be found at MindTools web-pages[δ] .

Important keywords are economic efficiency and labour productivity.

Definition 2 ... *Economic efficiency* is a general term for the value assigned to a situation by some measure designed to capture the amount of waste or "friction" or other undesirable economic features present.

Definition 3 ... *Labour productivity* is generally speaking held to be the same as the "average product of labour" (average output per worker or per worker-hour, an output which can be measured in physical terms or in price terms).

Increased productivity can also influence society more broadly, by improving living standards, and creating greated income. They are central to the process generating economic growth and capital accumulation.

Many of us have probably read about time management of the forth generation. We can agree on the quotation "We have wasted years. Why hurry for the seconds?" However, we cannot agree on all aspects of time management.

The most effective way is to improve algorithms and methods used on average personal computers to solve regular problems. The more people use these new methods the better. We can save digit places of spent time over difficult tasks.

Not all solutions to such tasks can save an amount of time or money, however, solutions do exist — we only need to find them, that's the hard part.

β ⟨http://www.effective-time-management.com/⟩

γ ⟨http://www.effective-time-management.com/time-management-articles.htm⟩

δ ⟨http://www.mindtools.com/pages/main/newMN_HTE.htm⟩

2.2 Self-management

The definition of self-management is close to the definition of automation. Let's refer to the definition by Wikipedia:[ε]

Definition 4 ... In business, education, and psychology, *self-management* refers to methods, skills, and strategies by which individuals can effectively direct their own activities toward the achievement of objectives, and includes goal setting, planning, scheduling, task tracking, self-evaluation, self-intervention and self-development etc.

Definition 5 ... In the field of computer science, *self-management* refers to the process by which computer systems shall manage their own operation without human intervention. Self-Management technologies are expected to pervade the next generation of network management systems.

There exists a very unique self-organizing management system e.g. one called SORMA (Self-Organizing ICT Resource Management),[ζ] but it has use specifically in medical applications at the present time.

For us, combining improved computer use with self-management principles leads to the expected results: dramatic time and money savings in the World.

Previous discussions and definitions of current terms lead us to major keywords, Data Mining, Data Management, and finally Meta-Data Management and others.

[ε] ⟨http://en.wikipedia.org/wiki/Self-management⟩

[ζ] ⟨http://autonomic.ac.upc.edu/blog/?q=node/19⟩

2.3 Data Management

Data management term can be defined as:[η]

> **Definition 6 ...** *Data Management* is a discipline which embraces the verification, coordination, validation, integration, and control of data requirements; planning for the timely and economical acquisition of data; and management of data assets after receipt. This discipline also includes monitoring the distribution of data required under contract and storage, retrieval, and the disposal of this data.

Data management comprises of all the disciplines related to managing data as a valuable resource.

2.4 Competitive Intelligence

One the most frequent terms in the forthcoming knowledge-based society is competitive intelligence. The definition by e-biz-enable[θ] is:

> **Definition 7 ...** *Competitive intelligence* is the process of discovering, analysing and using intelligence publicly available plus non-proprietary information sources for the purpose of becoming more competitive.

This topic is discussed in-depth in a dissertation (2006) by my colleague Ms. Miroslava Brázdilová.

2.5 Data Mining

A modern tool for huge database problems. A definition by Kurt Thearling:[ϑ]

[η] ⟨http://www.ntsc.navy.mil/Resources/Library/Acqguide/cdrldef.htm⟩

[θ] ⟨http://strategis.ic.gc.ca/epic/internet/inee-ef.nsf/vwapj/ci_e_good-one.pdf/$FILE/ci_e_good-one.pdf⟩

[ϑ] ⟨http://www.thearling.com/⟩

Definition 8 ... *Data Mining* is the automated extraction of hidden predictive information from databases.

Data mining software allows users to analyze large databases to solve business decision problems. Data mining is, in some ways, an extension of statistics, with a few artificial intelligence and machine learning twists thrown in. Like statistics, data mining is not a business solution, it is just a technology.

For more about data mining techniques and tools, please, check KDnuggets web pages[ι] and TheDataMine server[κ] .

This topic is discussed in-depth in a dissertation (2006) by my colleague Mr. Petr Klímek.

2.6 Meta-Data Management

Meta-data management is a kind of hope for future statistical and non-statistical analysis. We may find useful this definition by Wikipedia:[λ]

Definition 9 ... *Meta-Data Management* involves storing information about other information. With different types of media being used references to the location of the data can allow the management of diverse repositories.

URL's, images, video etc. may be referenced from a triple table of object, attribute and value. This can be generated by PHP or Java from a MySQL table using an HTML template.

2.7 Knowledge Management

There are a different definitions of Knowledge Management. The general one is:[μ]

[ι] ⟨http://www.kdnuggets.com/⟩

[κ] ⟨http://www.the-data-mine.com/⟩

[λ] ⟨http://en.wikipedia.org/wiki/Meta-data_management⟩

[μ] ⟨http://en.wikipedia.org/wiki/Knowledge_management⟩

Definition 10 ... *Knowledge management* refers to a range of practices and techniques used by organizations to identify, represent and distribute knowledge, know-how, expertise, intellectual capital and other forms of knowledge for leverage, reuse and transfer of knowledge and learning across the organisation.

A key distinction made by the majority of knowledge management practitioners is Nonaka Ikujiro's reformulation of Polanyi's distinction between tacit and explicit knowledge.

Definition 11 ... *Explicit knowledge* is knowledge that has been or can be articulated, codified, and stored in certain media. The most common forms of explicit knowledge are manuals, documents, procedures, and stories. Knowledge also can be audio-visual.

Definition 12 ... *Tacit knowledge* consists often of habits and culture that we do not recognize in ourselves.

A more descriptive view of knowledge in a knowledge society is given by F. W. Nickols in **[[Nic00]]** or *see* an article on the Internet.[v] The important integration can be seen in Figure 2.2.

[v] ⟨http://home.att.net/~nickols/Knowledge_in_KM.htm⟩

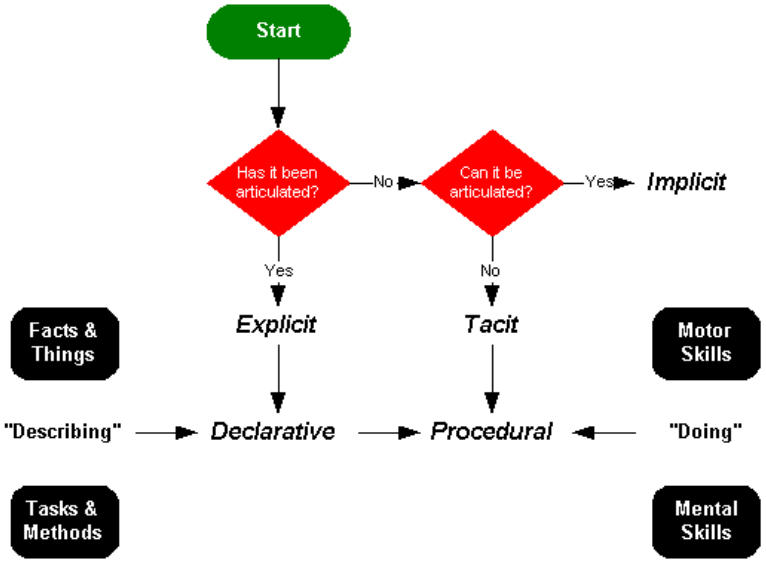


Figure 2.2: A framework for thinking about the knowledge in knowledge management

The tacit knowledge topic is discussed in-depth in a prepared dissertation (est. year of defence is 2007) by my colleague Ms. Jana Matošková.

2.8 Knowledge-Based Society (Information Society)

Society in the 21st century calls for the active development of new knowledge centered on science and technology and the application of such knowledge to society.

Based on the *World Science Forum – Budapest,* held in November 2005 in Budapest,[ξ] we can define the term knowledge-based society (information society).

Definition 13 ... *A knowledge-based society (information society)* is an innovative and life-long learning society, which possesses a community of scholars, researchers, engineers, technicians, research networks, and firms engaged in research and in the production of high-technology goods and service provision.

[ξ] ⟨http://www.sciforum.hu/⟩

A knowledge-based society forms a national innovation-production system, which is integrated into international networks of knowledge production, diffusion, utilization, and protection. Its communication and information technological tools make vast amounts of human knowledge easily accessible.

Knowledge is used to empower and enrich people culturally and materially, and to build a sustainable society.

This topic is partially discussed in dissertations (2006) by my colleagues Mr. Radek BENDA and Mr. Pavel ROSMAN. See also ⟦**TOV05**⟧ if you are interested in this topic.

2.9 New Economy

We present a term defined by the Czech Statistical Office:[o]

Definition 14 ... *New Economy* is a new developing structure of economy that is based on information, knowledge and innovations, which are created with the help of new information and communication technologies within the global economy.

The nets (telecommunication, data) form the main infrastructure for a New Economy and people; with their knowledge and skills, information and innovation are the main capital for the success of these phenomenon.

The New Economy or the Information Society creates new and exciting challenges for the statistical community. There is a considerable policy interest in the measurement of the information society/new economy indicators. In the future we expect this will increase. Information in this area plays a crucial role in understanding where we are and where we are going as a society.

[o] ⟨http://www.czso.cz/csu/redakce.nsf/i/is_statisticky_ramec_statistical_framework_csu_2003_pdf⟩

3 Theoretical Framework: Statement of the Problem and Background

3.1 History Notes

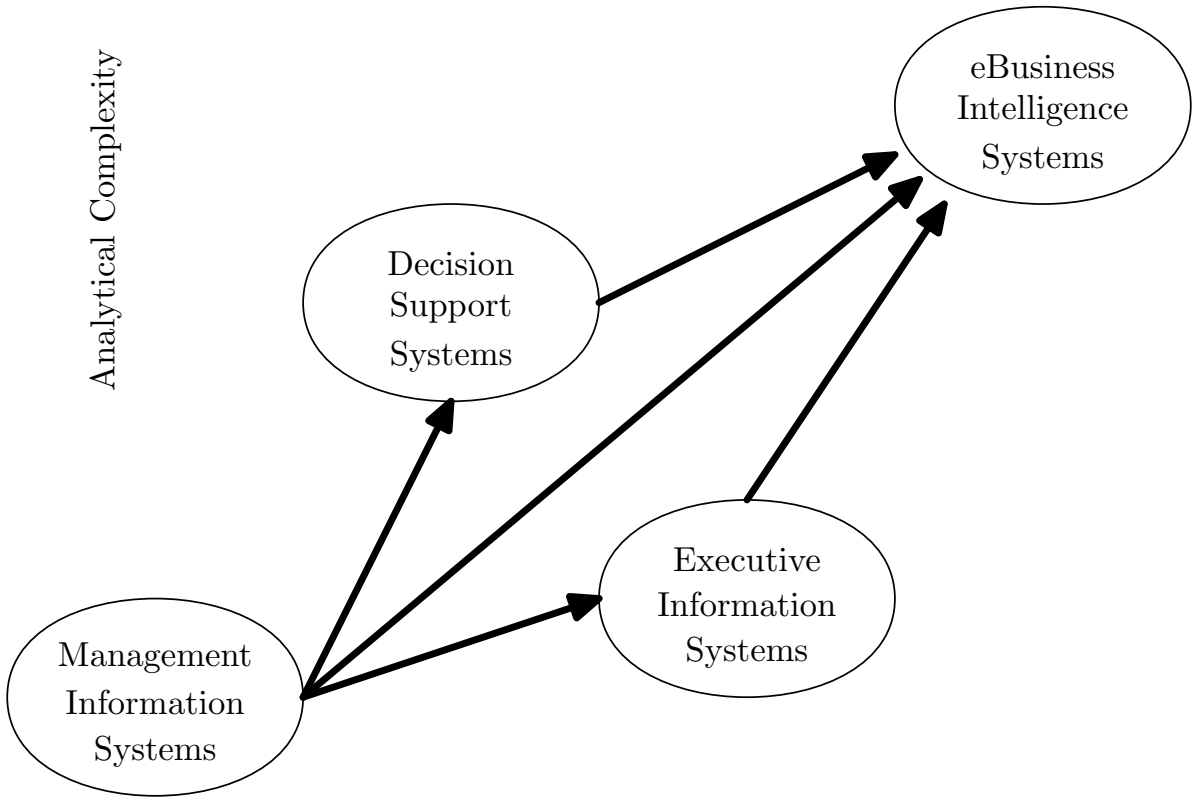


Figure 3.1: Development of management support systems
⟦**Lan05**, Kamel & Zyada, page 115⟧

The developments and the historical path are demonstrated in Figure 3.1. It is important to note that while business intelligence is increasingly deployed in business organisations and decision support systems these are becoming more available in government organisations and public administration also.

It is important to note that data warehousing increases the decision-maker capabilities in a passive way due to its dependences on historical data; however, business intelligence helps in projecting the future to be able to set the appropriate tactical and strategic plans in a more active way and hence realising organisational objectives.

3.2 Information Technology Mobilities

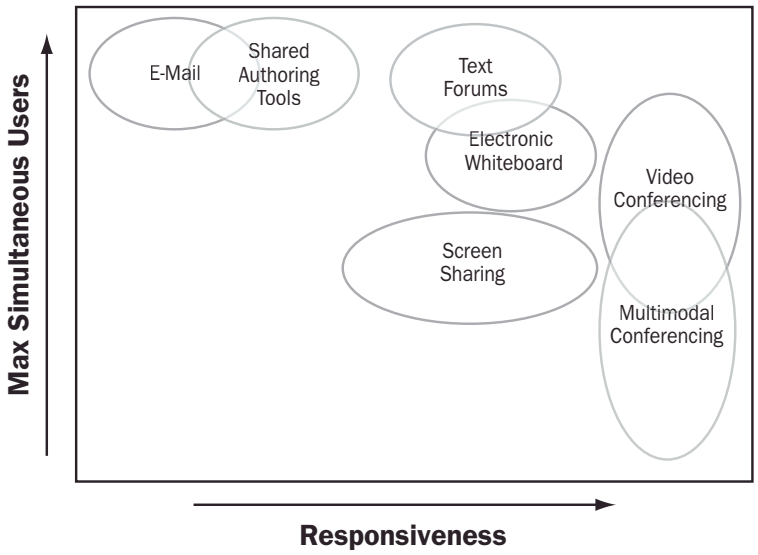


Figure 3.2: Groupware differing in responsiveness and the maximum number of simultaneous users that can be accommodated [[**Ber03**, page 121]]

Knowledge Management draws on technologies and approaches developed in virtually every field of computer science.

Knowledge use and transfer benefit from interface tools, intranets and internets, groupware, decision support tools, and collaborative systems.

Groupware typically is defined as any software that enables group collaboration over a network. Examples of groupware include shared authoring tools, electronic whiteboards, videoconferencing tools, online forums, e-mail, online screen sharing, and multimodal conferencing. Each of these technologies holds the potential to increase collaboration at a distance, reducing the cost of travel and the time knowledge workers waste in transit.

As illustrated in Figure 3.2, groupware differs in responsiveness and the maximum number of simultaneous users that can be accommodated.

For example, an e-mail system can handle a virtually unlimited number of users, as long as they don't try to send e-mail at once. Also, users typically read and respond to e-mail at different times. In contrast, videoconferencing, which is real-time communication, supports a limited number of users because of limitations in the bandwidth of the network and the processing capacity of each user's PC.

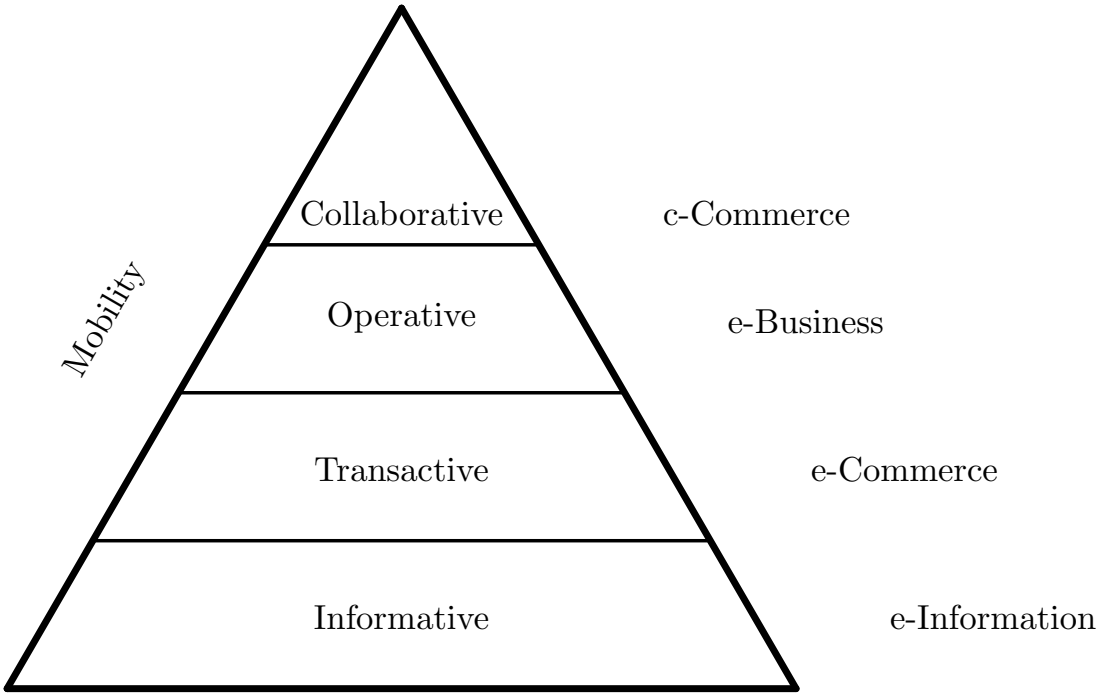


Figure 3.3: Increasing levels of utilization of the Web by businesses leading up to collaborative usage (based on Unhelkar [**Unh03**] or see [**Lan05**, Unhelkar, page 171])

While the term e-commerce has been used in a sweeping way to encompass all aspects of electronic business, there are subtle as well as significant differences between the implied meanings behind the usage of various terminologies.

Figure 3.2 shows the ways in which business use the net and the evolving levels of this usage.

Standalone computing, even today, does not require interaction amongst individuals. It is self-sufficient and primarily focuses on the automation of

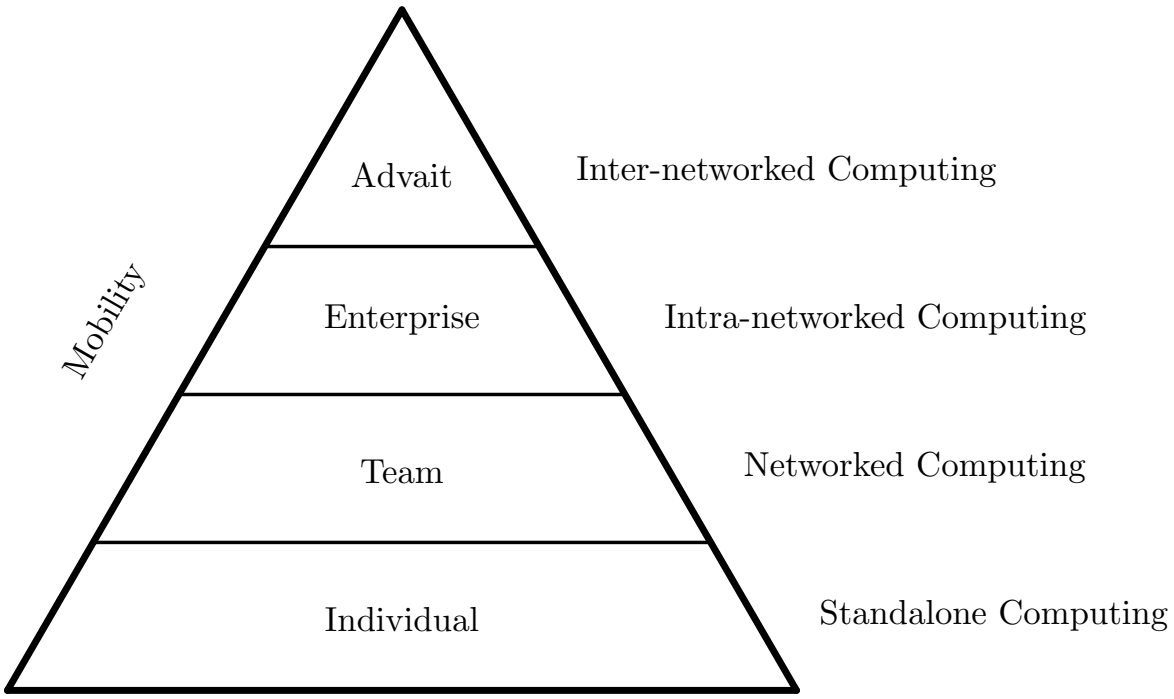


Figure 3.4: Increasing impact of computing on individuals, teams, organizations and clusters (Large industrial clusters also known as Advait) [[**Lan05**, Bhuvan Unhelkar, page 106]]

tasks. However as computing machines are networked, enabling interaction amongst team members, social issues related to computing start emerging.

A team is an organised entity that is managed by rules; hence networked computing maintains a "controlled" sociological perspective.

However once an entire enterprise is networked, and especially in the global context, the challenge in terms of sociological aspects of computing escalates, bringing the traits of teams and individuals within the teams to the fore.

Finally, when an entire industry is networked, perhaps through technologies such as Web services, leaving a single business thread running through the entire industry (also known as Advait Enterprise) the socio-cultural impact is immense. Numerous physical and technical alliances are likely to take place when a group of organisations reach the "Advait" level of inter-networked computing, *see* Figure 3.4.

When such a stage of inter-networked computing is reached, the dependence of businesses on each other through the formation of alliances across geo-

graphical and cultural borders is massive. It is crucial that such alliances start off by ensuring that they do not imply an imposition of one organisational culture over another.

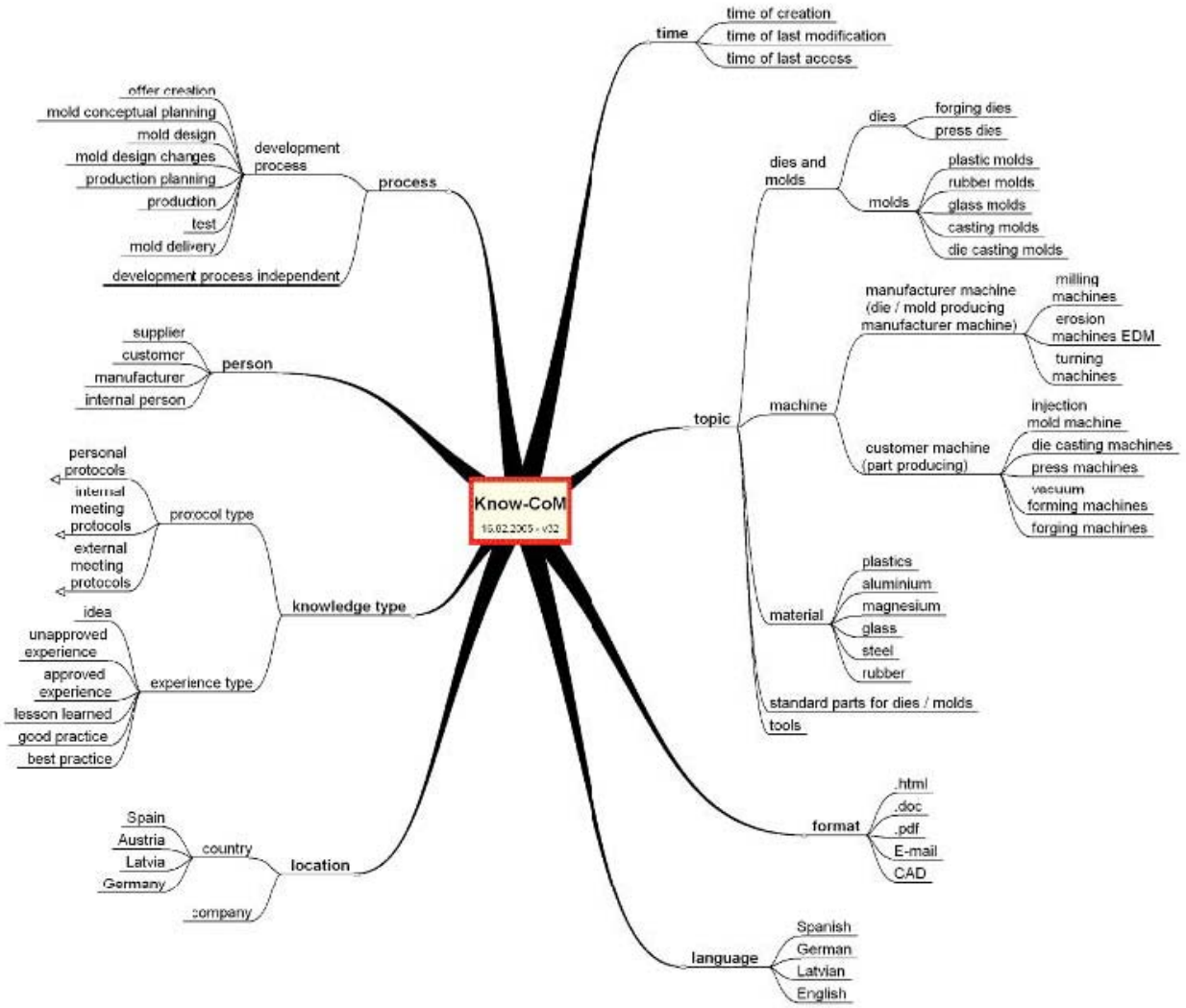


Figure 3.5: Joint knowledge structure [[**Jen05**, Florian Bayer, Rafael Enparantza, Ronald Maier, Franz Obermair, Bernhard Schmiedinger, page 194]]

A knowledge structure contains knowledge elements and the relations between them as well as metadata give further information about their content, and associations. To facilitate knowledge sharing, a joint knowledge structure has to be established in order to create a joint understanding between co-operating partners.

Figure 3.5 on page 51 depicts the dimensions described above as a MindMap, which represents a minimal joint knowledge structure for the enterprises participating in Know-CoM. According to these dimensions, nearly every document can be classified (semi)automatically. With the following example, the classification of a document corresponding to the eight dimensions will be illustrated:

If a tester ***xy*** (1) from the Spanish (2) company z (3) gains experiences (4) during the mold-testing phase (5) related to the plastic press mold (6) functionality on August 10 (7) and documents these experiences in the format .doc (8), then the following characteristics of the dimensions result from this documentation:

(1) person: → internal person → tester → tester ***xy***
(2) language: → Spanish
(3) location: → company z in Spain
(4) knowledge type: → experience type → unapproved experience
(5) process: → development process → test
(6) topic: → dies and molds → mold → plastic mold → plastic press mold
(7) time: → time of creation → August 10, 2007
(8) format: → .doc

The metadata are collected automatically according to the actual working context of the employee or semiautomatic application, for example, wizards, to guide users through a subset of metadata that cannot be derived automatically. Based on the knowledge structure, specifications of the dimensions are suggested and the user only has to approve or reject these suggestions. This multidimensional structure builds the basis for joint understanding, which is necessary for co-operation with knowledge spaces.

3.3 Information Systems Development

There are various forms of information systems; these include: transaction processing systems, management information systems, executive information systems, global information systems, decision support systems, and knowledgebased systems. Within these information systems lies the data that is needed for decision making. Table 3.1 on page 53 is a summary of

Table 3.1: Comparison of information and decision support systems [[**Lan05**, Chhai & Lan, page 134]]

Name	**Characteristics**
Transaction Processing System (TPS)	* Collects and stores data about transactions. * Data editing, data correction, and data manipulation. * Elementary day-to-day activities of an organisation. * Provides summarised data for decision-making.
Management Information Systems (MIS)	* Provides information to organisation's managers. * Provides standardised or predefined reports. * Generates information on performance, co-ordination, background information of organisation. * Extracts and summarise data from TPS.
Executive Information Systems (EIS)	* Computerised information system. * Provides easy access to information from different sources. * Provides organisational performance data, internal communication, and environment scanning. * Designed for individual use. * Displays data in an interactive way.
Global Information Systems (GIS)	* Data communication network that crosses national boundaries. * Accesses data and process data across these boundaries. * Able to link up with foreign subsidiaries' information systems.
Decision Support Systems (DSS)	* Interactive, computer-based information system. * Offers information and data and analysis models to assist in decision making. * Used for the support of structured and ill-structured decisions. * Produces reports. * Conducts decision analysis and obtains responses to queries.
Knowledge Based Systems (KBS) or Expert Systems (ES)	* Automates decision making in an area where experts are better suited to provide answers. * Constructs conclusions or answers based on the information it receives. * Uses rules to determine conclusions.

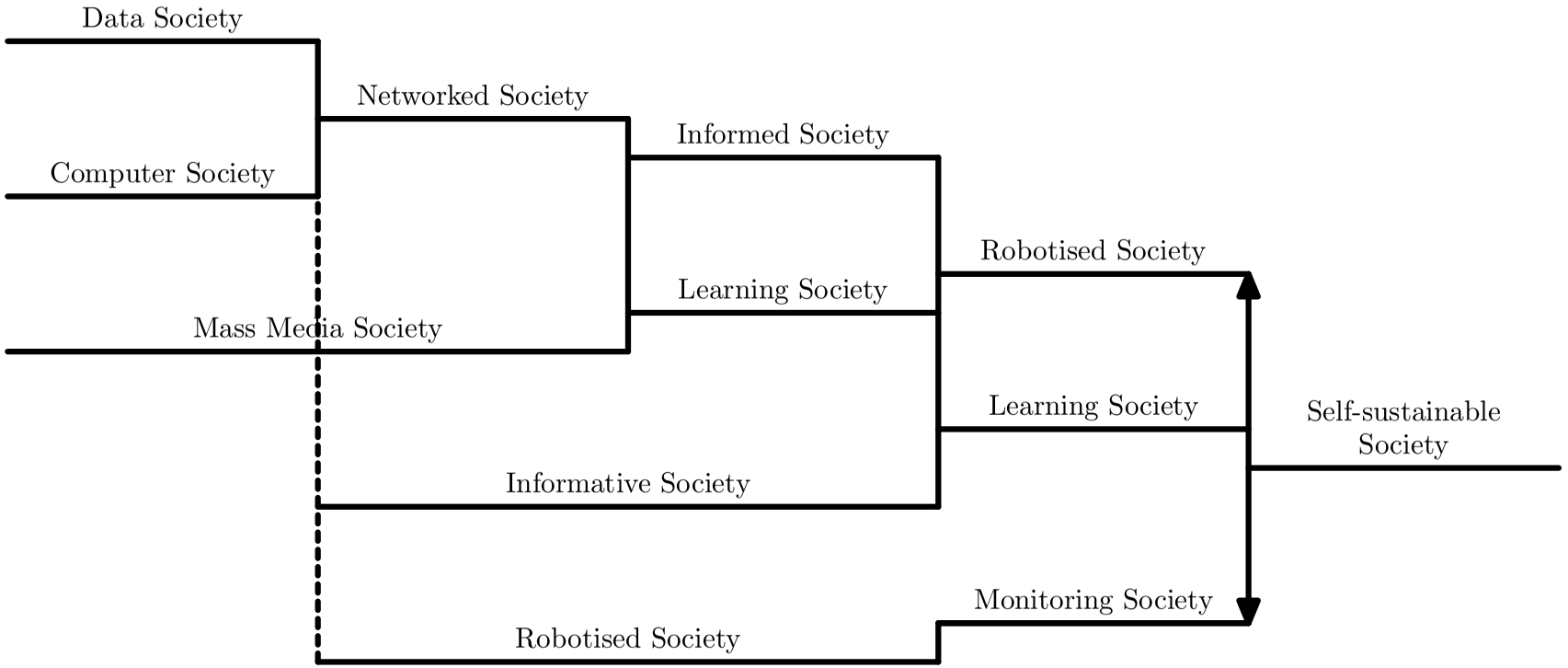


Figure 3.6: The path of information's development
(The Targowski Model)
[[**Lan05**, Targowski, page 22]]

the types of information systems, taking note that it is not possible to list all the types of information systems that are in use.

A complex view on information systems and their development represents the Targowski Model, *see* Figure 3.6 on page 54.

3.4 Michael Polanyi's Concept of Knowledge

Original Polanyi's concept was used from Sveiby's Ph.D. thesis [[**Sve94**]].

Polanyi's understanding of the process of knowing was developed with examples from scientific professions which are quite similar to professions involved in information processing.

Table 3.2: Some guidelines for the evaluation and measurement of the knowledge base [[**OEC00b**, page 241]]

	Competitive environment	**Non-competitive environment**
Knowledge is poorly articulated (tacit)	Consulting activity	Education (teacher)
Knowledge is highly codified	Biotechnology	Library management

Polanyi's concept of knowledge is based on three main theses:

First, true discovery, cannot be accounted for by a set of articulated rules or algorithms.

Second, knowledge is public and also to a very great extent personal (i.e. it is constructed by humans and therefore contains emotions, "passion".).

Third, the knowledge that underlies the explicit knowledge is more fundamental; all knowledge is either tacit or rooted in tacit knowledge.

Knowledge is thus not private but social. Socially conveyed knowledge blends with the experience of the reality of the individual. New experiences

are always assimilated through the concepts that the individual disposes of and which the individual has inherited from other users of the language. Those concepts are tacitly based. All our knowledge therefore rests in a tacit dimension.

Polanyi's main contribution in the theory of knowledge is that knowing can be both tacit and focal. It depends on the situation whether it is used tacitly or being focused and/or as articulated knowledge. Tacit and focal are not categories or levels in a hierarchy but are more like two dimensions of the same knowledge. Skills which are very difficult to articulate and to transfer between individuals thus have a large proportion of tacit knowledge, whereas a competent person must be able to focus more of his/her tacit process-of-knowing in order to articulate and communicate in a social context.

Knowledge as information or as tacit human skills. See standard taxonomy in Table 3.2 on page 55.

Definition is used from Lundvall's article **[[Lun00]]**.

The most important dividing line in the analysis of knowledge and learning goes between knowledge as information and knowledge as tacit skills. Information is knowledge that has been reduced into bits and then can be transmitted between localities and agents through telecommunication networks. Tacit knowledge is constituted of skills and routines embodied in people and embedded in organisations. It can normally be transferred only by experience based learning in the form of apprenticeship or network relationships. Learning tacit skills involves using all senses. Often it involves interaction with others more skilled in the area. Information, on the other hand, is 'accessed' rather than 'learnt'.

Learning skills changes people's capability to change the world while increased access to information affects what they know about the world.

3.5 Knowledge Management: Multidiscipline

Knowledge management had such giants as Peter Drucker, Karl Wiig, Ikujiro Nonaka, Larry Prusack, Tom Davenport, Tom Stewart, Hubert St. Onge, and Karl-Eric Sveiby, to name just a few.

However, these days knowledge management is clearly a multidiscipline, *see* Table 3.3 on page 59. We can also examine some of the barriers to knowledge management success, *see* Table 3.4 on page 59.

3.6 Knowledge Management: Codification and Personalisation

The "codification" approach is generally defined as the formalisation of tacit knowledge and the "personalisation" approach is the sharing of tacit knowledge by direct contact from person-to-person.

The summary findings are shown in Table 3.8 on page 60. The table shows the validated model with the corresponding factor loading for each of the operational variables using organisation level data. All factor loadings were significant at $p < 0.001$.

3.7 Key Subelements

Calabrese in his dissertation presented an extended listing of the disciplines and key subelements better defining each of the four pillars as shown in Table 3.6 on page 61.

In addition, the more comprehensive literature search reflected a change in the perceived recognition and existence of the four pillars as reflected in Table 3.5 on page 60. The review and findings were drawn from multiple publications in academia, case studies, general publications, and Web searches.

3.8 Critical Success Factors for Knowledge Management

Table 3.7 on pages 62 – 65 compiles a summary of the diverse perspectives of some of the leading authorities in the field regarding critical success factors for knowledge management implementation. An evaluation of the literature on the subject revealed that many authors tend to provide a comprehensive list of factors, whereas others suggest factors based on the researcher's background.

Additionally, some critical success factors identified in Table 3.7 are best used in a qualitative research, where the researcher can formulate in-depth questions that provide the needed assessment for the given success factor. Others are more practically implemented in questionnaires, where respondents can assess their appropriate level.

Table 3.3: List of knowledge management study impact areas [[**Sta05**, Michael A. Stankosky, page 4]]

Knowledge Management — Multidiscipline

Systems Theory	Risk Management Assessment
Intelligent Agents	Management of R&D
Decision Support Systems	Modeling and Simulation
Data Mining / Data Warehousing	Enterprise Resource Planning
Business Process Engineering	Systems Analysis
Systems Engineering	Leadership
Ethics	Communications Theory
Organisational Psychology	Visualisation
Groupware	Virtual Networks
Strategic Planning	Management-by-Objectives
Total Quality Management	Management Theory
Management of Information Systems	Data Communications & Networks

Database Design / Database Management Systems

Table 3.4: Barriers to Knowledge Management success [[**Sta05**, Michael A. Stankosky, page 5]]

Results From International Survey

Organizational Culture	80%
Lack of Ownership	64%
Info/Comms Technology	55%
Non-Standardised Processes	53%
Organisational Structure	54%
Top Management Commitment	46%
Rewards / Recognition	46%
Individual vice Team Emphasis	45%
Staff Turnover	30%

Original source: Earnst & Young KM International Survey, 1996
(431 senior executive responses)

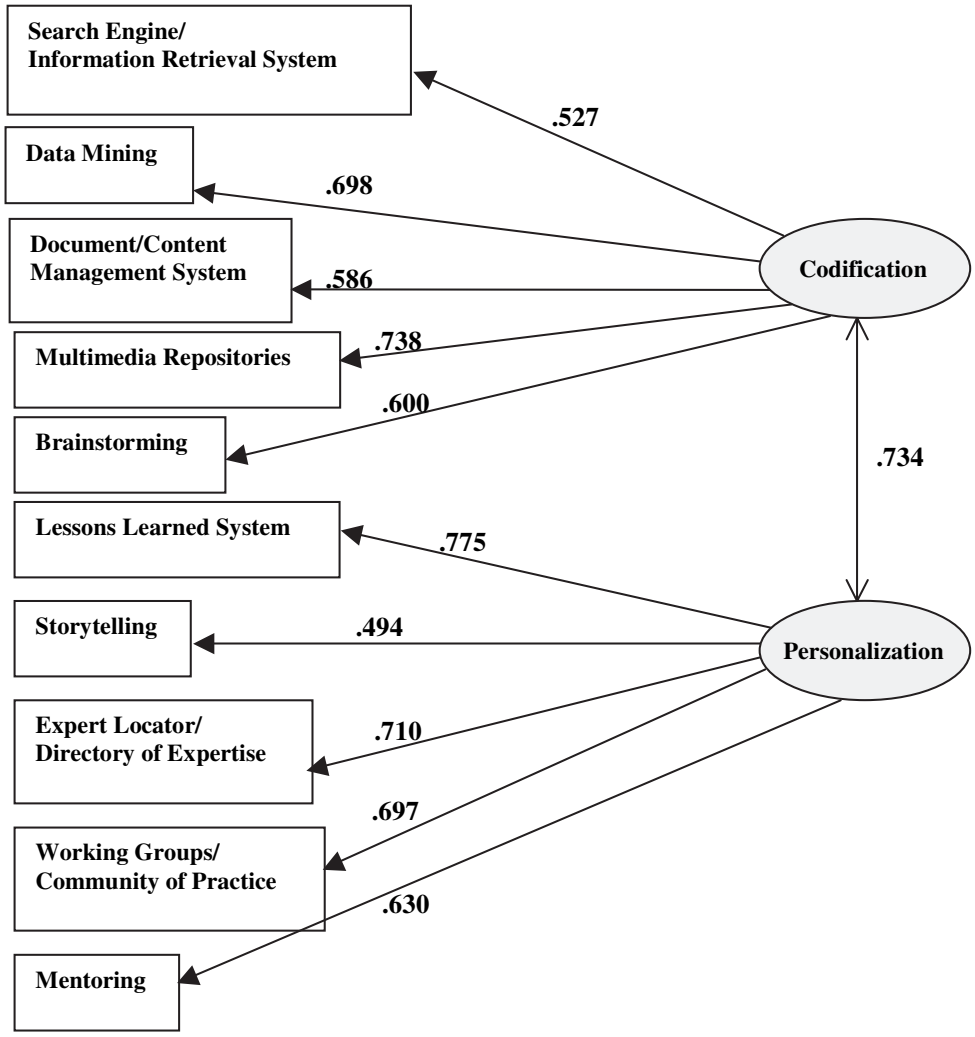


Figure 3.7: Validated measurement model of codification and personalisation factors using organisation level data (From ⟦**Rom04**, **RRS04**⟧, reprinted in ⟦**Sta05**, Juan Román-Velázquez, page 77⟧).

Table 3.5: Average scores and rank order of pillars ⟦**Sta05**, Francesco A. Calabrese, page 26⟧

Category	Academic		Cases		General		Total	
Key element	Avg.	Rank	Avg.	Rank	Avg.	Rank	Avg.	Rank
Technology	1.4	4	4.2	1	2.6	4	2.7	4
Organisation	4.2	2	3.7	3	3.6	1	3.8	1
Leadership	3.2	3	4.0	2	3.4	2	3.5	3
Learning	4.4	1	3.7	3	3.4	2	3.8	1

Table 3.6: Disciplines per pillar/Representative key subelements [[**Sta05**, Francesco A. Calabrese, page 25]]

Pillars and disciplines	**Representative key subelements defining each pillar**
Technology/tools—	Data warehousing
Disciplines:	Database management SW
Computer science	Multimedia repositories
Computational linguistics	Groupware
Operations research	Decision support system
Electrical engineering	Expert systems
Mathematics/statistics	Corporate Intranet
Logic	Speech understanding
	Business modeling systems
	Intelligent agents
	Neural networks, etc.
Organization/culture—	Process workflows
Disciplines:	Operating procedures for knowledge sharing
Psychology	Business process re-engineering
Operations research	Management by objectives
Organisational development	Total quality management
Philosophy	Metric standards
Sociolinguistics	Hierarchic, centralised or decentralised
	Matrix-type organisation
	Open/sharing
	Closed/power based
	Internal partnering vs. competing-type culture
Leadership/management—	Strategic planning
Disciplines:	Vision sharing
Operations research	Specific and general goals and objectives
Management science	Executive commitment
Psychology	KM programmes tied to metrics
Philosophy	Formal KM roles in existence
Logic	Tangible rewards for use of KM
Linguistics	Knowledge sharing
Management information systems	
Behavioural profiling	
Learning enterprise—	Tacit and explicit knowledge
Disciplines:	Management support for continuous learning
Cognitive psychology	Capturing, organising and disseminating knowledge
Organizational development	Virtual teams
Systems engineering	Exchange forums
Management philosophy	Communities of practice
Personal mastery	Innovation encouraged/recognised/rewarded
Mental models	
Shared vision	
Team learning	

Table 3.7: Critical Success Factors for Knowledge Management [[**Sta05**, Juan Román-Velázquez, pages 79 – 81]]

Authors	**Critical Success Factors**
Bassi (1999) [[**Bas99**]]	1. People learn (how, what) 2. People implement (how) 3. Sharing
Chait (2000) [[**Cha00**]]	1. Ensuring vision and alignment 2. Managing four domains: content, culture, process, and infrastructure 3. Creating an effective plan
Choi (2000) [[**Cho00**]]	1. Employee training 2. Employee involvement 3. Teamwork 4. Employee empowerment 5. Top-management leadership and commitment 6. Organisation constraints 7. Information systems infrastructure 8. Egalitarian climate, benchmarking 9. Knowledge structure
Davenport, De Long, and Beers (1998) [[**DDLB98**]]	1. Link to economic performance or industry value 2. Technical and organisational infrastructure 3. Standard, flexible knowledge structure 4. Knowledge-friendly culture 5. Clear purpose and language 6. Change in motivational practices 7. Multiple channels for knowledge transfer 8. Senior management support
Davenport and Prusak (1998) [[**DP98**]]	1. Technology (network) 2. Knowledge creation and dissemination 3. Knowledge sharing 4. Electronic repositories of knowledge 5. Training, culture, and leadership 6. Issues of trust 7. Knowledge infrastructure
Finneran (1999) [[**Fin01**]]	1. Creation of culture 2. Sharing of information and knowledge 3. Creative knowledge 4. Workers' buy-in (90% of the success of KM is involved with gaining buy-in of knowledge users and encouraging knowledge sharing)

Authors	Critical Success Factors
Haxel (2000) [[**Hax01**]]	1. Knowledge structured 2. Knowledge organised (goal is to share and apply knowledge faster and more efficiently than your competitors)
Heising (2001) [[**Hei01**]]	1. Store experiences from expert 2. Existing ℮-mail culture (corporate culture) 3. Senior management support 4. IT director business-focused and business process-oriented 5. Integrated among KM processes (creat, store, distribute, apply knowledge) 6. KM task must be combined with daily work task and integrated into daily business processes
Jennex and Olfman (2004) [[**JO04**]]	1. Integrated Technical Infrastructure including networks, databases/repositories, computers, software, KMS experts 2. Acknowledge strategy that identifies users, sources, processes, storage strategy, knowledge, and links to knowledge for the KMS 3. A common enterprise wide knowledge structure that is clearly articulated and easily understood. 4. Motivation and commitment of users including incentives and training 5. An organizational culture that supports learning and the sharing and use of knowledge 6. Senior management support including allocation of resources, leadership, and providing training 7. Measures are established to assess the impacts of the KMS and the use of knowledge as well as verifying that the right knowledge is being captured 8. There is a clear goal and purpose for the KMS 9. The search, retrieval, and visualisation functions of the KMS support easy knowledge use 10. Work processes are designed that incorporate knowledge capture and use 11. Learning organisation 12. Security/protection of knowledge
Kemp et al. (2001) [[**KNR$^+$01**]]	1. Clear goals 2. Strong sponsorship 3. Realistic expectations 4. An interactive approach 5. A system approach

Authors	Critical Success Factors
	6. A flexible framework 7. An evolutionary process 8. Integrated measurement 9. A capability model 10. Technical maturity
Liebowitz (1999) [[**Lie99**]]	1. KM strategy with support from senior leadership 2. Chief knowledge officer 3. Knowledge ontologies and knowledge repositories to serve as organisational/corporate memories in core competencies 4. KM systems and tools (technology) 5. Incentive to motivate employees to share knowledge 6. Supportive culture for KM
Manasco (1999) [[**Man01**]]	1. Knowing community 2. Creating context 3. Overseeing context 4. Supporting infrastructure (proper technology) 5. Enhancing process (creating and sharing knowledge)
Morey (1998) [[**Mor01**]]	1. Available (if knowledge exists, available for retrieval) 2. Accurate in retrieval (if available, knowledge retrieved) 3. Effective (knowledge retrieved useful and correct) 4. Accessible (knowledge available during time of need)
Skyrme (2000) [[**Sky01**]]	1. Top management support 2. Clear and explicit links to business strategy 3. Knowledgeable about knowledge 4. Compelling vision and architecture 5. Knowledge leadership and champions 6. Systematic knowledge processes (supported by specialist in information management [librarians] but close partnership between user and providers of information) 7. Well-developed knowledge infrastructure (hard and soft) 8. Appropriate bottom line measures 9. Creation of culture that supports innovation, learning, and knowledge

Authors	Critical Success Factors
	10. Technical infrastructure that supports knowledge work
Skyrme and Amidon (1999) [[SA99]]	1. Strong link to a business imperative 2. Compelling vision and architecture 3. Knowledge leadership 4. Knowledge creating and sharing culture 5. Continuous learning 6. Well-developed technology infrastructure 7. Systematic knowledge processes
Stankosky and Baldanza (2001) [[SB01]]	1. Leadership 2. Organisation 3. Technology 4. Learning
Streels (2000) [[Str00]]	1. Staff must buy into the new model 2. Lines of communication must be kept open 3. Sharing information 4. Writing weekly updates 5. Management supporting
Trussler (1999) [[Tru99]]	1. Appropriate infrastructure 2. Leadership and strategic (management commitment) 3. Creating motivation to share 4. Find right people and data 5. Culture 6. Technology (network) 7. Available to collaborators (transferring) 8. Training and learning
Wiig (1996) [[Wii01]]	1. Knowledge assets—to be applied or exploited—must be nurtured, preserved, and used to the largest extent possible by both individuals and organisations. 2. Knowledge-related processes—to create, build, compile, organise, transform, transfer, pool, apply, and safeguard knowledge—must be carefully and explicitly managed in all affected areas.

3.9 The New Economy: What do we mean by it?

Comments are used from the book ⟦**OEC00a**, page 17⟧ which is originally based on an article by Stiroh ⟦**Sti99**⟧.

The term "new economy" has been used extensively in recent years to describe the workings of the US economy and in particular the part of its economy that is linked to ICT. It reflects a view that something has changed and that the economy now works differently. Few studies clearly define the term "new economy" and it seems to mean different things to different people. The three main characteristics of the new economy appear to be the following:

The new economy may imply higher trend growth due to more efficient business practices linked to ICT use. The new economy may experience a pick-up in trend growth, due to higher MFP growth.

The new economy may affect the business cycle. ICT, in combination with globalisation, may change the short-run tradeoff between inflation and unemployment and lower the NAIRU (non-accelerating inflation rate of unemployment). As a result, the economy can expand for a longer period without inflationary pressures emerging. In this view, ICT puts downward pressure on inflation, while increased global competition keeps wage inflation in check. More extreme views have argued that the new economy may mean the end of the business cycle.

The sources of growth are different in the new economy. Certain parts of the new economy may benefit from increasing returns to scale, network effects and externalities. The value of communications networks and Internet applications, for instance, increases as more people are connected. This situation entails considerable spillovers, and these contribute to higher MFP growth and fuel further growth.

These three characteristics are closely related and the US experience of the past decade provides some support for all, although there is no support for extreme claims about the end of the business cycle. It is not yet clear to what extent the US economy has indeed entered a new era, however, and concerns have been raised in recent years about macroeconomic imbalances and the way they will be unwound.

3.10 Information Society Indicators used by EuroStat

The European Union is also developing and collecting data about the information society. An older project was called an ESIS (European Survey of the Information Society).[α]

Worth checking is a SIBIS project which was running from January 2001 to September 2003.[β]

More detailed aspects can be found, e.g. in *Information Society Indicators* presented by the United Nations[γ] .

Official Eurostat web site is now located at:

`http://europa.eu.int/comm/eurostat/`.

You may also register at this server for free. After that you may:

- Use advanced browser and download tool for multidimensional tables plus access to manuals.
- Selecting and downloading in various formats a subset of the table.
- Downloading the complete table in TSV format.

— — —

Europe's Information Society homepage (Thematic Portal) is located at:

`http://europa.eu.int/information_society/index_en.htm`

Eurostat, the statistical office of the European Communities, makes its databases accessible to the general public. The wide choice of offered funcions for all users of european statistics is free of charge. The users

[α] ⟨http://europa.eu.int/ISPO/esis/default.htm⟩

[β] ⟨http://www.sibis-eu.org/⟩

[γ] ⟨http://www.itu.int/osg/spu/statistics/DOI/linkeddocs/ESCWA_Info_Soc_Indicat05.pdf⟩

Table 3.8: The paradigms and measurements of information societies ⟦**Lan05**, Targowski, page 20⟧

IS Type	Paradigm	Purpose	Main Information Solution	Measures Per 1,000 population
Data (Dossier)	Measurement	Reduction	Mechanization and Automation, Off-line systems	Number of data entry personnel
Computer	Measurement	Reduction	Automation and How to compute? Off-line systems	Number of computers
Mass Media	News	Dissemination	Printing	Number of newspapers and Number of TV sets
Networked	Connection	Exchange	Internet, Intranet, Networked enterprise	Number of Internet Users, Number of Intranet servers
Virtual	Electronic presence	Exchange and Opinion	Internet, Intranet, Virtual enterprise systems	Number of bulletin board systems (national and organisational)
Informative	Optimisation	Decision-making	What to process? Data mining, Online systems, Application Portfolio	Number of OLAP software per organisation, % of GDP spent on IM, % of I-workers in the labour force
Communicate	Familiarity	Planning	Networking, Online systems, Networked enterprise	Number of Internet users, Number of telephones, Number of TV sets and Number of newspapers, % of GDP spent on telecommunication
Knowledge	Rules	Understanding	Research, education, Information retrieval	Number of scientists, Number of professors, Number of students
Robotised	Rules	Decision-making	Automation of judgment	Number of expert systems
Informed	Awareness	Decision-making	Data mining, Networking, Enterprise-wide systems	Number of OLAP software, and Mass Media and Network Indexes, Free press
Learning	Understanding	Planning and acting	Computer-aided instruction, Information retrieval, Digital library	Number of published books, Number of digital books and scientific documents
Global	Justice	Operations	Virtual government, Global systems	Number of applied virtual global agencies
Self-sustainable	Optimisation	Survival	Green economy, Ecological systems	Amount of energy from renewable sources
Monitoring	Warning	Survival	Satellites or tam-tam drums	Number of served people

Table 3.9: List of national statistics offices

Country	Local statistics office name	Web address
Austria	Statistik Austria	http://www.statistik.at/
Belgium	Nationaal Instituut voor de Statistiek / Institut National de Statistique (Statistics Belgium)	http://www.statbel.fgov.be/
Bulgaria	National Statistical Institute	http://www.nsi.bg/
Cyprus	Statistical Service of the Republic of Cyprus	http://www.mof.gov.cy/mof/cystat/statistics.nsf/
The Czech Republic	Czech Statistical Office	http://www.czso.cz/
Denmark	Danmarks Statistik (Statistics Denmark)	http://www.dst.dk/
Estonia	Statistikaamet (Statistical Office of Estonia)	http://www.stat.ee/
Finland	Tilastokeskus (Statistics Finland)	http://www.stat.fi/
France	Institut National de la Statistique et des Etudes Economiques (National Institute for Statistics and Economic Studies)	http://www.insee.fr/
Germany	Statistisches Bundesamt (Federal Statistical Office)	http://www.destatis.de/
Greece	National Statistical Service of Greece	http://www.statistics.gr/
Hungary	Központi Statisztikai Hivatal (Hungarian Central Statistical Office)	http://www.ksh.hu/
Iceland	Hagstofa Íslands (Statistics Iceland)	http://www.statice.is/
Ireland	Central Statistics Office	http://www.cso.ie/
Italy	Istituto nazionale di statistica (National Institute of Statistics)	http://www.istat.it/
Latvia	Central Statistical Bureau of Latvia	http://www.csb.lv/
Lithuania	Statistics Lithuania	http://www.std.lt/
Luxembourg	Service central de la statistique et des études économiques	http://www.statec.lu/
Malta	National Statistics Office	http://www.nso.gov.mt/
The Netherlands	Centraal Bureau voor de Statistiek (Statistics Netherlands)	http://www.cbs.nl/
Norway	Statistisk sentralbyrå (Statistics Norway)	http://www.ssb.no/
Poland	Central Statistical Office	http://www.stat.gov.pl/
Portugal	Instituto Nacional de Estatística	http://www.ine.pt/
Romania	Institutul National de Statistica (National Institute of Statistics)	http://www.insse.ro/
Slovakia	Štatistický úrad Slovenskej republiky (Statistical Office of the Slovak Republic)	http://www.statistics.sk/
Slovenia	Statistical Office of the Republic of Slovenia	http://www.stat.si/
Spain	Instituto Nacional de Estadística (National Statistics Institute)	http://www.ine.es/
Sweden	Statistiska centralbyrån (Statistics Sweden)	http://www.scb.se/
Switzerland	Statistik Schweiz	http://www.statistik.admin.ch/
Turkey	State Institute of Statistics	http://www.die.gov.tr/
The United Kingdom	Office for National Statistics	http://www.statistics.gov.uk/

can utilise predefined tables, compile a table of their own, download an electronic version of all Eurostat publications or use the refined search engine.

Eurostat in co-operation with the national statistical institutions, *see* list of them in Table 3.9 on page 69, simultaneously set up a net of national centres called **European Statistical Data Support – ESDS.**

The International Information Services Section of the Czech Statistical Office serves as the national contact centre in the Czech Republic prepared to support users in their finding and working with European statistical information.

The general survey measuring the ICT usage in households and by individuals in the Czech Republic covers these core ICT indicators:[δ]

- Access to selected ICTs,
- Use of computers and Internet,
- Purpose and nature of activities on the Internet, Internet commerce details.

The socio-demographic background variables concerning household characteristics are:

- Household type,
- Number of adults in household,
- Number of dependent children,
- Home based business,
- Household members teleworking,
- No home based business and no teleworking.

The socio-demographic background variables concerning individual characteristics are:

[δ] ⟨http://www.czso.cz/csu/redakce.nsf/i/is_statisticky_ramec_statistical_framework_csu_2003_pdf⟩

- Age,
- Sex,
- Education level,
- Employment situation.

For the first half of the questionnaire I also used European Statistical Data Support (ESDS),[ε] general databases and I chose indicators from *Science and technology: Information Society*.

Note No. 1.
Actual research activities are:

- Technology-enhanced learning and access to cultural heritage.
- Cross-media content for leisure and entertainment.
- Building the Grid and Grid applications.
- Networked audiovisual systems and home platforms.
- Open development platforms for software and services.
- Semantic-based knowledge systems.
- Cognitive systems.

Note No. 2.
On the occasion of Prague's International Conference on *"Statistics: Investment in the Future"* it was announce that the Cross-boarder Friendship Database (CBFD) was to be launched to the public on the Internet address:

`http://www.crossborderdatabase.de/`

Note No. 3.
In the Czech Republic there is also running a Public database, beta version from October 2006, maintained by the Czech Statistical Office at:

`http://vdb.czso.cz/vdb/`

[ε] ⟨http://www.europa.eu.int/comm/eurostat/⟩

4 Current Circumstances: Tasks from Various Perspectives

Table 4.1: Benefits and challenges of globalisation [**ICC04**, page 5]

Benefits	**Challenges**
Faster growth	Transitional problems
Better living standards	Social impact
Easier access to capital and technology	Cultural impact
Higher productivity	
Lower prices	

We present ten trends in business plus an objective and subjective list of current tasks.

4.1 Ten Trends in Business

Here is a list of modern trends according to notes from a session at "*Brainstorm 2006*" led by Diana Farrell, McKinsey Global Institute, called *Ten Trends That Matter to Business* presented on Ross Mayfield's[α] personal Weblog.

Macro

① *Shifting centers of economic activity*
China and India. From global GDP, in 15-20s years from now, non-Japan Asia will be 25%. The US will continue to represent 35%. Industry shifts: deindustrialisation towards services. Even in China, 15M manufacturing jobs will have been lost.

② *Overburdened public sector*
20-30% of GDP in most countries. Health care and pension burdens

[α] ⟨http://ross.typepad.com/blog/2006/06/ten_trends_that.html⟩

Table 4.2: Kondratieff Long Waves [[**WHMS00**, page 157]]

Kondratieff Wave	*Cycle*	*Recession Trough of Depression*	*Core Inputs*	*Carrier Branches*	*Infrastructures*
1st	1780s–1840s	1820s 1830s 1842–43	COTTON YARN IRON	Cotton textiles Other textiles Iron products	Ports Canals Water power Turnpike roads
2nd	1840s–1890s	1870s 1880s 1890s	COAL COAL GAS	Steam engines Railways Mechanisation Gas Machine tools	Iron – rail networks Telegraphy Steamships Gas light & heat
3rd	1890s–1940s	1920s 1930s 1930–34	STEEL	Electrification Electrical and heavy engineering Heavy chemicals Non-ferrous metals	Electric power Steel ships Global steel rail networks Telephones
4th	1940s–1990s	1970s 1980s 1990s	OIL NATURAL GAS	Automobiles Consumer durables Refineries Synthetic materials Automation	Motor highways Airlines Tankers Roll-on, roll-off
5th	1990s?– ?	?	MICRO-ELECTRONICS	Computers Video, telephone equipment software, info services	”Information highways” E-mail Air freight

are more drastic than we believe. In Japan, they would have to increase taxes by 125% to make good on obligations. This is not going to happen unless there is a new social contract, or a massive disruption. This is the case in Europe and to a degree in the US and UK. Appetite for 1st world services from the 3rd world.

③ *New Consumers*
In the developing world, 975M households will become consumers over the next 10 years. From $4 trillion to $9, which is the consuming power of Europe today. This consuming class will be quite different, it will require innovation to market to them. New entrants from the developing world will capture this as well. The population 60 or older is increasing at 2× the pace of the rest within the developed world. The Hispanic market in the US will have 60% of the purchasing power in the US in 10 years.

Social & Environmental

④ *Social Life in a Connected World*
2B use cell phones, 9trillion emails, 1B searches, $1 trillion invested in fiber. The impact this is having socially – the percentage of internet newlyweds last year is 12%. Vendors, consumers, price transparency. Online retail is 13%, 54% of computer sales.

⑤ *Turbulent Tides of Talent*
Emerging global labour market for talent. Young professional (university grads with 7 years exp) 33M in the developing world, twice that of the developed world.

⑥ *Social Cost of the Free Market*
Markets as social weapons. Business has never been loved, but there is a different tone, fueled by tech and edu. No high school grad can get into college without community service. Danish cartoons was an expensive proposition for their economy. A clash of civilisations. $639B socially responsible funds.

Business

⑦ *Limited Resources, Unlimited Demand*
Like the demands on the public sector, can't happen, so a place to look for discontinuity. The growth of every commodity is 200% over the past two years in China. Water as a resource may be more constrained than energy, it takes 39k liters of water to produce a car. China emits 12% of CO_2, in 12 years it will be 40% unless something changes. Potential for innovation and discontinuity (particularly regulatory).

⑧ *New Global Industry Structures*
A few patterns: Massive scaling of large companies, market cap of the top 150 companies from 2 to $11 trillion over the last 10 years. Average of 123k employees. Blurring of organisational structures into ecosystems. Disaggregation of the value chain that comes from the integration of India and China, not just call centers. This gives rise to a wholy other kind of innovation because of a capital to labour tradeoff. In the developed world 70% labour, 30% capital, so they are optimised around labour. In the developing world it is the inverse. A $3k car is possible because of this shift. The role of Private Equity is a catalyst for transforming sectors. A shift from public equity will provide performance pressure.

⑨ *New Science of Management*
Reliance on local and technology driven management. Data driven market capabilties, complex logistics, science management systems. Value creation over time, when innovation is commoditised quickly, becomes added value upon what is just created.

⑩ *New Economics of Knowledge*
A rise of patent production, R&D investment, time and energy leading to knowledge creation, where it is easy to access but harder to keep. Consumers creating knowledge themselves. Wikipedias of the world suggest a very different notion for generating knowledge.

There are more views on this topic. For instance, let's look at the notes *Ten Trends Reshaping the Global Landscape*[β] by William Van Dusen Wishard from World Trends Research.

We may also find interesting the blog message *The Ten Most Important Trends in Business*[γ] by Dave Pollard published in *Strategy + Business*.

4.2 Modern Tasks: Topics in Computational Statistics

Below is a list of selected topics from a major conference on computational statistics CompStat 2006[δ] held in Rome, Italy. This is also an actual list of fields which are very often used in this world.

Biostatistics
Business Intelligence
Categorical Data Analysis
Classification and Discrimination
Clustering
Computational Bayesian Methods
Computational Econometrics
Computational Methods for Industry
Computational Methods in Official Statistics
Computational Statistics in Finance
Data Mining
Design of Experiments
Dimensionality Reduction
Environmental Statistics
Functional Data Analysis
Graphics and Data Visualisation
Image and Signal Processing
Imprecise Data and Fuzzy Methods
Internet Based Methods
Machine Learning
Matrix Computations and Statistics
Metadata and Data Representation
Microarray Data Analysis
Multivariate Data Analysis
Neural Networks and Genetic Algorithms
Nonparametric Statistics and Smoothing
Optimisation Algorithms
Partial Least Squares
Pattern Recognition
Resampling Methods
Robustness
Simulation
Software Evaluation
Spatial Statistics
Statistical Databases
Statistical Education
Statistical Matching and Data Imputation
Statistical Methods for Market Analysis
Statistical Musicology
Statistical Software
Support Vector Machine
Symbolic Data Analysis
Time Series Analysis
Web Mining
Textual Data Analysis and Information Retrieval

β ⟨http://www.worldtrendsresearch.com/ten-trends/ten-global-trends.html⟩

γ ⟨http://blogs.salon.com/0002007/2005/09/02.html⟩

δ ⟨http://w3.uniroma1.it/compstat2006/⟩

Table 4.3: Categories of learning ⟦**OEC01**, page 15⟧

	Dissemination of existing knowledge	Creation of new knowledge
Individual learning (resulting in human capital)	A e.g. schooling; vocational training; "learning-by-doing" in the workplace	B e.g. university-based research by PhD student; "learning-by-doing" in the workplace
Organisational learning (resulting in structural capital)	C e.g. building data bases, creation of routines and manuals; appropriation of technological licences from other firms; recruitment of highly qualified staff by firms	D e.g. R&D in universities by research groups; R&D within firms; collaborative R&D between firms and research institutes

4.3 Modern Tasks: Academic Development

The taxonomy of basic categories of learning is shown in Table 4.3 on page 78.

According to *MUNDO – Universiteit Maastrich* web pages[ε] (Maastricht University centre for international cooperation in academic development) we can agree that the emergence of the global knowledge-based society implies that we have to move from:

- Terminal education *to* Lifelong learning.
- Knowledge-based learning *to* Application of knowledge.
- Discipline based knowledge *to* Integrated (multi disciplinary) knowledge.
- Rote learning *to* Analysis, synthesis, understanding.
- Learning things just in case they may be useful *to* Just in time learning.
- Directive based learning *to* Initiative based learning.
- Individual study *to* Group work.

The forthcoming knowledge-based society will have to cope with problems that cannot be solved without proper activities. In economy, competition will intensify in which the survivor will be the one who obtains knowledge

[ε] <http://www.mundo.unimaas.nl/mundo.html>

and information *the fastest.* Speed is one of the critical factors of success in a knowledge-based society facing different problems.

Problem-Solving Approach

Before defining a problem-solving approach, let us briefly describe what is a problem in general.

> *A problem* is a deficit or surplus of something that is necessary to achieve one's goals.

Problems exist where goals need to be attained and there is uncertainty about the solution.

> We can define a *problem-solving approach* generally as a transformation process where the inputs are problems and the outputs are solutions (*see* Figure 4.1).

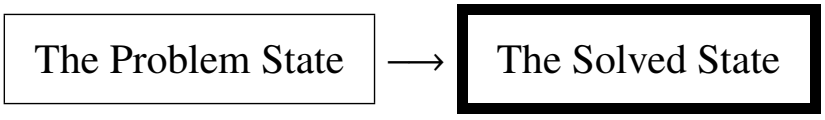


Figure 4.1: The solution path.

If we successfully accomplish this process, we obtain knowledge of various meanings, types, and important items. We have to share this knowledge with forthcoming generations to keep it alive.

We use *different tools* in this transformation process. A long-life learning process altogether with preparing solid textbooks, practice books, and electronic resources is the best *feedback* in this transformation process (*see* Figure 4.2).

Problem-Based Learning

Now we can see how important the real-world problems are to the class. However, solving them in classes is not a trivial question. Even if we keep

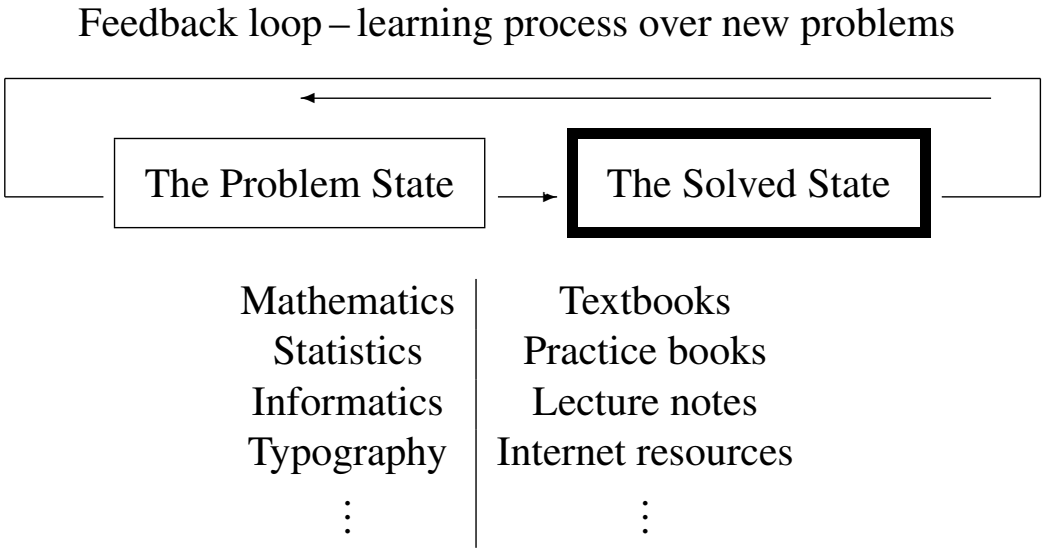


Figure 4.2: The solution path with feedback loop.

in mind that we are trying to prepare students for their professions as well as is possible.

In the 1960s McMaster Medical School introduced a learning environment that was a combination of small group, cooperative, self-directed, interdependent, self-assessed problem-based learning. Since then this approach has been called problem-based learning.

Problem-based learning methodology helps a lot. Next follows a definition by Don Woods [ζ].

> *Problem-based learning* is any learning environment in which the problem drives the learning.
> In the Czech Republic we usually use the term *managerial games.*

That is, before students learn some knowledge they are given a problem. The problem is posed so that the students discover that they need to learn some new knowledge before they can solve the problem. Some basic example problem-based learning environments include:

- research projects,

[ζ] <http://chemeng.mcmaster.ca/pbl/pbl.htm>

- engineering design projects that are more than a synthesis of previously learned knowledge.

Don Woods continues his discussion about problem-based learning and his experiences. There is also a note about having a class with 300 students. That is an impressive number because students are not working with computers. Thinking about it in depth they must have very well prepared materials even if they use prescreening and/or developing their students skill in problem solving.

Worth reading are web pages *problem-based learning @ maricopa*[η] and *IMSA: Problem-Based Learning Network*[θ] .

Problem-Based and Computer-Based Learning

After three years of teaching I can say that there is no way for me to go back to using chalk and a black board. There are so many effective ways using just an average personal computer. I can even simulate above-average difficult situations in the classroom. Of course, I mean in a computer laboratory.

I tend to use just one general term: computer-based learning. However, there are many alternatives and ways. Whoever would like to see a list of e-learning related abbreviations is welcome to visit web page *Abbreviations E-Learning – Abkürzungen multimediales Lernen* by Marc Jelitto [ϑ].

> Putting together problem-based and computer-based learning against difficult problems is what I am working on and improving all the time.

[η] <http://www.mcli.dist.maricopa.edu/pbl/>

[θ] <http://www2.imsa.edu/programs/pbln/>

[ϑ] <http://marcjelitto.de/lernen/abkuerz.htm>

4.4 Comments on Difficult Tasks

The teacher is as good as his most difficult, prepared, presented, and solved problem in the classroom.

Učitel je právě tak dobrý jako jeho nejtěžší problém, který připravil, uvedl a vyřešil ve své výuce.

Author's thought when trying to solve an unsolvable task in the classroom. 9:20 a.m. 23rd April 2004.

Real-world problems are not as easy as they might seem to be, we all know it, nearly all of us have faced them once or more times in life.

My actual view on current circumstances of attacking difficult problems is simplified in next three paragraphs.

What Does the Term "Difficult Problem" Mean?

Difficult problem is a real-world task, and in addition, a problem:

- which may not have any solution at all,
- where the solution, e.g. the global optimum, cannot be found or reached at the present time,
- we are not capable of inventing it by ourselves,
- to meet a deadline which is an unusually tight one, or,
- there is poor or no form of automation, although this should be available.

Difficult Problems in the Textbooks and Books of Exercises

In this dissertation I am presenting some findings about textbooks and books of exercises which contain difficult problems and tasks. I am focusing on custom fields (Mathematics, Statistics, Informatics [especially Programming], and Typography) and their support materials. I don't even deal with more difficult problems in my latest major publications.

Difficult Problems in the Classes

The situation of using difficult problems in the classroom is the same situation as in textbooks and books of exercises because of following them and only them while teaching. However, I am improving this situation year by year, with the assistance of my colleagues.

4.5 Comments on Marketing and Marketing Tasks

Marketing terms and comments are taken from the well-known Tutor2u[ι] server.

What is marketing?

There are many different definitions of marketing. Consider some of the following alternative definitions:

"The all-embracing function that links the business with customer needs and wants in order to get the right product to the right place at the right time"

"The achievement of corporate goals through meeting and exceeding customer needs better than the competition"

"The management process that identifies, anticipates and supplies customer requirements efficiently and profitably"

"Marketing may be defined as a set of human activities directed at facilitating and consummating exchanges"

Which definition is right? In short, they all are. They all try to embody the essence of marketing:

[ι] ⟨http://www.tutor2u.net/⟩

Definition 15 . . . *Marketing term*

* Marketing is about meeting the needs and wants of customers;
* Marketing is a business-wide function – it is not something that operates alone from other business activities;
* Marketing is about understanding customers and finding ways to provide products or services which customers demand.

Marketing concept and orientation

It is a fundamental idea of marketing that organisations survive and prosper through **meeting the needs and wants of customers.** This important perspective is commonly known as the **marketing concept.**

The marketing concept is about **matching a company's capabilities with customer wants.** This matching process takes place in what is called the **marketing environment.**

Businesses do not undertake marketing activities alone. They face threats from competitors, and changes in the political, economic, social and technological environment. All these factors have to be taken into account as a business tries to match its capabilities with the needs and wants of its target customers.

An organisation that adopts the marketing concept accepts the needs of potential customers as the basis for its operations. Success is dependent on satisfying customer needs.

What are customer needs and wants?

Definition 16 . . . *A need* is a basic requirement that an individual wishes to satisfy.

People have basic needs for food, shelter, affection, self-development and esteem. Many of these needs are created from human biology and the nature of social relationships. Customer needs are, therefore, very broad.

Whilst customer needs are broad, customer wants are usually quite narrow.

Definition 17 ... *A want* is a desire for a specific product or service to satisfy the underlying need.

Consider this example:

Consumers **need** to eat when they are hungry.
What they **want** to eat and in what kind of environment will vary enormously. For some, eating at McDonalds satisfies the need to meet hunger. For others a microwaved ready-meal meets the need. Some consumers are never satisfied unless their food comes served with a bottle of fine Chardonnay.

Consumer wants are shaped by social and cultural forces, the media and marketing activities of businesses.

This leads onto another important concept – that of customer demand:

Consumer demand is a **want** for a **specific product** supported by an **ability and willingness to pay** for it.

For example, many consumers around the globe want a Mercedes. But relatively few are able and willing to buy one.

Businesses therefore have not only to make products that consumers want, but they also have to make them affordable to a sufficient number to create profitable demand.

Businesses do not create customer needs or the social status in which customer needs are influenced. It is not McDonalds that makes people hungry. However, businesses do try to influence demand by designing products and services that are

∗) Attractive
∗) Work well
∗) Are affordable
∗) Are available

Businesses also try to communicate the relevant features of their products through advertising and other marketing promotion.

Which leads us finally to an important summary point.

Definition 18 ... *A marketing orientated business* is one which has adopted the marketing concept.

Marketing management in a customer-orientated business

The process of marketing management is about attracting and retaining customers by offering them desirable products that satisfy needs and meet wants.

Marketing management in a customer-orientated business consists of five key tasks summarised in the Table 4.4 on page 87.

Alternatives to a marketing orientation

There are three main alternatives to adopting a marketing orientation. These are:

(1) Sales orientation

(2) Production orientation, and

(3) Product orientation.

These are described briefly below.

Sales orientation

Some businesses see their main problem as selling more of the product or services which they already have available. They may therefore be expected to make full use of selling, pricing, promotion and distribution skills (just like a marketing-orientated business).

The difference is that a sale-orientated business pays little attention to customer needs and wants, and does not try particularly hard to create suitable products or services.

Production orientation

A production-orientated business is said to be mainly concerned with making as many units as possible. By concentrating on producing maximum volumes, such a business aims to maximise profitability by exploiting economies of scale.

Table 4.4: Five tasks of marketing management

Marketing Task	Commentary
Identify target markets	Management have to identify those customers with whom they want to trade. The choice of target markets will be influenced by the wealth consumers hold and the business' ability to serve them.
Market research — Dissertation focus!	Management have to collect information on the current and potential needs of customers in the markets they have chosen to supply. Areas to research include how customers buy (which marketing channels are used) and what competitors are offering.
Product development — Dissertation focus!	Businesses must develop products and services that meet needs and wants sufficiently to attract target customers to wish and buy.
Marketing mix	Having identified the target markets and developed relevant products, management must then determine the price, promotion and distribution for the product. The marketing mix is tailored to offer value to customers, to communicate the offer and to make it accessible and convenient.
Market monitoring	The objective in marketing is to first attract customers – and then (most importantly) retain them by building a relationship. In order to do this effectively, they need feedback on customer satisfaction. They also need to feed this back into product design and marketing mix as customer needs and the competitive environment changes.

In a production orientated business, the needs of customers are secondary compared with the need to increase output. Such an approach is probably most effective when a business operates in very high growth markets or where the potential for economies of scale is significant.

Product orientation

This is subtly different from a production orientation. Consider a business that is "obsessed" with its own products – perhaps even arrogant about how good they are. Their products may start out as fully up-to-date and technical leaders.

However, by failing to consider changing technological developments or subtle changes in consumer tastes, a product-orientated business may find that its products start to lose ground to competitors.

5 Scope of Research and Research Objectives

5.1 Research Methodology and Limitations

Managers and leading persons do not have free time for studying fields like Statistics so I must construct my working hypotheses with this fact in my mind.

Working hypotheses depend on the actual needs of managers and leading persons. They depend on solved problems, also. A general list of a working hypotheses is as follows.

- Inspire faculty students.
  Solution: Let me write this dissertation in English to inspire students to do the same in the future.
- Defend against risk situations.
  Solution: Solutions, programs, and procedures must be as general as possible. Use robust statistics where possible and where necessary.
- Be user-friendly.
  Solution: Pay attention to after core-programming.
- To have fully automated solution.
  Solution: Use modern programming tools and knowledge about them.
- Be as cheap as possible.
  Solution: Use Open Source software as often as possible.
- To have language-independent outputs.
  Solution: Use multilingual interfaces or English language where possible and appropriate.
- To have typographical clear outputs.
  Solution: Use TEX as often as possible.
- Present the outputs.
  Solution: Use presenting software to always have the best presentations.

- Publish results.
  Solution: Publish problems with solutions in textbooks and practice books.

- Save the knowledge for next generations.
  Solution: Develop actual and found new courses which cover difficult real-world problems:

  - *DTP and Electronic Publishing* – in English and Czech;
  - *Computerised Data Processing* – in English and Czech;
  - *Statistical Analysis Methods* – in English and Czech;
  - *Oral and Poster Presentations* – in English and
  - *Programming and Web & On-line Calculations* – in English, too.

In this doctoral dissertation I use these basic tools: simulation, optimization, statistics (esp. procedures in nonparametric statistics) and programming in `VBA`, `PHP`, and `MySQL`.

My limitations are a lack of free time plus described and known limitations of hardware and software products.

5.2 Research Objectives

Here follows a list of research objectives.

- To inspire readers and to motivate undergraduate students and Ph.D. graduating students to write their Bachelors Works, Diploma Theses, and Doctoral Dissertations in English in the future as well.

- To show readers that there are plenty of hard and tough problems in our everyday life. To present tools, software, algorithms and procedures that can be used to solve these problems.

- Resolving these daily problems (fully or nearly fully automated) is a great opportunity to be more effective, faster and cheaper than other people. This is a critical element of success in this commercial world.

I am also trying to work with Open Source software only (but it depends on circumstances), because it is currently the cheapest choice we can achieve.

- To include numbers for all the computer source codes.
- To comment on codes in a comprehensive way.
- To present the findings from my questionnaire filled in by students at the FaME, the Tomas Bata University in Zlín.
- To expand solved, difficult problems into actual textbooks and practice books.
- To develop new study materials on an e-learning server.
- To found new study courses in Czech or/and in English if necessary to achieve the goal of passing new knowledge to the forthcoming graduating students.
- To discuss the opportunity to create new study programme. The first idea is to have study programme dealing with Mathematics and Statistics. The second idea is to have study programme completely taught in English.

5.3 Design of Solving Difficult Problems Development

Thinking about these tasks in depth is neither pleasant nor comfortable. We are not able to tell the correct answers in the classroom and worse the solutions may not be found in our lifetime. We are unable to go far because no one is able to predict the future position of the flying bees, are we?

Overlooking the above mentioned *small details* for a moment we can see challenges for these difficult problems. These questions arise:

- How to proof the discussed results, or at least the local optimum, in the classroom?
- Is there some effective way of how to organize classes?

- Are we able to prepare solid and readable textbooks or/and practice books?
- How to prepare difficult problems if, in general, we are not able to make up such tasks?
- How to collect problems and their solutions?

The main objective is to answer these above questions.

5.4 Fields to Use

Table 5.1 on page 93 shows the author's view on the basic tools for solving present-day tasks. That's the usual way of solving specific tasks. For data analysis (figures, text and partly other data types) the most important fields are mathematics and statistics. In general, programming, which belongs to the informatics field, is the most important one.

Solving problems with text and text data types are needed in a standard firm or university. Text is hard to avoid in the real world. People seldom escape text further than 5 meters.

5.5 World Impact Factor on Global Society (WIF) [hours]

This proposed and considered indicator is in a way similar to Quality of Life indicators (Environment and Healt).

This indicator, or any similar one, should reflect the true use and importance for the global society. It can be measured in time units or in saved opportunity costs.

Key problems are:

- What's the number of users? (Proper guessing technique)
- What's the frequency of use? (Proper guessing technique)
- Is there any new development? (Internet feedback: offering a new version of Open Source Software)

Table 5.1: Basic tools for solving problems (often used)

Discussed Field	**Deals mainly with…**
Mathematics	— Figures
Statistics	— Figures
	— Text
Typography	— Figures
	— Text
	— Graphics
Informatics	— Figures
	— Text
	— Graphics
	— Sound sequences
	— Video sequences
	— In general: anything.

Proposed partial solutions to the above mentioned problems are:

- Counters of web-page or file downloads on FTP server.
- Unique number of IP addresses.
- Inner counter programmed in the software product itself.

The highest values would have had Open Source Software, e.g. Communities such as Linux, OpenOffice.org, TEX and R community.

5.6 Notes on Concept of a new Study Programme in the FaME at the TBU in Zlín

After the analysis of my major questionnaire research I proved that the actual situation over automation and, at least, the students' chances to solve truly difficult problems are at a low level. Our students should be and can be prepared much better for their upcoming life outside the academic field.

The specialization should be in Mathematical and Statistical Methods. The ideal state would be to have this or another study programme in English.

Rumour said that I had only some grand designs for the faculty. My questionnaire showed that the discussed fields are at a pretty low level in our faculty referring to an average graduating student. The European Union needs mathematicians, statisticians, computer scientists, and also typographers and that is a challenge for our faculty.

6 Research Stage I: Questionnaire with Questions Used by EuroStat and czso.cz

6.1 Notes on Methodology

For the first stage of my research I used some questions from a recent questionnaire used by EuroStat to Data: Population/social conditions: Information society statistics. The same questionnaire was translated and used by the Czech Statistical Office and statistics offices in other countries in the European Union.

Data and also metadata are stored at:

`http://www.europa.eu.int/comm/eurostat/`

We must notice that Eurostat data is available free of charge. A full list of 3-level information society statistics indicators can be found in **Appendix A** on pages 226 – 232.

There are usually five dimensions:

1. Period of time
   (annual, quarterly, monthly, daily, cumulated from January)
2. Geopolitical entity (declaring)
3. Individual type
4. Unit
5. Information society indicator(s) themselves; main groups are:
   - access and use of personal computer,
   - access and use of the internet,
   - e-learning (e-skills), e-health, e-government, and e-commerce.

In the questionnaire I used only a few questions from the EuroStat, *see* Part I (Část I) on pages 234 – 237 from **Appendix B** on pages 233 – 241.

In all my analyses I used English translations of only necessary and important questions for the thesis. I enclosed a full version of the questionnaire to inspire future researchers. However, I didn't need all the presented questions to demonstrate my analyses and conclusions.

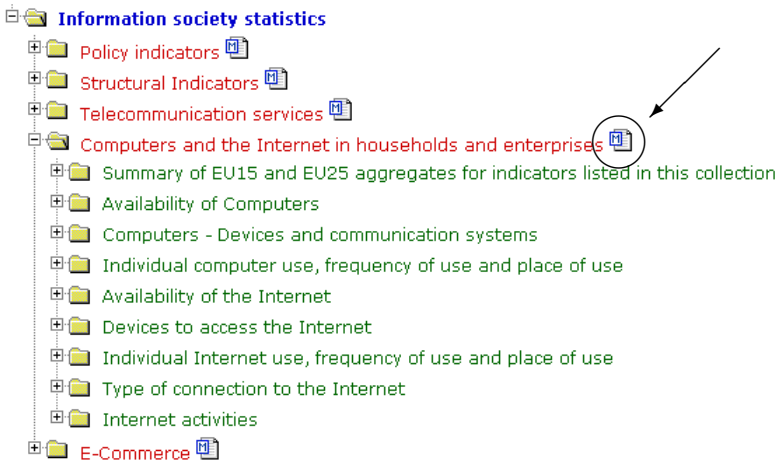


Figure 6.1: Access to methodological manual and model questionnaires

On the EuroStat's website, *see* Figure 6.1, are model questionnaires. We used their paper models and prepared an electronic model for the final stage.[α]

The main resource for proper methodology was *Methodological Manual* for year 2006[β] which can be also found on the EuroStat's website via the icon seen in Figure 6.1.

Statistics on the information society in Europe can be found in different publications, older or brand new by EuroStat, OECD, World Bank etc. Let's mention one for all, *see* [[**EC03**]]. On page 5 we can also find an ℮Europe definition.

Note. While completing my thesis, in September and October 2006, EuroStat added a new first-level option titled *E-skills of individuals*. EuroStat is truly hard-working on this issue.

[α] ⟨http://study.uis.fame.utb.cz/dotaznik/⟩

[β] ⟨http://europa.eu.int/estatref/info/sdds/en/infosoc/metmanual_2006.pdf⟩

6.2 Were students lying to me?

According to notes and tips in the books ⟦**BSW04**⟧ and ⟦**CH03**⟧ and especially paper back in a book "*How Innovativeness Influences Internet Shopping*" ⟦**Kri05**, Ronald E. Goldsmith and Barbara A. Lafferty, Chapter XV⟧ we may use some lie testing questions, direct or indirect questions.

For instance, **direct questions** are: "Please say: Are you telling the truth during this research?" or "I have tried to answer all of these questions honestly and accurately" with a seven-point response format where 1 = Always False and 7 = Always True.

Indirect asking usually means that you use two questions with (nearly) opposite meanings. E.g., "Do you like shopping?" (Yes, I do./No, I don't.) and "I don't like shopping." (Sentence is true/sentence is false.)

If the answers are in conflict, in the mentioned example *Yes* or *No* to both questions, we may say that a person is lying. Indirect questions have an important role in modern questionnaires.

I used a different approach. I politely asked my students not to lie during questionnaire filling. I asked them before I told them what the questionnaire was all about. They agreed.

To demonstrate a **weaker method** I compared two independent groups. The first one consisted of those who wrote either their name or e-mail address even if it was optional. The second one consisted of students who didn't write their name or e-mail address. If we assume that those who wrote their personal information didn't lie we can make a statistical comparison.

Note 1. During my questionnaire I didn't use a question to identify randomly-clicking person via using an item such as "If you read this item, do not respond to it."

Note 2. Statistical software and other computer programmes used during this thesis preparation are listed in **Appendix C** on page 242.

Note 3. I did a pilot survey with the help of a colleague and my brother.

I chose five subquestions at random from the questionnaire. I worked with categorial data; a table of rows consisting of Signed/Unsigned questions

Table 6.1: Comparing signed and unsigned questionnaire participants

Statistics \ Question Code	M4	OP6	OP9	I21	PZD3
Positive answers x_{signed}	13 of 33	22 of 33	29 of 33	27 of 33	3 of 33
Positive answers $x_{unsigned}$	30 of 128	68 of 128	98 of 128	86 of 128	15 of 128
Sample p_{signed}	0.393939	0.666667	0.878788	0.818182	0.090909
Sample $p_{unsigned}$	0.234375	0.531250	0.765625	0.671875	0.117188
Difference $p_{signed} - p_{unsigned}$	0.159564	0.135417	0.113163	0.146307	−0.0262784
95% confidence interval for dif.: lower	−0.0225835	−0.0471811	−0.0201978	−0.00839661	−0.139085
95% confidence interval for dif.: upper	0.341712	0.318014	0.246524	0.301010	0.0865281
Value of Z	1.720	1.450	1.660	1.850	−0.460
P-Value	0.086	0.146	0.096	0.064	0.648
Are 2 groups from the same distribution?	YES	YES	YES	YES	YES

Note: Are signed and unsigned groups from the same distribution:
Yes, if $P > 0.05$ or check if zero is a part of the confidence interval for difference.

M4: Are you using mobile phone for: Multimedia Messaging Service (MMS)?
OP6: Why you bought PC? Entertainment reasons (music, games, movies etc.).
OP9: The use of PC in the last 3 months. Every day or nearly every day.
I21: The use of Internet for personal purposes in the last 3 months. Searching information on goods and services.
PZD3: The calculation of χ^2-test. I can do this with the help of statistical software.

and columns where were answers Yes/No to the specific subquestion. That was the first option. I did not choose independent sample testing via t-test. Even if I had the normality test would not have been passed (standardized skewness and kurtosis were outside the range of -2 to $+2$).

I finally decided to use a test and confidence interval for 2 proportions. The reason for this was the presence of a confidence interval which is not computed in a 2×2 tables via χ^2-test. In a similar case, the confidence interval could be computed in one-dimensional tables when Chi-Square Goodness-of-Fit Test is applied ⟦**She04**, pages $227 - 229$⟧.

The summary gives us Table 6.1 on page 98. The conclusion is that students weren't lying. They had promised not to lie before they got a link to an electronic version of the questionnaire.

6.3 Are there differences in answers between men and women?

The next question I needed to answer was if there are statistical differences in answering between men and women. If to apply one combined analysis or two partial ones.

I selected the same principle as before. That means that I used an analysis of two proportions: a test and confidence interval for a difference over randomly chosen five subquestions. Two people out of 161 forgot to select if they were male or female. These two were struck off the analysis. The summary is given in Table 6.2 on page 100. The results point to some differences in answers between men and women. The initial guess is that every fifth question may have been statistically different between men's and women's answers on a 95% confidence level.

6.4 Use of Mobile Phones?

EuroStat's questionnaire didn't involve this specific question. The mentioned comparison is between faculty students and the Czech Republic only. The results can be seen in Table 6.3 on page 101. Faculty students have more

Table 6.2: Comparing groups of men and women in the questionnaire

Statistics \ Question Code	OP10	I37	DTP20	PZD5	KMR10
Positive answers x_{men}	7 of 44	33 of 44	5 of 44	18 of 44	0 of 44
Positive answers x_{women}	25 of 115	63 of 115	8 of 115	38 of 115	0 of 115
Sample p_{men}	0.159091	0.750000	0.113636	0.409091	0.000000
Sample p_{women}	0.217391	0.547826	0.069565	0.330435	0.000000
Difference $p_{men} - p_{women}$	−0.0583004	0.202174	0.0440711	0.0786561	0.000000
95% confidence interval for dif.: lower	−0.190069	0.041884	−0.0605989	−0.0901499	*
95% confidence interval for dif.: upper	0.0734682	0.359159	0.148741	0.247462	*
Value of Z	−0.870	2.520	0.830	0.910	*
P-Value	0.386	0.012	0.409	0.361	*
Are 2 groups from the same distribution?	YES	NO	YES	YES	YES

Note: Are men and women groups from the same distribution?
Yes, if $P > 0.05$ or check if zero is a part of the confidence interval for difference.

OP10: How often you used PC in the last 3 months? 1-4 days per week.
I37: Have you bought over Internet any services or goods?
DTP20: Are you able to install web-domain server by yourself?
PZD5: Are you able to calculate χ^2-test with the table of frequency? Yes, manually with the textbook.
KMR10: Are you using MATLAB software product?

Table 6.3: Comparing faculty students contra the Czech Republic

Statistics \ Question Code	M1 all	M1 15-24	Phoning	SMS	MMS	WAP	Banking	Getting Info	Buying
Positive answers $x_{students}$	151 of 161	151 of 161	151 of 151	150 of 151	40 of 151	13 of 151	19 of 151	39 of 151	5 of 151
Positive answers x_{Czechs}	7412 of 9779	1272 of 1413	100% of 7412	83% of 7412	7% of 7412	3% of 7412	5% of 7412	4% of 7412	1% of 7412
Sample $p_{students}$	0.937888	0.937888	1.000000	0.993377	0.264901	0.086093	0.125828	0.258278	0.033113
Sample p_{Czechs}	0.757951	0.900212	1.000000	0.830000	0.070000	0.030000	0.050000	0.040000	0.009984
Difference $p_{students} - p_{Czechs}$	0.179937	0.0376759	0.000000	0.163372	0.194879	0.0561413	0.0757738	0.218208	0.0231288
95% confidence interval for dif.: lower	0.141701	−0.0027488	*	0.147864	0.124256	0.0112335	0.0226426	0.148254	−0.00550019
95% confidence interval for dif.: upper	0.218174	0.0781006	*	0.178880	0.265502	0.101049	0.128905	0.288162	0.0517577
Value of Z	9.220	1.830	*	20.650	5.410	2.450	2.800	6.110	1.580
P-Value	0.000	0.068	*	0.000	0.000	0.014	0.005	0.000	0.113
Are 2 groups from the same distribution?	NO	YES	YES	NO	NO	NO	NO	NO	YES

Note: Are students and Czechs from the same distribution?
Yes, if $P > 0.05$ or check if zero is a part of the confidence interval for difference.

M1 all:	Do you have mobile phone for personal use? Comparing all people.
M1 15-24:	Do you have mobile phone for personal use? Comparing 15-24 years old only.
Phoning:	Using mobile phone for phoning purposes.
SMS:	Sending Short Message Services (SMS) via mobile phone.
MMS:	Sending Multimedia Messaging Service (MMS) via mobile phone.
WAP:	Browsing the internet using WAP.
Banking:	Using bank services over selfphone.
Getting Info:	Getting any information about goods or services.
Buying:	Buying any goods or services over mobile phone.

mobile phones than the average Czech person at 95% confidence level and more mobile phones than the same age group of 15-24 years old, but this bigger difference is statistically significant only at 93.2% confidence level.

All mobile phone services are used more frequently by faculty students compared with the average in the Czech Republic. Only 'Phoning' and 'Buying' mobile phone services are from the same distribution at 95% confidence level.

Note. The important part is the use of PDA (Personal Digital Assistant). We can set programmes or calculations even being in an airoplane or travelling some other way. For instance, we can prepare a list of tasks during morning travelling and pick up results in the late afternoon. The same principle can be applied using a mobile phone over internet interfaces.

6.5 Use of Personal Computers?

As we can see from Table 6.4 on page 103 the Czech Republic with 30% ±1.31% belongs among the lowest.

However, faculty students' access to a personal computer can be estimated as 97.5155% (157 of 161) with a 95% confidence level (0.937612, 0.993190). If we use normal approximation we get 95% confidence interval as (0.951112, 0.999198).

This is good news. Nearly in all cases students can work with a personal computer and get all the advantages from them. We don't have to worry about giving them assessments where a personal computer is requested and needed.

Because personal computers belong to one of the family members we may be sure that installation of any software is not a problem. From this point of view any trial version of software related to statistics, mathematics or even informatics, in general, doesn't have to be a problem when pushed or kindly asked to use them.

The Table 6.5 on page 104 summaries the main reasons why households bought a personal computer in 2005. The comparison between faculty students and the average Czech person is presented as well. 'Other reason'

Table 6.4: Availability of computers: Households

Geopolitical entity \ Time	2002	2003	2004	2005
eu25 European Union (25 countries)	:	:	54	58
eu15 European Union (15 countries)	50	56	58	63
cz Czech Republic	:	24	30	30
dk Denmark	72	79	79	84
de Germany (including ex-GDR)	61	65	69	70
ee Estonia	:	:	36	43
gr Greece	25	29	29	33
es Spain	:	47	52	55
fr France	37	46	50	:
ie Ireland	:	42	46	55
it Italy	40	48	47	46
cy Cyprus	:	:	47	46
lv Latvia	:	:	26	32
lt Lithuania	12	20	27	32
lu Luxembourg (Grand-Duché)	53	58	67	75
hu Hungary	:	:	32	42
nl Netherlands	69	71	:	78
at Austria	49	51	59	63
pl Poland	:	:	36	40
pt Portugal	27	38	41	42
si Slovenia	:	:	58	61
sk Slovakia	:	:	39	47
fi Finland	55	57	57	64
se Sweden	:	:	:	80
uk United Kingdom	58	63	65	70
bg Bulgaria	:	:	15	:
ro Romania	:	:	12	:
tr Turkey	:	:	10	:
is Iceland	:	:	86	89
no Norway	:	71	72	74
ch Switzerland	67	69	:	:
mk Macedonia	:	:	30	:
ca Canada	64	67	:	:
us United States	:	62	:	:
jp Japan	72	78	78	:
kr Korea (Republic of) (South)	79	78	78	:
au Australia	61	66	:	:

Table 6.5: Main reasons why households bought a personal computer and comparisons from the student side

Particular Reason	Students	Country	Difference	Status
Wish of children	0.127	0.350	−0.223	↘↘
Work related to family	0.185	0.306	−0.121	↘
Education	0.962	0.498	0.464	↗↗
Work	0.363	0.411	−0.048	□
Entertainment	0.573	0.314	0.259	↗↗
Internet access	0.739	0.406	0.333	↗↗

Order (country):
Education, Work, Internet access, Wish of children,
Entertainment, Work related to family.

Order (students):
Education, Internet access, Entertainment, Work,
Work related to family, Wish of children.

wasn't analysed. This question isn't presented in the EuroStat's questionnaire.

The third question is about the frequency of using a personal computer. The analyses includes only the percentage of individuals who used a computer within the last 3 months. I used a more descriptive category 'Students' instead of 'Individuals, 16 to 24 years old'. However, the results would be almost the same in all the listed countries.

An overview of different countries is presented in Table 6.6 on page 105. More details on the Czech Republic and faculty students can be found in Table 6.7 on page 106. From this perspective faculty students are at the same level as the average of all individuals in Portugal, Germany or Slovenia. I wish we had only faculty students in our country.

The last question in this part was about specific computer skills. I should have used basic computer skills (Word processor, Spreadsheet, Database, Presentation, Graphic processor, Company and other specialised software) questions as well. The question on specific computer skills is good for demonstrating the differences of levels between students and Czechs indi-

Table 6.6: Frequency of PC use: Individuals

Geopolitical entity \ Statistics	A	B	C	D
eu25 European Union (25 countries)	72	22	4	1
eu15 European Union (15 countries)	77	18	4	1
cz Czech Republic	46	45	8	:u
dk Denmark	83	15	2	0
de Germany (including ex-GDR)	78	18	:u	:u
ee Estonia	73	:u	:u	0
gr Greece	56	31	10	2
es Spain	57	35	7	2
ie Ireland	46	45	7	1
it Italy	89	5	6	:u
cy Cyprus	64	31	4	0
lv Latvia	63	31	5	1
lt Lithuania	60	38	2	0
lu Luxembourg (Grand-Duché)	74	22	4	0
hu Hungary	67	29	3	:u
nl Netherlands	91	7	1	0
at Austria	84	15	2	0
pl Poland	64	32	4	0
pt Portugal	77	21	:u	:u
si Slovenia	76	:u	:u	:u
sk Slovakia	58	37	5	1
fi Finland	86	11	2	0
se Sweden	85	13	1	1
uk United Kingdom	:u	:u	:u	:u
bg Bulgaria	:	:	:	:
ro Romania	:	:	:	:
tr Turkey	:	:	:	:
is Iceland	90	9	0	0
no Norway	72	24	3	1
mk Macedonia	:	:	:	:

A: Percentage of individuals who used a computer, on average, every day or almost every day in the last 3 months.
B: Percentage of individuals who used a computer, on average, at least once a week (but not every day) in the last 3 months.
C: Percentage of individuals who used a computer, on average, at least once a month (but not every week) in the last 3 months.
D: Percentage of individuals who used a computer, on average, less than once a month in the last 3 months.
'u' means Unreliable or uncertain data.

Table 6.7: Frequency of computer use: the Czech Republic details

Individual type \ Statistics	A	B	C	D
Students in 2003	:	:	:	:
Students in 2004	46	45	8	1
Students in 2005	46	45	8	:u
All Individuals	53	33	12	2
Individuals, 16 to 24	47	42	9	:u
Males, 16 to 24	51	40	8	:u
Females, 16 to 24	44	44	10	:u
Faculty students	79	20	1	0
Faculty males	84	16	0	0
Faculty females	76	22	1	0

A: Percentage of individuals who used a computer, on average, every day or almost every day in the last 3 months.
B: Percentage of individuals who used a computer, on average, at least once a week (but not every day) in the last 3 months.
C: Percentage of individuals who used a computer, on average, at least once a month (but not every week) in the last 3 months.
D: Percentage of individuals who used a computer, on average, less than once a month in the last 3 months.
'u' means Unreliable or uncertain data.

vidualy. The question summary on faculty students contra to the Czech Republic topic is given in Table 6.8 on page 107.

Detailed information are in Tables 6.9 and 6.10 on page 108 and page 109, respectively.

Writing a computer programme and creating web pages are important indicators. I would like to do further analyses on this topic.

All individuals

We may run dependent t-test (paired t-test) over 21 countries where data is available. We would figure that means are 10.1429 ± 1.2292 (programming skills) and 10.4762 ± 1.3966. The difference is -0.333333 and 95% confidence interval for mean difference is $(-2.287668, 1.621002)$ which includes zero. Both skills are from the same distribution, p-value is 0.726.

Table 6.8: Specific computer skills: the Czech Republic details

Individual type \ Statistics	A	B	C	D	E
Total 15+	24.1	17.0	6.3	8.7	2.3
Males 15+	28.9	19.9	8.7	11.8	3.4
Females 15+	19.5	14.3	4.0	5.9	1.2
Age group 15-24	47.1	33.9	13.2	20.0	5.1
Tertiary	51.5	44.1	19.5	23.3	8.9
Students	57.8	42.0	16.9	25.0	5.8
Faculty students	83.9	93.2	36.0	50.3	7.5
Faculty males	100.0	100.0	43.2	63.6	13.6
Faculty females	78.8	92.0	34.5	46.9	5.3
Faculty students – Total 15+	59.8	76.2	29.7	41.6	5.2
Status	↗↗	↗↗	↗↗	↗↗	□

A: Installation of software or hardware.
B: Use of ZIP tools.
C: Creating macros.
D: Creating web pages.
E: Writing a computer program (C, C++, Pascal, etc.).

Correlation coefficient is 0.753 which is significant because p-value is equal to 0.000 which is lower than 0.05.

Students

Analysing 'Students': mean over programming skill is 22.00 ± 1.7307 and over creating web pages is 25.52 ± 2.4973. So it is nearly double as in 'All individuals'. Mean difference is −3.52381 and 95% confidence interval for mean difference is (−8.21169, 1.16407) which also includes zero. We may say, again, that both indicators are from the same distribution. This conclusion supports p-value = 0.133 > 0.05.

The Pearson correlation coefficient is 0.484 and this value is statistically significant at 95% confidence level because p-value is equal to 0.026 which is lower than 5%.

Table 6.9: Individuals' level of computer skills: Programming

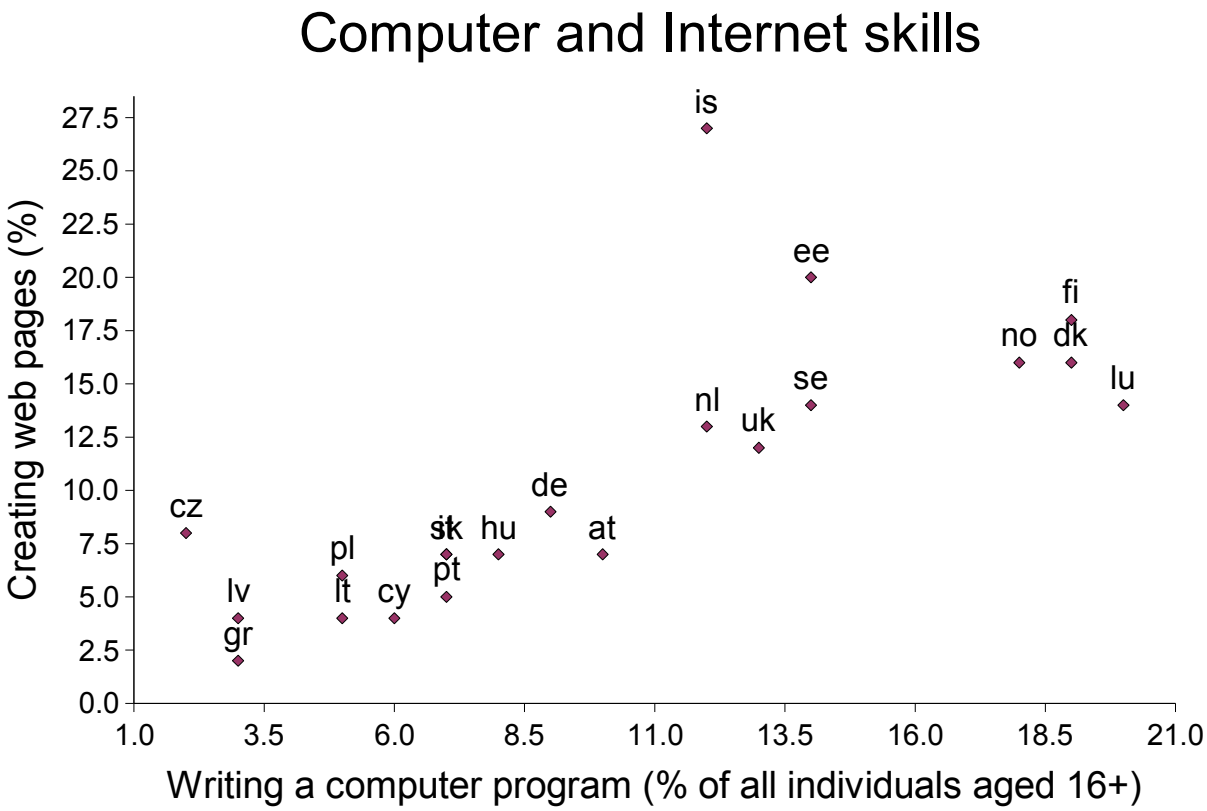
Geopolitical entity \ Statistics	A	B	C	D	E	F	G	H
eu25 European Union (25 countries)	9	19	24	14	25	10	18	21
eu15 European Union (15 countries)	10	21	27	15	26	10	19	24
cz Czech Republic	2	5	7	3	13	3	9	6
dk Denmark	19	29	36	22	36	15	25	28
de Germany (including ex-GDR)	9	22	29	13	20	7	16	25
ee Estonia	14	24	30	:u	27	15	19	24
gr Greece	3	9	9	8	10	8	9	14
ie Ireland	:	:	:	:	:	:	:	:
it Italy	7	16	21	12	22	10	16	20
cy Cyprus	6	15	18	12	19	8	13	24
lv Latvia	3	6	7	5	15	6	9	8
lt Lithuania	5	16	19	12	15	6	9	20
lu Luxembourg (Grand-Duché)	20	38	46	31	42	19	33	41
hu Hungary	8	17	23	11	28	11	19	21
nl Netherlands	12	20	26	13	33	11	23	21
at Austria	10	21	29	13	23	13	18	29
pl Poland	5	13	16	10	16	8	12	15
pt Portugal	7	16	19	14	31	19	24	24
si Slovenia	7	:u	:u	:u	:u	:u	:u	:u
sk Slovakia	7	16	21	11	18	9	13	18
fi Finland	19	33	42	22	37	17	26	31
se Sweden	14	22	30	13	33	12	22	23
uk United Kingdom	13	26	30	22	32	11	22	32
bg Bulgaria	:	:	:	:	:	:	:	:
ro Romania	:	:	:	:	:	:	:	:
tr Turkey	:	:	:	:	:	:	:	:
is Iceland	12	16	25	6	39	9	23	19
no Norway	18	21	30	11	42	18	29	19
mk Macedonia	:	:	:	:	:	:	:	:

A:	ind_total	All Individuals
B:	y16_24	Individuals, 16 to 24 years old
C:	m_y16_24	Males, 16 to 24 years old
D:	f_y16_24	Females, 16 to 24 years old
E:	m_i5_6	Males with high formal education
F:	f_i5_6	Females with high formal education
G:	i5_6	Individuals with high formal education
H:	stud	Students
u:		Unreliable or uncertain data

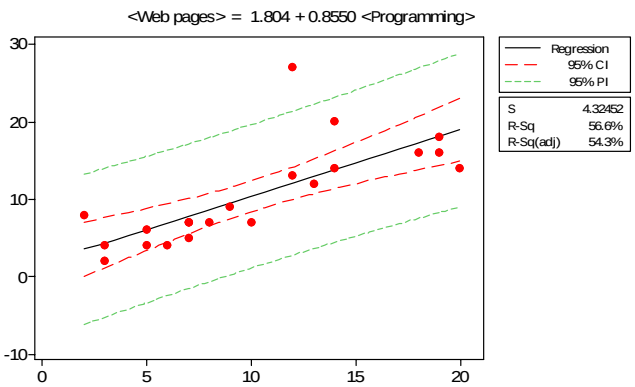
Table 6.10: Individuals' level of Internet skills: Web Pages

Geopolitical entity \ Statistics	A	B	C	D	E	F	G	H
eu25 European Union (25 countries)	9	20	24	15	21	10	16	22
eu15 European Union (15 countries)	9	20	26	15	21	10	16	23
cz Czech Republic	8	19	22	17	31	13	23	24
dk Denmark	16	30	39	20	30	14	21	27
de Germany (including ex-GDR)	9	21	27	14	15	7	12	21
ee Estonia	20	35	45	:u	38	24	29	38
gr Greece	2	5	7	3	9	3	6	7
ie Ireland	2	4	7	1	7	2	5	4
it Italy	7	16	18	13	21	11	16	19
cy Cyprus	4	13	12	13	12	6	9	18
lv Latvia	4	9	10	9	11	6	8	10
lt Lithuania	4	10	14	7	10	6	8	13
lu Luxembourg (Grand-Duché)	14	34	47	23	26	16	22	38
hu Hungary	7	15	19	12	22	11	16	21
nl Netherlands	13	28	35	20	26	10	19	25
at Austria	7	18	22	13	16	9	13	26
pl Poland	6	19	21	16	15	8	11	22
pt Portugal	5	13	15	11	22	12	16	19
si Slovenia	7	:u	:u	:u	:u	:u	:u	:u
sk Slovakia	7	13	17	9	19	8	14	16
fi Finland	18	41	48	33	26	19	22	39
se Sweden	14	25	33	16	28	12	20	27
uk United Kingdom	12	25	31	19	28	12	20	39
bg Bulgaria	:	:	:	:	:	:	:	:
ro Romania	:	:	:	:	:	:	:	:
tr Turkey	:	:	:	:	:	:	:	:
is Iceland	27	55	58	53	37	36	37	55
no Norway	16	31	35	27	28	15	21	32
mk Macedonia	:	:	:	:	:	:	:	:

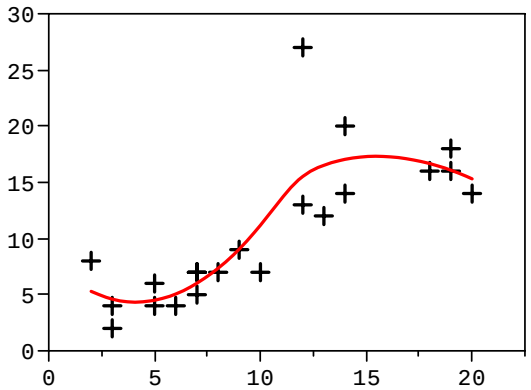
A:	ind_total	All Individuals
B:	y16_24	Individuals, 16 to 24 years old
C:	m_y16_24	Males, 16 to 24 years old
D:	f_y16_24	Females, 16 to 24 years old
E:	m_i5_6	Males with high formal education
F:	f_i5_6	Females with high formal education
G:	i5_6	Individuals with high formal education
H:	stud	Students
u:		Unreliable or uncertain data



(a) Computer and Internet skills: All individuals aged 16+ in 2005. Countries Ireland, Slovenia, Bulgaria, Romania, Turkey, Macedonia were extracted.

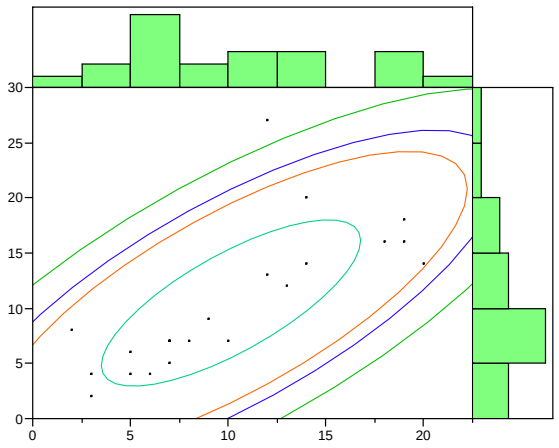


(b) Linear regression model with 95% confidence and prediction interval

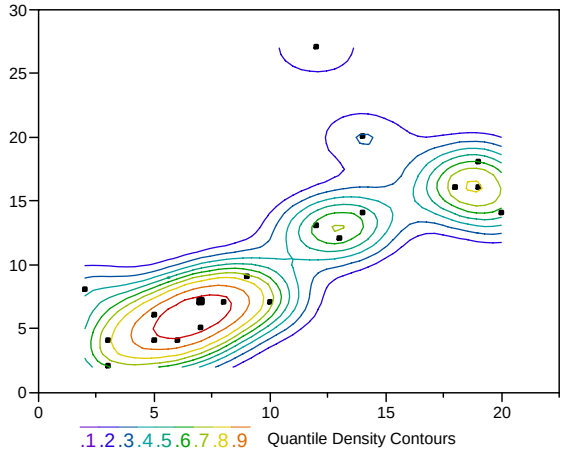


(c) Spline fit smoothing at $\lambda = 10$

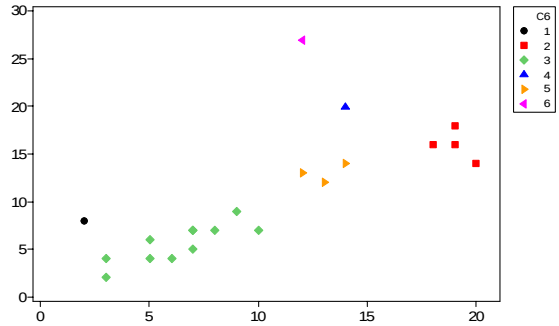
Figure 6.2: Analyses over two key statistical society indicators (the first page): writing a computer program and creating web pages: All individuals



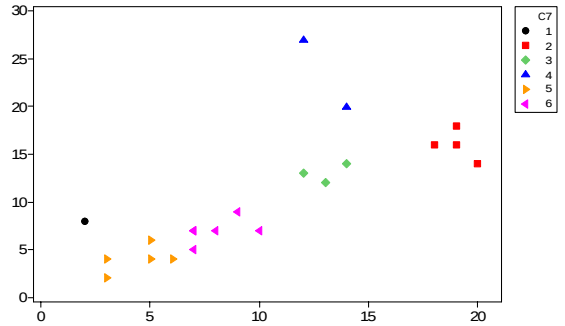
(d) Bivariate normal ellipse $P = 0.99$, $P = 0.95$, $P = 0.90$ and $P = 0.50$ and histogram borders



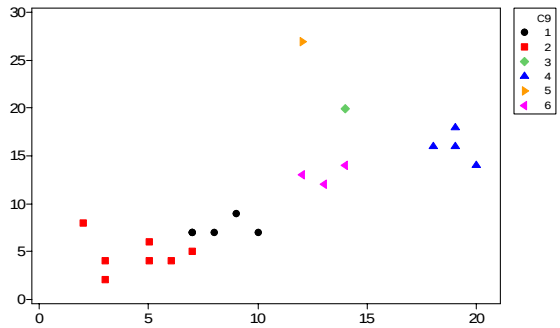
(e) Quantile density contours per ten percent from 0.1 to 0.9



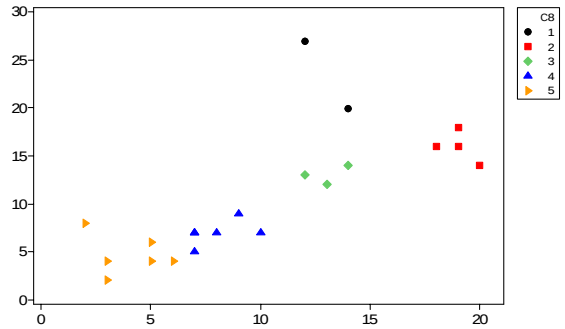
(f) Hierarchical clustering: Average linkage method and Euclidean distance measure, 6 clusters



(g) K-Means clustering: standardise variables, 6 clusters

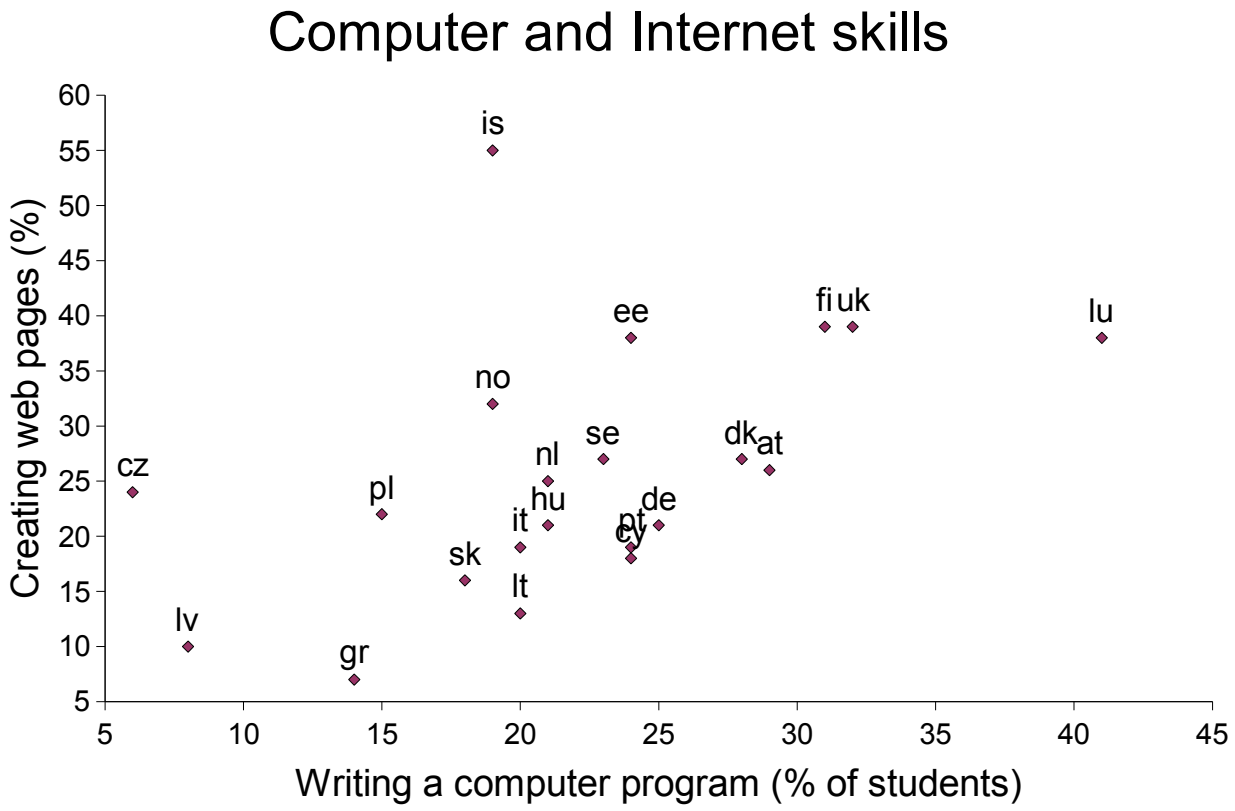


(h) Normal mixtures: Huber coverage 0.9, 6 clusters

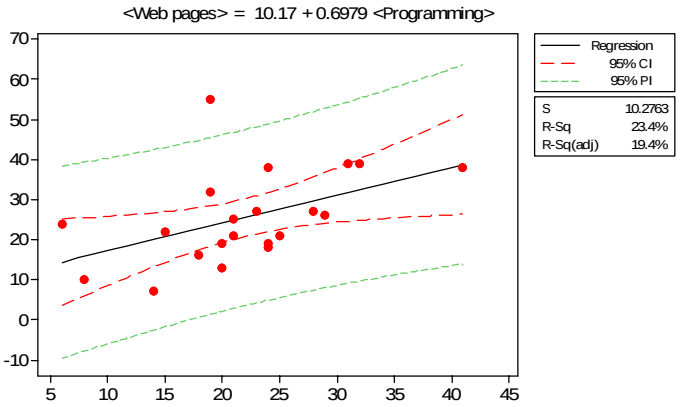


(i) Self Organising Map: bandwidth 0.6, 6 clusters

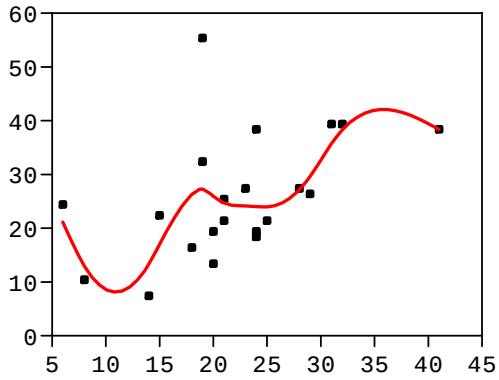
Figure 6.2: Analyses over two key statistical society indicators (the second page): writing a computer program and creating web pages: All individuals



(a) Computer and Internet skills: Students aged 16+ in 2005. Countries Ireland, Slovenia, Bulgaria, Romania, Turkey, Macedonia were extracted.

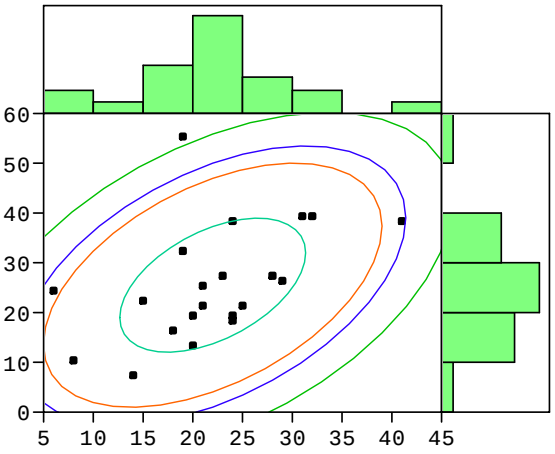


(b) Linear regression model with 95% confidence and prediction interval

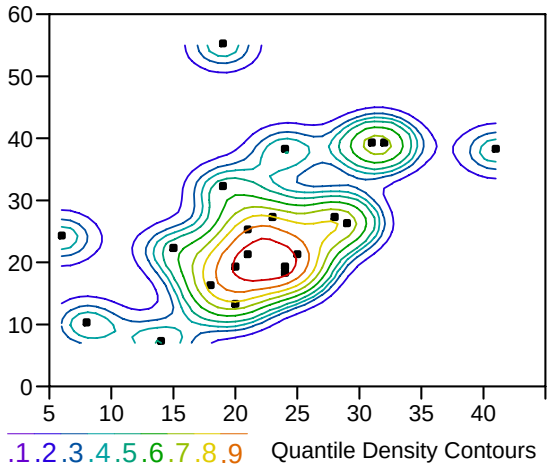


(c) Spline fit smoothing at $\lambda = 10$

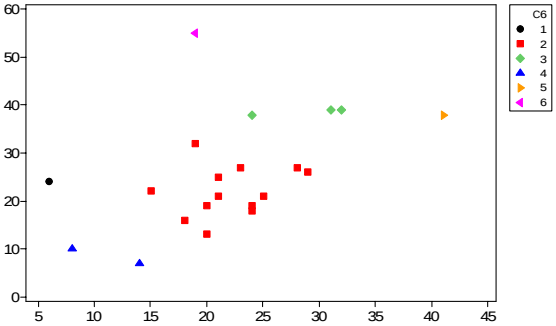
Figure 6.3: Analyses over two key statistical society indicators (the first page): writing a computer program and creating web pages: Students



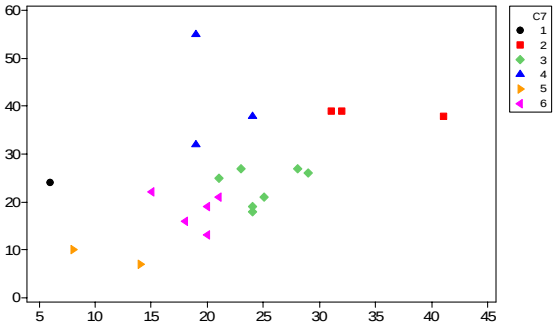
(d) Bivariate normal ellipse $P = 0.99$, $P = 0.95$, $P = 0.90$ and $P = 0.50$ and histogram borders



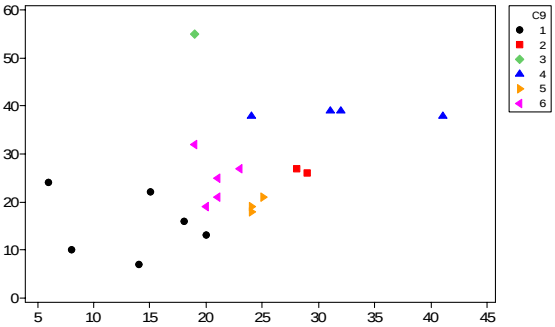
(e) Quantile density contours per ten percent from 0.1 to 0.9



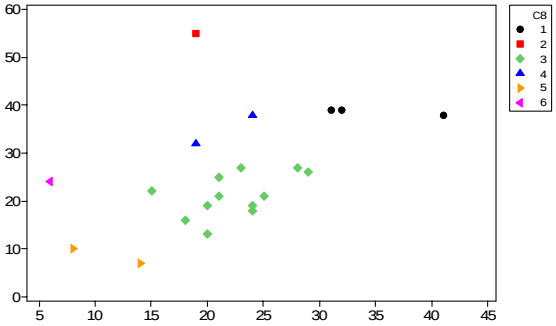
(f) Hierarchical clustering: Average linkage method and Euclidean distance measure, 6 clusters



(g) K-Means clustering: standardise variables, 6 clusters



(h) Normal mixtures: Huber coverage 0.9, 6 clusters



(i) Self Organising Map: bandwidth 0.6, 6 clusters

Figure 6.3: Analyses over two key statistical society indicators (the second page): writing a computer program and creating web pages: Students

6.6 Use of the Internet?

Czech students have access to the internet at home in 80.1242% (129 out of 161), men 77.2727% (34 out of 44) and women 81.7391% (94 out of 115). All figures are significantly better than the average in the Czech Republic and many other countries excluding Iceland, see Table 6.11 on page 115.

The average of the Czech Republic with 19% is one of the worst here, see Table 6.11 on page 115 one more time. Only every fifth household/family can access the Internet and what about the remaining four-fifths? We have a lot of work to accomplish in this area.

I didn't include a question on the regular use of the Internet but still the figures and comparison between countries are not good for the Czech Republic, see Table 6.12 on page 116. We are one of the lowest countries, again.

The next question was 'Main reasons why households obtained internet access' with 6 options plus 'Others'. This question is not a part of the EuroStat questionnaire. I didn't analyse the last option in depth. The comparison is given in Table 6.15 on page 119.

The last two questions I analysed were 'Frequency of the internet use by individuals in the last 3 months' (All individuals and Individuals 15+ who used the internet in the last 3 months) and 'Time spent on the internet by individuals – average week in the last 3 months'. The second question is not included in the EuroStat questionnaire; I compared figures with Czech data.

The international comparison can be seen in Tables 6.13 and 6.14 on pages 117 and 118, respectively.

The comparison of faculty students contra the Czech Republic is shown in Tables 6.16 and 6.17 on pages 119 and 120, respectively.

Note. My electronic survey included some more questions about Internet services/activities and their use. I think that an in depth analyses on this topic is not necessary in this doctoral thesis.

Table 6.11: Level of Internet access (%): Households

Geopolitical entity \ Time	2002	2003	2004	2005
eu25 European Union (25 countries)	:	:	42	48
eu15 European Union (15 countries)	39	43	45	53
be Belgium	:	:	:	50
cz Czech Republic	:	15	19	19
dk Denmark	56	64	69	75
de Germany (including ex-GDR)	46	54	60	62
ee Estonia	:	:	31	39
gr Greece	12	16	17	22
es Spain	:	28	34	36
fr France	23	31	34	:
ie Ireland	:	36	40	:
it Italy	34	32	34	39
cy Cyprus	24	29	53	32
lv Latvia	3	:	15	31
lt Lithuania	4	6	12	16
lu Luxembourg (Grand-Duché)	40	45	59	65
hu Hungary	:	:	14	22
nl Netherlands	58	61	:	78
at Austria	33	37	45	47
pl Poland	11	14	26	30
pt Portugal	15	22	26	31
si Slovenia	:	:	47	48
sk Slovakia	:	:	23	23
fi Finland	44	47	51	54
se Sweden	:	:	:	73
uk United Kingdom	50	55	56	60
bg Bulgaria	:	:	10	:
ro Romania	:	:	6	:
tr Turkey	:	:	7	:
is Iceland	:	:	81	84
no Norway	:	60	60	64
mk Macedonia	:	:	11	:
ca Canada	51	55	:	:
us United States	:	55	:	:
jp Japan	49	54	56	:
kr Korea (Republic of) (South)	70	69	86	:
au Australia	46	53	:	:

Table 6.12: Individuals who accessed Internet at least once a week

Geopolitical entity \ Statistics	A	B	C	D	E	F
eu25 European Union (25 countries)	43	68	69	66	72	78
eu15 European Union (15 countries)	46	69	72	67	73	80
be Belgium	53	76	77	75	79	88
cz Czech Republic	26	51	51	52	66	63
dk Denmark	73	90	94	87	89	95
de Germany (including ex-GDR)	54	81	84	77	69	88
ee Estonia	54	83	:u	:u	69	95
gr Greece	18	37	41	32	50	48
es Spain	35	62	64	59	69	77
ie Ireland	31	34	33	34	59	45
it Italy	28	51	54	49	66	66
cy Cyprus	26	49	48	51	57	64
lv Latvia	36	75	71	79	67	81
lt Lithuania	30	65	64	66	61	85
lu Luxembourg (Grand-Duché)	63	83	86	80	88	87
hu Hungary	34	55	55	55	75	71
nl Netherlands	74	92	91	93	92	97
at Austria	49	74	75	74	75	91
pl Poland	29	62	64	60	64	74
pt Portugal	28	62	59	65	79	88
si Slovenia	40	:u	:u	:u	:u	:u
sk Slovakia	43	68	73	63	74	79
fi Finland	:	:	:	:	:	:
se Sweden	76	93	95	91	93	95
uk United Kingdom	54	74	75	72	76	86
bg Bulgaria	:	:	:	:	:	:
ro Romania	:	:	:	:	:	:
tr Turkey	:	:	:	:	:	:
is Iceland	81	94	95	93	96	98
no Norway	74	90	91	90	90	94
mk Macedonia	:	:	:	:	:	:

A: ind_total All Individuals
B: y16_24 Individuals, 16 to 24 years old
C: m_y16_24 Males, 16 to 24 years old
D: f_y16_24 Females, 16 to 24 years old
E: i5_6 Individuals with high formal education
F: stud Students
u: Unreliable or uncertain data

Table 6.13: Frequency of use: All individuals

Geopolitical entity \ Statistics	A+B	A	B	C	D
eu25 European Union (25 countries)	43	29	14	6	2
eu15 European Union (15 countries)	46	31	15	6	2
be Belgium	53	38	15	3	1
cz Czech Republic	26	10	16	6	0
dk Denmark	73	57	16	4	0
de Germany (including ex-GDR)	54	34	20	8	3
ee Estonia	54	40	14	4	1
gr Greece	18	11	7	3	1
es Spain	35	21	15	7	3
ie Ireland	31	17	14	5	2
it Italy	28	27	2	5	1
cy Cyprus	26	16	10	4	1
lv Latvia	36	23	14	5	1
lt Lithuania	30	16	14	4	1
lu Luxembourg (Grand-Duché)	63	44	20	5	1
hu Hungary	34	20	14	3	1
nl Netherlands	74	53	20	4	1
at Austria	49	32	17	5	2
pl Poland	29	17	12	5	1
pt Portugal	28	19	9	3	1
si Slovenia	40	27	13	5	:u
sk Slovakia	43	23	20	6	1
fi Finland	:	:	:	:	:
se Sweden	76	57	19	4	1
uk United Kingdom	54	34	20	9	4
bg Bulgaria	:	:	:	:	:
ro Romania	:	:	:	:	:
tr Turkey	:	:	:	:	:
is Iceland	81	65	16	4	1
no Norway	74	50	23	4	2
mk Macedonia	:	:	:	:	:

A+B	i_iuse	Percentage of individuals who accessed Internet, on average, at least once a week
A	i_iday	Percentage of individuals who accessed the Internet, on average, every day or almost every day in the last 3 months
B	i_iwk	Percentage of individuals who accessed the Internet, on average, at least once a week (but not every day) in the last 3 months
C	i_imth	Percentage of individuals who accessed the Internet, on average, at least once a month (but not every week) in the last 3 months
D	i_iltmth	Percentage of individuals who accessed the Internet, on average, less than once a month in the last 3 months
u:		Unreliable or uncertain data

Table 6.14: Frequency of use: Who used Internet in the last 3 months

Geopolitical entity \ Statistics	A+B	A	B	C	D
eu25 European Union (25 countries)	84	56	28	12	4
eu15 European Union (15 countries)	84	58	27	12	4
be Belgium	92	66	25	6	2
cz Czech Republic	80	30	50	18	1
dk Denmark	95	74	21	5	0
de Germany (including ex-GDR)	84	52	31	12	4
ee Estonia	91	67	23	7	2
gr Greece	82	49	33	14	5
es Spain	79	46	33	15	6
ie Ireland	83	46	36	13	5
it Italy	84	79	5	14	2
cy Cyprus	84	51	33	12	4
lv Latvia	87	54	33	11	2
lt Lithuania	87	47	40	11	2
lu Luxembourg (Grand-Duché)	92	63	29	7	2
hu Hungary	90	54	37	8	2
nl Netherlands	93	67	26	5	2
at Austria	88	58	30	9	3
pl Poland	84	49	35	13	3
pt Portugal	87	59	28	10	3
si Slovenia	86	58	28	12	:u
sk Slovakia	85	45	40	12	2
fi Finland	:	:	:	:	:
se Sweden	93	70	24	5	1
uk United Kingdom	81	51	30	13	6
bg Bulgaria	:	:	:	:	:
ro Romania	:	:	:	:	:
tr Turkey	:	:	:	:	:
is Iceland	94	76	18	5	1
no Norway	92	63	29	6	2
mk Macedonia	:	:	:	:	:

A+B	i_iuse	Percentage of individuals who accessed Internet, on average, at least once a week
A	i_iday	Percentage of individuals who accessed the Internet, on average, every day or almost every day in the last 3 months
B	i_iwk	Percentage of individuals who accessed the Internet, on average, at least once a week (but not every day) in the last 3 months
C	i_imth	Percentage of individuals who accessed the Internet, on average, at least once a month (but not every week) in the last 3 months
D	i_iltmth	Percentage of individuals who accessed the Internet, on average, less than once a month in the last 3 months
u:		Unreliable or uncertain data

Table 6.15: Main reasons why households obtained the internet access

Individual Type & Statistics	A	B	C	D	E	F	G
Czech Republic: total	22.1	57.3	56.2	47.5	39.0	22.3	2.6
Faculty students	9.2	51.5	86.9	94.6	32.3	36.9	0.8
Difference	−12.9	−5.8	30.7	47.1	−6.7	14.6	−1.8
Status	↘↘	↘	↗↗	↗↗	↘	↗	□

A: Wish of children
B: Looking for information not related to work and education
C: Communication
D: Education
E: Work
F: Entertainment
G: Other reason

Table 6.16: Frequency of the internet use by individuals in the last 3 months

Individual type \ Statistics	**A+B**	**A**	**B**	**C**	**D**
Total 15+	80.2	29.7	50.5	18.0	1.3
Males 15+	82.4	32.6	49.8	16.2	1.1
Females 15+	77.6	26.4	51.2	20.1	1.5
Age group 15-24	80.8	27.7	53.1	17.4	:
Tertiary	90.8	41.3	49.5	8.0	:
Students	81.5	26.5	55.0	17.3	:
Faculty students	95.7	59.0	36.6	1.9	0.0
Faculty males	93.2	68.2	25.0	2.3	0.0
Faculty females	96.5	55.7	40.9	1.7	0.0
Faculty students − Total 15+	15.5	29.3	−13.9	−16.1	−1.3
Status	↗↗	↗↗	↘	↘↘	□

Table is in average week in the last 3 months.
A: Every day or nearly every day.
B: 1-4 days a week.
C: At least once a month but not every week.
D: Less than once a month.

Table 6.17: Time spent on the Internet by individuals

Individual type \ Statistics	**A**	**B**	**C**	**D**
Total 15+	24.4	48.3	21.3	4.3
Males 15+	20.8	47.0	24.7	5.9
Females 15+	28.5	49.8	17.4	2.5
Age group 15-24	21.7	46.5	23.6	5.2
Tertiary	14.1	50.6	27.7	5.7
Students	21.4	46.1	24.8	4.9
Faculty students	3.7	26.1	38.5	29.8
Faculty males	9.1	20.5	31.8	38.6
Faculty females	1.7	27.0	41.7	27.0
Faculty students – Total 15+	−20.7	−22.2	17.2	5.5
Status	↘↘	↘↘	↗↗	↗↗

Table is in an average for one week.
A: 1 hour and less.
B: More than 1 hour but no more than 5 hours.
C: More than 5 hours but no more than 20 hours.
D: More than 20 hours.

7 Research Stage II: Questionnaire with Questions Related to University Courses

7.1 Notes on Methodology

In my research stage II, I used questions related to three courses I am actually teaching this academic year 2006/2007:

1. DTP and Electronic Publishing (in Czech *DTP a elektronické publikování*)
2. Computerised Data Processing (in Czech *Počítačové zpracování dat*)
3. Quantitative Methods for Managerial Decision Making (in Czech *Kvantitativní metody v rozhodování*)

I was and I am still teaching other courses but I avoided questions related to them. The main reason was that these questions fulfilled my expectations and they were enough to support my conclusions. There was no need to add more or in-depth questions to demonstrate my purposes.

I asked for co-operation only from Czech students in *Kvantitativní metody v rozhodování* course. The number of Erasmus students would not serve any purpose for statistical conclusions.

The research was focused on Czech students and students studying in the Faculty of Management and Economics only.

The importance of following three courses is simple to describe. These courses would become a part of the EVENE project and feedback from students on how to improve them was appreciated.

7.2 Questions Related to *DTP and Electronic Publishing* (DEP) Course

This part of the questionnaire was focused on specific and concrete typography and informatics issues.

Table 7.1: Adding non-breakable spaces summary

Individual type \ Software	HTML	Word	LaTeX
Faculty: all students	8.1	56.5	0.0
Faculty: men	18.2	61.4	0.0
Faculty: women	4.3	55.7	0.0

Table 7.2: Adding non-breakable dashes summary

Individual type \ Software	HTML	Word	LaTeX
Faculty: all students	6.8	37.9	0.0
Faculty: men	15.9	47.7	0.0
Faculty: women	3.5	34.8	0.0

The first question was 'Am I able to add non-breakable spaces on HTML page, in Microsoft Word, or in LaTeX.' The question summary gives us Table 7.1 on page 122.

The second question was 'Am I able to add non-breakable dashes on HTML page, in Microsoft Word, or in LaTeX.' The question summary gives us Table 7.2 on page 122.

The next question was 'Do I know how to validate my web pages.' Only 8.7% (14 out of 161), 13.6% of men and 7.0% of women know how to do that.

The question on the background of technical preparations for electronic forms in HTML was an important one. The note was that technically it didn't have to work as an internet interface. Only 19 out of 161 (11.8%) people committed themselves that they are able to do that. In detail it meant 22.7% men (10 out of 44) and 7.8% (9 out of 115).

Next two subquestions were related to the previous one. The questions were if they are able to get an electronic form to work by using PHP, ASP, or another programming language; e.g. MySQL, MSSQL, or another database system for storing data purposes. Only 3 out of 161 (women) are able to do that in PHP and get it to work. One student pointed out that he is able to do that in Java. That means 4 out of 161 students (2.5%) is able to get an

internet interface to work. The second subquestion summary is nearly the same. Only 2 out of 161 (both women) are able to store data in MySQL. No one else is able to do that in MySQL nor using another database system.

Briefly stated it means that only 1.2% of all students are able to get an electronic market survey functioning for their thesis, if necessary, at the time of answering my questionnaire. I must mention, again, that the students were fourth-year students and they had already defended their Bachelor Theses where a market survey is strongly recommended with all required statistical analyses and conclusions.

The next question was related to electronic forms as well. It was asking students if they were able to prepare an electronic formular as a DOC (plus its locking), PDF (plus unblocking right for editing this file), FDF, or another way. The results are:

DOC: 30.4% (49 out of 161), 45.5% of men and 24.3% of women.
PDF: 26.1% (42 out of 161), 47.7% of men and 17.4% of women.
No one was able to use a FDF file or any other way.

The problem of these methods of preparing electronic forms is how to do analyses automatically. That's a different problem.

— — —

To install trial versions of most software products, related to statistics, mathematics or any other field we can think of, we need the administrator's rights. This was the next question: if a student has access to a personal computer where she/he can do installations.[α]

My results show that these rights have 32.9% (53 out of 161) of all students, 59.1% men and 23.5% women. To install software like Minitab or Statgraphics only one third of all students could do this: That is not welcoming news either.

The second to last question from this part tried to obtain information on students' ability to install a web-domain server.

[α] Students have neither permission to do any installation or writing into INI files in the library study rooms nor in the school computer laboratories at the Tomas Bata University in Zlín. Even teachers don't have this permission usually.

After obtaining these proportions we are learning more alarming news. Only 8.1% students (13 out of 161) can do this; to be more specific once more that is 11.4% of men and 7.0% of women.

The last question in this block of questions was if students knew what a scientific poster is and how to prepare one. No one had either this knowledge or these skills.

7.3 Questions Related to *Computerised Data Processing* (CDP) Course

I prepared a couple of questions related to a new course (that time: Winter 2005) taught in the Faculty of Management and Economics. The topic was storing historical data for future comparisons. Now, I present here the basic figures.

There were four questions: 'If students could calculate χ^2-test when raw data are given.'; 'If they could calculate χ^2-test when cross tabulation data (contingency table) are given.'; 'If they could calculate the Pearson correlation coefficient.'

The question mentioned above had subquestions: 'To hand, without using additional literature.'; 'To hand, with the use of statistical literature.'; and 'With the use of statistical software.' The results are given in Table 7.3 on page 125.

The fourth question asked about, "In which software they could use variables and loop-cycles?" The results are given in Table 7.4 on page 125; there were no notes in 'Others'. The results were really bad. In short it can be said that there are almost no students with programming skills in the Faculty of Management and Economics in Zlín.

Table 7.3: Statistical analysis computations (%)

Method / Statistics	To hand without books	To hand with books	Using software
χ^2-test with raw data: all	0.6	32.3	11.2
only men	2.3	40.9	15.9
only women	0.0	28.7	8.7
χ^2-test with table: all	1.2	35.4	12.4
only men	2.3	40.9	18.2
only women	0.9	33.0	9.6
Correlation coefficient: all	0.0	28.6	7.5
only men	0.0	29.5	9.1
only women	0.0	28.7	7.0

Table 7.4: The use of programming tools (%)

Programming tool	All students	Men	Women
BASIC	1.9	0.0	2.6
Pascal	3.7	9.1	1.7
DELPHI	0.0	0.0	0.0
Java	1.2	0.0	1.7
PHP	1.2	0.0	1.7
C, C++	0.6	2.2	0.0
Visual Basic	1.9	0.0	2.6
Java Script	0.6	0.0	0.8

7.4 Questions Related to *Quantitative Methods for Managerial Decision Making* (QMD) Course

The final block of questions were related to the course I am actually teaching in English (Erasmus programme) and Czech (forth-year students; first-year Master's degree study programme) in parallel.

During classes we are using WinQSB version 1.00 created by Yih-Long Chang. I excluded this software product from the analyses. The problem may be that this software product is possibly no longer being developed by Yih-Long Chang.

The results are presented in three tables: in Table 7.5 on page 127 (use of statistical software), Table 7.6 on page 127 (use of mathematical and optimisation software) and Table 7.7 on page 127 (use of simulation software). The field 'Others' was empty all the time. I selected the software used mostly in the Czech Republic. For an updated list of commercial and non-commercial software products see *Software Library for Operations Research* website.[β]

The three questions above were included in the brief analyses. The results indicate that using software in the fields of mathematics and statistics is almost unknown area to our students.[γ]

The forth question in this part is an open-ended question (text field) and is related to the course development itself but the results are not presented here.

[β] ⟨http://www.wior.uni-karlsruhe.de/bibliothek/⟩

[γ] It's upto teachers to change it if possible and convenient to the actual study programmes.

Table 7.5: The use of statistical software (%)

Statistical software	All students	Men	Women
Minitab	1.2	0.0	1.7
Statgraphics	0.0	0.0	0.0
SPSS	0.0	0.0	0.0
ℝ	0.0	0.0	0.0
StatXact	0.0	0.0	0.0
LogXact	0.0	0.0	0.0
MS Excel Add-ins	18.0	22.7	16.5

Table 7.6: The use of optimization software (%)

Optimization software	All students	Men	Women
MS Excel Solver	39.8	56.8	33.0
MATLAB	0.0	0.0	0.0
MuPAD	0.0	0.0	0.0
Mathematica	0.6	0.0	0.9
Evolver	0.0	0.0	0.0
Maple	0.6	0.0	0.9

Table 7.7: The use of simulation software (%)

Simulation software	All students	Men	Women
MATLAB	0.6	2.3	0.0
Simulink	0.0	0.0	0.0
Powersim	0.0	0.0	0.0
DYNAST	0.0	0.0	0.0
SIMUL8	0.0	0.0	0.0
SIMPROCESS	0.0	0.0	0.0

7.5 Which Study Materials Do Students Prefer During Their Studies?

The last question I want to mention is the preference system of study materials from the students' point of view. The summary is given in Table 7.8 on page 128. The last subquestion was an open-ended field. They mainly pointed to readability and the content of study materials plus the *art of speech making* by lecturers.

Table 7.8: Preferences on study materials (%)

Study material	All students	Men	Women
Book/Exercise book	24.8	31.8	21.7
Textbook/Workbook	78.3	79.5	78.3
Lecture notes	46.0	36.4	50.4
Notes from seminars	55.9	47.7	59.1
Internet resources	4.3	6.8	3.5

It can be noticed from Table 7.8 on page 128 the order would be: textbook/workbook; notes form seminars; lecture notes; book/exercise book and Internet resources.

From my subjective point of view: only 4.3% of all students using Internet resources for study purposes mark it is as a good option. This is the worst figure I have learned here in this doctoral thesis. This is the area we (teachers) need to improve in the future.

Closing notes. I should have used more questions about this topic: about students' e-learning skills, to add and use scales on each study material, to ask them about their opinions on specific course study materials etc.

8 Summary of Research Parts I+II

Let me summarise the key findings and note and comment on some more facts and figures.

8.1 Research Part I

The idea of using the same questions during my own questionnaire as EuroStat and the Czech Statistical Office did came into my mind during my Erasmus exchange in Savonia Polytechnic, Varkaus, Finland, when I was preparing a lecture on "*The Internet and its use in different countries*," topic.

From the cluster analysis: Finland stands alone far above other countries as a cluster on its own. Computer laboratories in Varkaus are incredible. They have a lot of computers, enough space to use them during the day and dataprojectors in every single one. In bigger computer labs you can find even two dataprojectors. I don't like to use commercial software, I prefer open source software, but still the real world is using them. They have had tools from Adobe, Macromedia, SPSS installed on every single computer.

EuroStat does incredible work when preparing surveys and collecting data from local official statistics offices. The idea of publishing data for free (mostly Internet Explorer required) has many advantages. After the registration process we are free to downloading anything from the EuroStat server quite fast. I welcome and appreciated this very much.

However, I missed key questions in Czech Statistical Office's survey. For instance, questions on basic computer skills. These questions shoudn't be only recommended by EuroStat. Some of them should be compulsory.

Faculty students are above-average in most indicators excluding programming skills. Men at the faculty are slightly better than women. From time to time the difference is significantly big statistically.

The average of the Czech Republic is below-average, usually in the lowest part, compared with other European Union's countries in most indicators.

8.2 Research Part II

I did not have a lot of oportunities to get feedback from my students. So I took a chance and inserted into my questionnaire a few questions related to my actual courses. It's always good to know what students (don't) use, (don't) need and would(n't) like to know.

However, to increase students' chances in the European Union labour market calls for sacrifices. We, teachers, need to and have to push students quite hard.

Time-saving is the key element in the modern world for success. It includes statistics, mathematics, programming and typography as well. No exceptions to faculty students.

More about this issue can be found in Section 11 *Recommendations to University Lecturers* starting on page 200.

9 Selected Solved Marketing-Informatics Tasks

We show selected problems which we have faced in the past and which were very *real*. Further we will discuss them in nearly the same way as we can imagine them during lectures, seminars, and workshops, or even over the Internet using an ℮-learning server.

We will not be preparing a practice book we will try to discuss the concept and the major types of difficult problems from a lecturer's point of view instead.

9.1 Marketing Tasks

Marketing tasks \ Used form (printed or electronic)		
	Cell I Market research A printed form	**Cell II** Market research An electronic form
	Cell III Promotion A printed form	**Cell IV** Promotion An electronic form

Figure 9.1: Taxonomy of discussed marketing tasks

Finally we get to the assignment of solved problems to the presented matrix taxonomy seen in Figure 9.1 above.

We present you with a couple of tasks from those collected in the past three years with their technical solutions together with a different level of discussion.

Table 9.1: Taxonomy of solutions to marketing-informatics tasks

As we can notice, a few problems could easily cross different marketing tasks. We have tried to put them into a cell where solved tasks primarily belong.

9.2 Tasks at Universities

Tasks and problems to be solved at universities can be unique, hard to find elsewhere, and also very often multi-disciplinary.

An average teacher becomes a manager in a common sense. It means he or she becomes a regular decision maker working under pressure with a strong need for saving time. He or she is not only an expert in his or her field like mathematics, statistics, programming, computer science or even typography.

Definition 19 ... University lecturer = time manager and
solver of unique problems.

Most of the marketing-informatics problems mentioned above in the previous Section 9.1 are typical for academic fields as well as for the commercial environment.

Let's start with the problems' definition and their solutions.

Cell I: Market Research: A Printed Form

9.3 The Difficulty of Printed Materials via Fog Index

The main function of readability tests is to give a quick assessment about the density of the writing. Readability tests however cannot tell you how easily a reader can understand the information in the text.

The Fog Index is one of these readability tests,[α] which is actually used by the Centre for Further and Distant Education. I have programmed the core of the invented software and the later extended product which is now offered, free of charge, to the students of the basic level of ℮-learning studies.[β] The distance studies are offered to many universities in the Czech Republic. If you obtain the Certificate, you are allowed to prepare study materials for the students of these studies, long-life and ℮-learning courses.

An easier variant of this problem in Czech documents was required by the Centre for Further and Distant Education in Olomouc[γ] to be able to calculate the Fog Index (also known as Gunning-Fog Index).[δ]

Program 9.1: Counting Gunning-Fog Index (The Core)

Start of discussed code Fog Index

```
CLS
PRINT "VYPOCET FOG INDEXU. "
PRINT

PRINT "Vysledky se ukladaji do souboru DELKY.TXT."
PRINT "Ve vstupnim souboru je posledni radek prazdny."
PRINT
INPUT "Zadejte vstupni soubor (napr. vstup.txt): ", aa$
DIM a(50)
CLS

OPEN aa$ FOR INPUT AS #1
OPEN "delky.txt" FOR OUTPUT AS #2

PRINT #2, "VYPOCET FOG INDEXU. "
PRINT #2,
```

[α] ⟨http://juicystudio.com/services/readability.php⟩

[β] ⟨http://www.cdiv.upol.cz/www/autori_obtiznost.htm⟩

[γ] ⟨http://www.cdiv.upol.cz/⟩

[δ] Fog Index is one of three used by amazon.com in Text Stats.

```
DO

INPUT #1, a$

FOR k = 1 TO LEN(a$)

c = c + 1
IF MID$(a$, k, 1) = " " OR MID$(a$, k, 1) = "," OR MID$(a$, k, 1) = "." OR
  MID$(a$, k, 1) = ";" or MID$(a$, k, 1) = „" OR MID$(a$, k, 1) = ""“" OR
  MID$(a$, k, 1) = "(" OR MID$(a$, k, 1) = ")" OR MID$(a$, k, 1) = ":" THEN
        a(c - 1) = a(c - 1) + 1
        c = 0
END IF
IF MID$(a$, k, 1) = "." THEN vet = vet + 1

NEXT k

LOOP UNTIL (EOF(1))
vv = 0

FOR l = 1 TO 40 STEP 2
PRINT , "";
PRINT USING "##"; l;
PRINT " znak. slov je ";
PRINT USING "####"; a(l);
PRINT , "";
PRINT USING "##"; l + 1;
PRINT " znak. slov je ";
PRINT USING "####"; a(l + 1)

PRINT #2, "";
PRINT #2, USING "##"; l;
PRINT #2, " znak. slov je ";
PRINT #2, USING "####"; a(l);
PRINT #2, , "";
PRINT #2, USING "##"; l + 1;
PRINT #2, " znak. slov je ";
PRINT #2, USING "####"; a(l + 1)

cc = cc + a(l) + a(l + 1)
IF l > 2 THEN vv = vv + a(l) + a(l + 1)
REM SLEEP
NEXT l

PRINT
PRINT #2,

PRINT "Po stisku klavesy se vypocte FOG Index."
30 d$=inkey$
if d$="" then goto 30
CLS

REM PRINT vv
PRINT "VYPOCET FOG INDEXU. "
```

```
PRINT
PRINT "Ve vstupnim souboru je slov: "; cc
PRINT "                       a vet: "; vet
PRINT
PRINT "Prumerny pocet vet ve 100 slovech je S ="; vet * 100 / cc
PRINT "Prumerny pocet slov ve 100 slovech je A = 100 / S ="; 100 / (vet * 100 / cc)
PRINT "Prumerny pocet 3+ znakovych slov je S ="; vv * 100 / cc
fog = 5 + .4 * (vet * 100 / cc + vv * 100 / cc)
PRINT "FOG Index je tedy F = 5 + 0,4 (A + L) ="; fog
PRINT
PRINT "Zaver: ";
IF fog < 24.5 THEN PRINT "FOG Index je mensi nez 24,5, tedy material je jednoduchy
  ke cteni a pochopeni, vety jsou kratke a je zde malo dlouhych slov."
IF fog < 29.5 AND fog >= 24.5 THEN PRINT "FOG Index je v int. <24,5; 29.5), tedy
  material je dosti obtizny, hodne lidi bude cist vety i vicekrat nez jednou."
IF fog < 39.5 AND fog >= 29.5 THEN PRINT "FOG Index je v int. <29,5; 39.5), tedy
  material je skoro jiste odborna kniha."
IF fog > 39.5 THEN PRINT "FOG Index je vetsi nez 39,5, tedy text
  je tezky az necitelny."
PRINT
PRINT "Pokracujete stiskem libovolne klavesy."
PRINT "Vsechny zaznamy jsou v souboru delky.txt."
print ""
PRINT "Hezky den preje Pavel Striz."


PRINT #2, "Ve vstupnim souboru je slov: "; cc
PRINT #2, "                         a vet: "; vet
PRINT #2,
PRINT #2, "Prumerny pocet vet ve 100 slovech je S ="; vet * 100 / cc
PRINT #2, "Prumerny pocet slov ve 100 slovech je A = 100 / S ="; 100/(vet*100/cc)
PRINT #2, "Prumerny pocet 3+ znakovych slov je S ="; vv * 100 / cc
fog = 5 + .4 * (vet * 100 / cc + vv * 100 / cc)
PRINT #2, "FOG Index je tedy F = 5 + 0,4 (A + L) ="; fog
PRINT #2,
PRINT #2, "Zaver: ";
IF fog < 24.5 THEN PRINT #2, "FOG Index je mensi nez 24,5, tedy material je
  jednoduchy ke cteni a pochopeni, vety jsou kratke a je zde malo dlouhych slov."
IF fog < 29.5 AND fog >= 24.5 THEN PRINT #2, "FOG Index je v int. <24,5; 29.5),
  tedy material je dosti obtizny, hodne lidi bude cist vety i vicekrat nez jednou."
IF fog < 39.5 AND fog >= 29.5 THEN PRINT #2, "FOG Index je v int. <29,5; 39.5),
  tedy material je skoro jiste odborna kniha."
IF fog > 39.5 THEN PRINT #2, "FOG Index je vetsi nez 39,5, tedy text
  je tezky az necitelny."
PRINT #2,
PRINT #2, "Hezky den preje Pavel Striz."


CLOSE all
40 d$=inkey$
if d$="" then goto 40
```

End of discussed code Fog Index

9.4 Author's Fees Problem Solved for the FaME of the TBU in Zlín

This problem, its solution approximations and exact solution, the numerical result of the example and discussions are also analyzed in depth in the Doctoral Thesis Summary.

I will discuss here the concept of solving a difficult problem. This one mainly belongs to the informatics and typography categories, although it also belongs to some other categories.

Definition of the Author's Fees Problem

This real-world problem arose at the Centre for Further Education in the FaME at the TBU in Zlín. I think that this is a good example of many difficult problems I have faced in the past.

The Centre for Further Education is responsible for calculating the author's fees when textbooks and practice books arrive to be printed. Author's fees computations are based on the number of characters and the content of pictures and mathematical formulae, and of course, on the actual price per one author's sheet [AS]. The price is fixed by the faculty. We will use an imaginary price of 1 000 price units.

Finding the number of chars is not the major problem here. The problem is to compute content in squared centimeters of all graphics and mathematical formulae, e.g. *see* Figure9.2(a) on page 141 which is an original input page.

First Guess: Use a Number of Pages

We can guess the number of author's sheets by the number of pages, *see* ⟦**Ryb01**, page 51⟧. The actual number of author's sheets differs from mathematical textbooks to textbooks nearly with no graphics and mathematical formulae. If we guess this number badly, the authors might protest against it. That is not the best strategy and the most effective way.

For instance, the delivered textbook has 76 pages. Then the guess is that the number of author's sheets is 76, too.

Second Guess: Use Lattice

This was the former method of guessing before implementing my idea which was used to solve this kind of task at the Centre for Further Education. The principle is this.

We put a transparency matrix over the page and we count the number of cells which contain more than 50% of graphics and mathematical formulae. The result of this procedure is that page 93 of the textbook has 11 cells which we can count in. Let us say that one cell is 2 cm $\times$ 2 cm – *see* Figure 9.2(b). Then we can note down that page 93 contains 44 cm sq. Now proceed to page 94 etc.

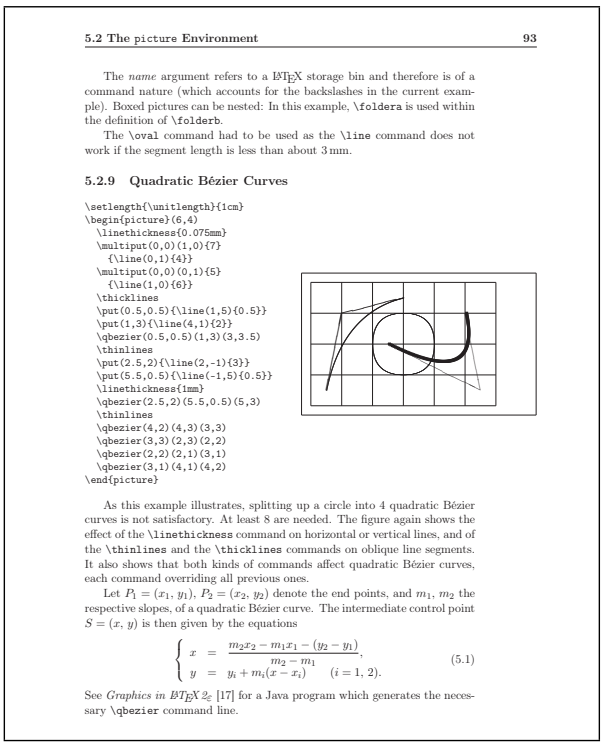
Third Guess: Use Lattice with Smaller Grids – the Actual State

If we want to be more accurate, we have to use a matrix with smaller grids, of course. We just replace the transparency matrix for another one. In this case we used 1 cm $\times$ 1 cm – *see* Figure 9.2(c). The result is that a page contains 60 cells with more than 50% of graphics. In this case it means that the approximate result is 60 cm sq.

It took hours just to compute one single textbook or practice book. This former method was used for years.

Even Better Guess: Use Bitmap Graphics as an Input Lattice

One fine guess technique is to use a scanner and scan the page. Then you can choose the resolution of a bitmap output, e.g. 600 dpi. Then you just mark the graphics with red rectangles or points, if you have the rest in black-white, and let PHP with GD library compute it for you. This is the first option to have a semi-automatic computation. However, this takes a lot of time because of scanning and marking. The actual code in PHP is not presented here, even though it is an impressive, small piece of newer programming.



5.2 The picture Environment 93

The *name* argument refers to a LaTeX storage bin and therefore is of a command nature (which accounts for the backslashes in the current example). Boxed pictures can be nested: In this example, \foldera is used within the definition of \folderb.

The \oval command had to be used as the \line command does not work if the segment length is less than about 3 mm.

5.2.9 Quadratic Bézier Curves

```
\setlength{\unitlength}{1cm}
\begin{picture}(6,4)
  \linethickness{0.075mm}
  \multiput(0,0)(1,0){7}
    {\line(0,1){4}}
  \multiput(0,0)(0,1){5}
    {\line(1,0){6}}
  \thicklines
  \put(0.5,0.5){\line(1,5){0.5}}
  \put(1,3){\line(4,1){2}}
  \qbezier(0.5,0.5)(1,3)(3,3.5)
  \thinlines
  \put(2.5,2){\line(2,-1){3}}
  \put(5.5,0.5){\line(-1,5){0.5}}
  \linethickness{1mm}
  \qbezier(2.5,2)(5.5,0.5)(5,3)
  \thinlines
  \qbezier(4,2)(4,3)(3,3)
  \qbezier(3,3)(2,3)(2,2)
  \qbezier(2,2)(2,1)(3,1)
  \qbezier(3,1)(4,1)(4,2)
\end{picture}
```

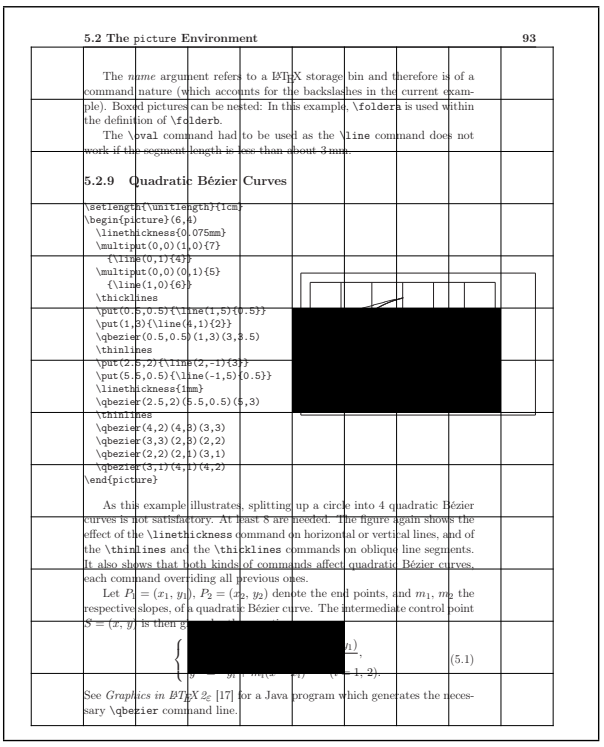
As this example illustrates, splitting up a circle into 4 quadratic Bézier curves is not satisfactory. At least 8 are needed. The figure again shows the effect of the \linethickness command on horizontal or vertical lines, and of the \thinlines and the \thicklines commands on oblique line segments. It also shows that both kinds of commands affect quadratic Bézier curves, each command overriding all previous ones.

Let $P_1 = (x_1, y_1)$, $P_2 = (x_2, y_2)$ denote the end points, and m_1, m_2 the respective slopes, of a quadratic Bézier curve. The intermediate control point $S = (x, y)$ is then given by the equations

$$\begin{cases} x &= \dfrac{m_2 x_2 - m_1 x_1 - (y_2 - y_1)}{m_2 - m_1}, \\ y &= y_i + m_i(x - x_i) \qquad (i = 1, 2). \end{cases} \tag{5.1}$$

See *Graphics in LaTeX 2ε* [17] for a Java program which generates the necessary \qbezier command line.

(a) Original page taken from [**OPHS02**, page 93].



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    {\line(0,1){4}}
  \multiput(0,0)(0,1){5}
    {\line(1,0){6}}
  \thicklines
  \put(0.5,0.5){\line(1,5){0.5}}
  \put(1,3){\line(4,1){2}}
  \qbezier(0.5,0.5)(1,3)(3,3.5)
  \thinlines
  \put(2.5,2){\line(2,-1){3}}
  \put(5.5,0.5){\line(-1,5){0.5}}
  \linethickness{1mm}
  \qbezier(2.5,2)(5.5,0.5)(5,3)
  \thinlines
  \qbezier(4,2)(4,3)(3,3)
  \qbezier(3,3)(2,3)(2,2)
  \qbezier(2,2)(2,1)(3,1)
  \qbezier(3,1)(4,1)(4,2)
\end{picture}
```

As this example illustrates, splitting up a circle into 4 quadratic Bézier curves is not satisfactory. At least 8 are needed. The figure again shows the effect of the \linethickness command on horizontal or vertical lines, and of the \thinlines and the \thicklines commands on oblique line segments. It also shows that both kinds of commands affect quadratic Bézier curves, each command overriding all previous ones.

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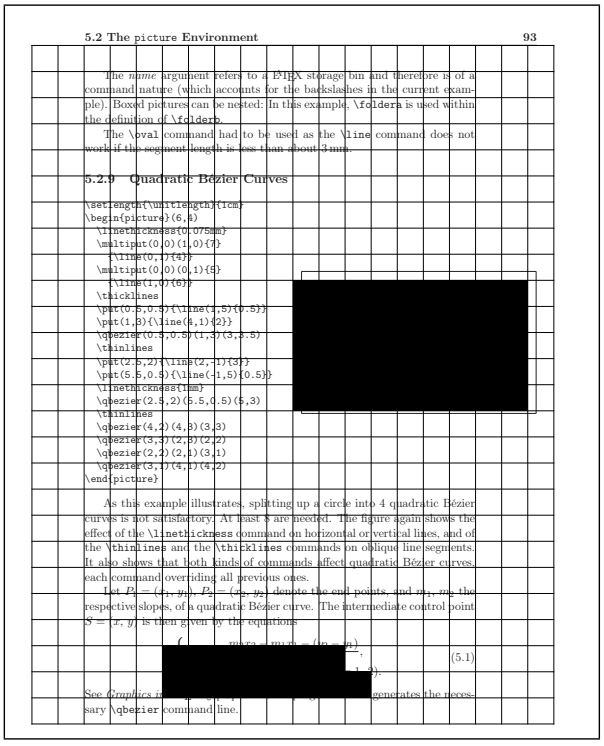
(5.1)

See *Graphics in LaTeX 2ε* [17] for a Java program which generates the necessary \qbezier command line.

(b) Lattice with bigger grids.



5.2 The picture Environment 93

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The \oval command had to be used as the \line command does not work if the segment length is less than about 3 mm.

5.2.9 Quadratic Bézier Curves

```
\setlength{\unitlength}{1cm}
\begin{picture}(6,4)
  \linethickness{0.075mm}
  \multiput(0,0)(1,0){7}
    {\line(0,1){4}}
  \multiput(0,0)(0,1){5}
    {\line(1,0){6}}
  \thicklines
  \put(0.5,0.5){\line(1,5){0.5}}
  \put(1,3){\line(4,1){2}}
  \qbezier(0.5,0.5)(1,3)(3,3.5)
  \thinlines
  \put(2.5,2){\line(2,-1){3}}
  \put(5.5,0.5){\line(-1,5){0.5}}
  \linethickness{1mm}
  \qbezier(2.5,2)(5.5,0.5)(5,3)
  \thinlines
  \qbezier(4,2)(4,3)(3,3)
  \qbezier(3,3)(2,3)(2,2)
  \qbezier(2,2)(2,1)(3,1)
  \qbezier(3,1)(4,1)(4,2)
\end{picture}
```

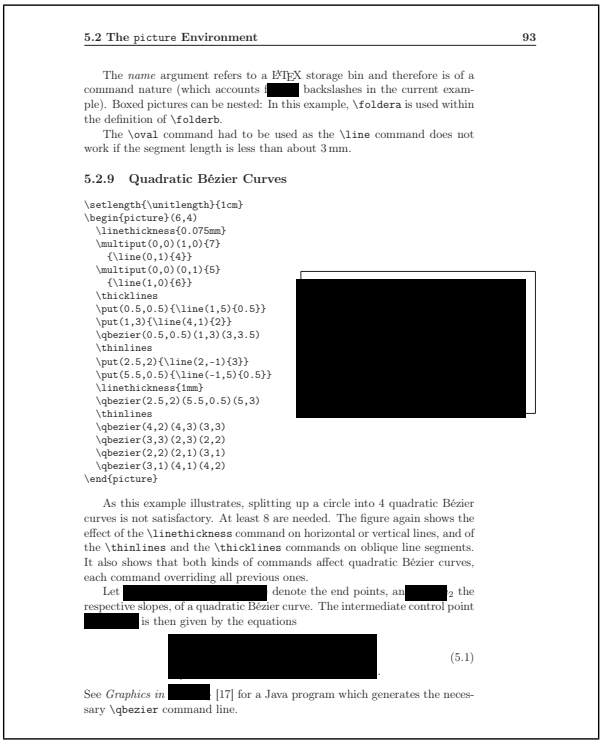
As this example illustrates, splitting up a circle into 4 quadratic Bézier curves is not satisfactory. At least 8 are needed. The figure again shows the effect of the \linethickness command on horizontal or vertical lines, and of the \thinlines and the \thicklines commands on oblique line segments. It also shows that both kinds of commands affect quadratic Bézier curves, each command overriding all previous ones.

Let $P_1 = (x_1, y_1)$, $P_2 = (x_2, y_2)$ denote the end points, and m_1, m_2 the respective slopes, of a quadratic Bézier curve. The intermediate control point $S = (x, y)$ is then given by the equations

(5.1)

See *Graphics in* [17] for a Java program which generates the necessary \qbezier command line.

(c) Lattice with smaller grids.



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    {\line(0,1){4}}
  \multiput(0,0)(0,1){5}
    {\line(1,0){6}}
  \thicklines
  \put(0.5,0.5){\line(1,5){0.5}}
  \put(1,3){\line(4,1){2}}
  \qbezier(0.5,0.5)(1,3)(3,3.5)
  \thinlines
  \put(2.5,2){\line(2,-1){3}}
  \put(5.5,0.5){\line(-1,5){0.5}}
  \linethickness{1mm}
  \qbezier(2.5,2)(5.5,0.5)(5,3)
  \thinlines
  \qbezier(4,2)(4,3)(3,3)
  \qbezier(3,3)(2,3)(2,2)
  \qbezier(2,2)(2,1)(3,1)
  \qbezier(3,1)(4,1)(4,2)
\end{picture}
```

As this example illustrates, splitting up a circle into 4 quadratic Bézier curves is not satisfactory. At least 8 are needed. The figure again shows the effect of the \linethickness command on horizontal or vertical lines, and of the \thinlines and the \thicklines commands on oblique line segments. It also shows that both kinds of commands affect quadratic Bézier curves, each command overriding all previous ones.

Let denote the end points, an 2 the respective slopes, of a quadratic Bézier curve. The intermediate control point is then given by the equations

(5.1)

See *Graphics in* [17] for a Java program which generates the necessary \qbezier command line.

(d) The only correct and exact solution.

Figure 9.2: Guessing principles for calculating author's sheets and fees over page 93 from an electronic book [**OPHS02**].

The Perfect Solution

Solve this problem as effectively and fast as possible without any form of guessing. You do have all the necessary author's source documents. The only correct and exact solution is 67.32 cm sq, *see* Figure9.2(d).

Lengths and widths of rectangles as you read the page are {1.2, 0.5}, {8.8, 5.3}, {5.5, 0.6}, {1.6, 0.6}, {2.1, 0.6}, {8.0, 1.7}, and {1.6, 0.6}.

Proof of the Author's Fees Problem

Let us use Visual Basic for Applications. The algorithm is simple and starts with opening files to save results.

Program 9.2: Author's fees problem

Start of discussed code Fees

```
1 Sub Fees()
2 'VBA macro for finding the amount of author's fees

3 Open "C:/author/inline.txt" For Output As #1
4 Open "C:/author/outline.txt" For Output As #2
```

End of first part

It continues with basic information about source document.

```
5 Selection.HomeKey Unit:=wdStory
6 Selection.EndKey Unit:=wdStory, Extend:=wdExtend
7 Set doc = ActiveDocument
8 MsgBox "In␣this␣document␣are␣(v␣dokumentu␣jsou):" & vbCr _
9    & vbCr & "InlineShape␣(obrázky,␣vzorce,␣vložené" _
10   & "␣objekty,␣...)␣=␣" & doc.InlineShapes.Count & vbCr _
11   & "Shapes␣(šipky,␣čáry,␣textová␣pole,␣diagramy,␣...)" _
12   & "␣=␣" & doc.Shapes.Count
```

End of part 2

Then the code defines variables and the first FOR cycle checks all in-line shapes. The results about heights and widths are saved into `inline.txt`.

```
Dim edge_a, edge_b, i,a,b, counter, sum1,sum2, partial
counter = 0
sum1 = 0
sum2 = 0
Print #1, "INLINE␣SHAPES"
Print #1, "Height;␣Width;␣Rectangle␣content"
Print #1, "Výška;␣Šířka;␣Obsah␣obdélníku"

For i = 1 To doc.InlineShapes.Count
    a = Selection.InlineShapes(i).Height
    b = Selection.InlineShapes(i).Width
    edge_a = PointsToCentimeters(a)
    edge_b = PointsToCentimeters(b)
    partial = edge_a * edge_b
    sum1 = sum1 + partial
    Print #1, edge_a; ";␣"; edge_b; ";␣"; partial
Next i

Print #1,
Print #1, "The␣grand␣total␣is:"; sum1; "cm␣squared."
Print #1, "Celkový␣součet␣je:"; sum1; "cm␣čtverečních."
Print #1, sum1

Selection.HomeKey Unit:=wdStory
With Dialogs(wdDialogEditFind)
    .Find = sum1
    .Show
End With
```

End of part 3

The second FOR cycle does the same as the first one with outline shapes. The algorithm checks all of them. The results are saved into outline.txt.

Start of part 4

```
Print #2, "OUTLINE␣SHAPES"
Print #2, "Height;␣Width;␣Rectangle␣content"
Print #2, "Výška;␣Šířka;␣Obsah␣obdélníku"

For i = 1 To doc.Shapes.Count
    ActiveDocument.Shapes(i).Select
    a = Selection.ShapeRange.Height
    b = Selection.ShapeRange.Width
    edge_a = PointsToCentimeters(a)
    edge_b = PointsToCentimeters(b)
    partial = edge_a * edge_b
    sum2 = sum2 + partial
    Print #2, edge_a; ";␣"; edge_b; ";␣"; partial
Next i

Print #2,
Print #2, "The␣grand␣total␣is:"; sum2; "cm␣squared."
Print #2, "Celkový␣součet␣je:"; sum2; "cm␣čtverečních."
Print #2, sum2
```

End of part 4

The program ends with messaging the grand total of content of all outline shapes. After that the program ends with closing all the opened files.

```
Selection.HomeKey Unit:=wdStory
With Dialogs(wdDialogEditFind)
    .Find = sum2
    .Show
End With
```

```
60 Close #1
61 Close #2

62 End Sub

            End of discussed code Fees
```

As we can notice the code is not complete. It is very close to the final version but it still gives us a lot of space for improvements and modifications.

The only problem remains. If two or more objects have a shared content, then we must group them (if they are not) to get the correct result. The grouping of objects is usually done by the author of the textbook.

Questions and Tasks Related to the Author's Fees Problem

All questions and tasks are being discussed and solved independently from the original numbered source code.

1. Can we swap lines 3 and 4? Or even lines 60 and 61?

   Solution: Yes, we can swap lines 3 and 4. We can also swap lines 60 and 61. Nothing serious would change.

2. What would happen if we delete or write apostrophes at the beginning of lines 5 and 6 in the code?

   Solution: These two lines of code are not necessary for knowing the real content of in-line and outline shapes. The `FOR` cycles are independent of the initial selection of the text or graphics. The program `Fees` would work perfectly.

3. How can we in Microsoft Word assign the [CTRL]+[SHIFT]+[U] key combination to run macro named `Fees` in an active document?

   Solution: Run the following macro or add these lines of code anywhere to the `Fees` macro and run your macro "blindly" one time.

Program 9.3: Assigning key combination

```
Assigning key combination

CustomizationContext = ActiveDocument
KeyBindings.Add KeyCode:=BuildKeyCode(wdKeyControl, _
   wdKeyShift, wdKeyU), KeyCategory:=wdKeyCategoryMacro, _
   Command:="Fees"
```

4. Actually, the results are in centimeters squared. Change the code so that the result will be in points squared.

   Solution: Modify lines 23 and 45 to the first shown line and lines 24 and 46 to the following form of the second line. Technically speaking, just add the letter 'a' ('b') and an apostrophe before command `PointsToCentimeters`.

Program 9.4: Fees problem in points squared

```
Results in points squared

   edge_a = a 'PointsToCentimeters(a)
   edge_b = b 'PointsToCentimeters(b)
```

5. Find a way how to get results in inches squared.

   Solution: Change the code similar to the previous task and get results in inches squared. One more time modify lines 23 and 45 to the first shown line and lines 24 and 46 to the following form of the second line. Technically just replace command `PointsToCentimeters` with command `PointsToInches` and you will get the results in inches squared.

Program 9.5: Fees problem in inches squared

```
Results in inches squared

    edge_a = PointsToInches(a)
    edge_b = PointsToInches(b)
```

6. Find a way how to insert results into Microsoft Word document to the position of the cursor.

   Solution: First of all, you must not either delete or mark lines 5 and 6 like in the question 2 on page 145. Add the first line of the following code anywhere before line 20—if you did then mark lines 5 and 6.

   Or add the first line before line 5 if you did not mark the two lines. Then just add the next two following lines to the original code anywhere after line 50. Anyway, you can see that marking lines 33 and 55 would not change the position of the message.

Program 9.6: Inserting results into Microsoft Word document

```
Inserting results into document

ActiveDocument.Bookmarks.Add Name:="place"

ActiveDocument.Bookmarks("place").Select
Selection.TypeText Text:=sum1 & ",␣" & sum2 & "␣cm␣sq."
```

7. From the version Microsoft Word 2003 and higher you can use, and it is a default tool, the Drawing Canvas. You can actually delete Drawing Canvas if you move your drawn object outside the Drawing Canvas. But many people rather change the size of Drawing Canvas than deleting it because they usually do not know that they can move their drawn objects and then delete Drawing Canvas. The question is if our algorithm counts Drawing Canvas as one of the in-line or

outline shapes and if the content of Drawing Canvas is added to the total of contents.

Solution: Authors of textbooks and practice books actually change width and height of Drawing Canvas so there is no reason to skip this type of object. As shown before, we have to group objects which share a part of the same content. However, we would like to know if the actual object is Drawing Canvas or not. Drawing Canvas is one of the Shape types and it does not matter how many shapes are inside. If you add the following lines right after line 41, you will know which object is the Drawing Canvas.

Program 9.7: Identifying the drawing canvas

Drawing canvas problem

```
If doc.Shapes(i).Type = 20 Then
   MsgBox "Actual␣object␣" & i & "␣of␣" _
   & doc.Shapes.Count & "␣is␣Drawing␣Canvas."
End If
```

The advantage of using Drawing Canvas tool is that you must not group objects anymore as a person who counts the content of all included pictures and mathematical formulae in the Microsoft Word document.

8. If we want to count the author's fees, we need, next to the content of pictures and mathematical formulae, number of characters and spaces. Send a message to the user about how many characters and spaces the actual document contains.

   Solution: This information is an internal information and we can get it by running the following lines of code. However, you will not know the number of Enters which is also an important character. So rather than using the internal information from File–Properties–Statistics or using the internal commands of Microsoft Word, let us do it this way.

Program 9.8: Number of chars in the document

The first discussed way

```
Selection.WholeStory
MsgBox "Document␣contains␣" _
   & Len(Selection.Text) & "␣chars."
```

There is, however, a not-so-pleasant and not-so-welcomed problem.

Number of chars in various tables (automatically created Table of Contents, List of Tables, List of Maps etc.), the Header, and Footer will not enter this procedure. The alternative way is to export your Microsoft Word document into `.txt` document and insert the content into a new document and run macro over it one time. This is the exact and the best way. By the way, we could also do the automation here but there is no need to discuss it right now.

9. Let us say that we know the exact number of chars from the previous task or we have just all chars in the active document (middle step in the previous task). Compute the number of author's sheets if we know these actual coefficients and the following mathematical relation 9.1. These coefficients were taken from [[**Ryb01**, page 51]]. These are taken as a standard in the Czech Republic, however the price per author's sheet is different from university to university.

$$n = \frac{l}{36\,000} + \frac{c}{2\,300}\ [\mathrm{AS}], \tag{9.1}$$

where: n – the number of author's sheets,

l – the number of characters with spaces,

c – the content in squared centimeters.

Solution: Let us assume that we have all chars in the actual document. Let us extend the original code, right after line 61, with these lines.

Program 9.9: Key improvement to the author's sheets problem

```
Number of author's sheets

Selection.WholeStory
chars = Len(Selection.Text)
sheets = chars / 36000 + (sum1 + sum2) / 2300
MsgBox "Number␣of␣author's␣sheets␣is:␣" & sheets
```

10. Imagine that you have the actual costs (we can call it price, values, or fees) for one author's sheet. Prepare the final version of code to compute the author's fees.

    Solution: The solution after solving the previous task and implementing the four lines of code is pretty clear. Add the following lines after those four from task 9. We are assuming that the actual cost per author's sheet is 1 000 price units.

Program 9.10: Final improvement to the author's fees problem

```
Author's fees

unitcost = 1000
costs = unitcost * sheets
MsgBox "Number␣of␣author's␣fees␣is:␣" & costs
```

11. Test your program over different real or imagined documents. Compare your outputs with your calculations on a sheet of paper computed without personal computer.

    An example: Let us say that I have got in my document one hundred letters 'a'. The result ought to be $2.80\bar{5}$ price units.

    Then I continued in editing my document. I drew one straight line which made a rectangle with width of 10 cm and height of 10 cm. I changed the width and height of Drawing Canvas too. Technically

I deleted it and only the drawn objects without the canvas remained. The author's fees are approximately 46.28 price units.

I added the second straight line with the same parameters like in the previous paragraph. This rectangle has no shared content with the first one. The costs are 89.78 price units.

I put these two straight lines together and the shared content is 50 squared centimeters. I forgot to group them. So the actual price is the same as before, that is 89.78 price units. However, I made a mistake. How is it possible? Because I did not group them. The shared content had to be subtracted from the total content. The costs must be 68.05 price units. It makes a difference, doesn't it?

12. *Additional task.* Let us say that we have a document written in OpenOffice.org Writer. Solve the Author's Fees Problem.

    Solution: OpenOffice.org Writer is very similar to Microsoft Word in many ways. However, it contains new programming tools, Python and BeanShell, not only some sort of Visual Basic and scripting language JavaScript like in Microsoft Word. The Author's Fees Problem is one of the problems we are exposed to in everyday life. How to avoid writing our final procedure in another programming language? It is easy. Export the document into DOC document or into RTF document. RTF format is called device independent. After that open this file in Microsoft Word and run your final macro version.

    There may be a problem with PDF format, which is usually vector-constructed. Luckily, all desktop publishing systems provide exports to alternative formats.

13. *Additional task.* Solve the Author's Fees Problem if you have LaTeX source code.

    Solution: We can use one of the converters available on the Internet. One of the best is TeX2Word [[**CC03**]] or TeX2RTF [[**ST+06**]]. However, they are not fully operational these days. The procedure can be rewritten directly with the TeX commands. I, the author of some textbooks and practice books, am using it these days as a support tool because I am working with TeX frequently. The PDF format is not accepted by the Centre for Further Education without DOC file or at

least the number of author's sheets. I am not using converters because I need an exact result. I decided to write my own procedure. The solution will be probably shown in the dissertation.

Additional task. The original code has outputs in Czech and in English. Then we added some improvements written in English only. Improve the final version of the code to allow the outputs switch to English and/or to Czech or another language.

Solution: The first part of the task is not too difficult. We can add a couple of lines similar to the way in which the English outputs are constructed. Let us mix tasks 9 and 10 and extend the code the following way.

Program 9.11: New language extensions

```
Short-cut solution:  bilingual extension

Selection.WholeStory
chars = Len(Selection.Text)
sheets = chars / 36000 + (sum1 + sum2) / 2300
MsgBox "Number␣of␣author's␣sheets␣is:␣" & sheets
MsgBox "Počet␣autorských␣výtisků␣je:␣" & sheets
unitcost = 1000
costs = unitcost * sheets
MsgBox "Number␣of␣author's␣fees␣is:␣" & costs
MsgBox "Autorský␣honorář␣je␣ve␣výši:␣" & costs
```

The solution of the second part might consume some more time in programming. We would need a new leading variable, language switcher, and a couple of string variables. We can work with the `IF` command which helps us to assign the right texts to the string variables. The solution to this task is not presented here.

9.5 Analysis of Bitmapped Graphics

Geometric Centre of a Bordered Object

The problem can be shown via a simple example. Let's look for centre of the Czech Republic.

Program 9.12: Centre of the Czech Republic (in pixels)

Start of discussed code Centre Point

```
<?php
$im=ImageCreateFromPng("pomocne3.png"); //mapa2 a pomocne3
$iks=imagesx($im);
$yps=imagesy($im);
$barev=imagecolorstotal($im);

$pixelu=$iks*$yps;
echo $im."<br>".$iks." * ".$yps." s ".$pixelu." pixely a s ".$barev." barvami";
?>

<br><br><img src="pomocne3.png" height=200 border=2><br>

<?
$bila=0;   $cerna=0;  $ostatni=0;

$cernaX=0; $cernaY=0;

$smes=0;   $smesX=0;  $smesY=0;

$smes2=0;  $smes2X=0; $smes2Y=0;

for ($radky=0;$radky<$iks;$radky++){
for ($sloupce=0;$sloupce<$yps;$sloupce++){

if (imagecolorat($im,$radky,$sloupce)==$barev-1){
  $bila++;
  }
if (imagecolorat($im,$radky,$sloupce)==0){
  $cerna++;
  $cernaX=$cernaX+$radky;
  $cernaY=$cernaY+$sloupce;
  }

if (imagecolorat($im,$radky,$sloupce)!=$barev-1){
  $smes++;
  $smesX=$smesX+$radky;
  $smesY=$smesY+$sloupce;
  }
```

```
if ((imagecolorat($im,$radky,$sloupce)!=$barev-1)&
  (imagecolorat($im,$radky,$sloupce)!=0)){
  $smes2++;
  $smes2X=$smes2X+$radky;
  $smes2Y=$smes2Y+$sloupce;
  }
 }
}

$ostatni=$pixelu-$bila-$cerna;

echo "<br><br>".$bila." pixelů bílé.<br>";
$tak=$bila*100/$pixelu;
echo "Výskyt bílé v procentech: ".$tak.".";

echo "<br><br>".$cerna." pixelů černé.<br>";
$tak=$cerna*100/$pixelu;
echo "Výskyt černé v procentech: ".$tak.".";
$tcx=$cernaX/$cerna+1;
$tcy=$cernaY/$cerna+1;
echo "<br> teziste cerna X = ".$tcx;
echo "<br> teziste cerna Y = ".$tcy;

echo "<br><br>".$ostatni." pixelů ostatních barev.<br>";
$tak=$ostatni*100/$pixelu;
echo "Výskyt ostatních barev v procentech: ".$tak.".";
$tcx=$smesX/$smes+1;
$tcy=$smesY/$smes+1;
echo "<br><br> Těžiště bez bílé X = ".$tcx;
echo "<br> Těžiště bez bílé Y = ".$tcy;

$tcx=$smes2X/$smes2+1;
$tcy=$smes2Y/$smes2+1;
echo "<br><br> Těžiště šedá X = ".$tcx;
echo "<br> Těžiště šedá Y = ".$tcy;
?>
```

End of discussed code Centre Point

Content of a Bordered Object

The previous problem can be rewritten to count the contents of bitmapped graphics if we are able to locate the border. The source code is not presented here.

Grayness of Graphics: Statistical Quality Control Problem

Graphical statistical analysis is not a unique real-world situation we are facing these days. For example, we want to automatically analyse the river levels at flood monitoring stations.

Here I mention a principle of solving such analysis with one of the Statistical Process Control [SPC] methods.

If we have a series of pictures we may analyse them one by one. The total number of gray pixels can be compared. After that we are able to monitor any changes.

The solution, which is an alternative to the Centre Point problem, is not concluded in this doctoral thesis.

Symmetry of the Object: Centre of a Bullet on the Target

When you practice shooting or zeroing a fire-arm or almost any gun, you need an effective way of doing an analysis.

For my private purposes I used a numerically effective method of finding the symmetry of the target. However, this procedure was neither the most accurate nor robust.

The algorithm and an example was published as an article **[[Stř05]]** and is available on-line on the Czech Statistical Society website.[ε]

[ε] ⟨http://www.statspol.cz/bulletiny/ib-05-2.pdf⟩

Cell II: Market Research: An Electronic Form

9.6 Expertise in Pairwise Comparison for the Czech Statistical Office

Pairwise comparison is a widely-used technique and it is a kind of divide-and-rule problem-solving method. It determines the relative order (ranking) of a group of items. This is often used as a part of a process of assigning weights to criteria in a design concept development.

The same concept can be used to set weights for any questionnaire.

The Czech Statistical Office, Regional Office in Zlín, asked me to do an investigation into a pairwise comparison in geographical indicators. The weights were used in an analyses which were published by the Czech Statistical Office in a publication titled *Demografický, sociální a ekonomický vývoj Zlínského kraje v letech 2000 až 2004* under code **13-7205-05** (161) in autumn 2005.[ζ]

The coefficients were used especially in Chapter 8 *Mezikrajské srovnání* on pages 79 – 89.[η]

This form of co-operation will continue later this calendar year because I have recently been invited to do pairwise comparisons again.

9.7 Automation in Evaluation of Electronic Forms

The advantages and disadvantages of printed and electronic forms can be seen in Figure 9.3 on page 159.

An electronic form is a good way of how to collect data from the Internet. It involves four basic technical steps:

- First, prepare the electronic form itself (also known as an Internet Interface) with the use of HTML tags `<FORM>` and `</FORM>`.
- Second, send the content of variables to the database system to be stored.

[ζ] ⟨http://www.czso.cz/xz/edicniplan.nsf/publ/13-7205-05-2000_az_2004⟩

[η] ⟨http://www.czso.cz/xz/edicniplan.nsf/t/0D0039F957/$File/72050508.pdf⟩

- Third, use the database command SELECT and retrieve any information you need.
- Last, if necessary do any calculations and statistical analysis. Use PHP and ℝ languages.

Internet Interface

A simple example of internet interface using HTML can be written as quotation.php as below:

Program 9.13: Internet interface using HTML

Start of discussed code Internet Interface

```
<HTML>
<HEAD>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8">
```

How to deliver the quiz?

Paper?	**Web/Intranet?**
Negatives:	*Negatives:*
∗ Hand scoring	∗ Larger Implementation costs
∗ No time tag capability	
∗ Doesn't support intranet goal	
Positives:	*Positives:*
∗ Small implementation costs	∗ Electronic, instant scoring
	∗ Time tag capability
	∗ Supports intranet goal
	∗ Continued availability

Figure 9.3: Delivery mechanism decision map ⟦**Jen05**, Lynne P. Cooper, Rebecca L. Nash, Tu-Anh T. Phan, Teresa R. Bailey, page 7⟧

```
</HEAD>

<DIV ALIGN="left">
<h4>Sending quotation</h4>

<form action="senddata.php" method="post">
<table border="0" cellspacing="0" cellpadding="3">
  <tbody><tr>
<td width="100">Quotation:</td>
<td><textarea name=quotation rows=3 cols=40 ></textarea></td>
  </tr>

  <tr>
<td width="100">Author:</td>
<td><textarea name=author rows=3 cols=40></textarea></td>
  </tr>

    <tr>
<td> </td>
<td align=center>
<input type="submit" value="Send this quotation to the server!" name="submit"
onmouseover="this.style.color='red';" onmouseout="this.
style.color='black';">
</td>
  </tr>
          <tr>
<td> </td>
<td align=center>
<input type="reset" value=" Reset all boxes! " name="reset"
onmouseover="this.style.color='red';" onmouseout="this.style.color='black';">
</td>
  </tr>
</tbody></table>
</form></DIV>
</HTML>
```

End of discussed code Internet Interface

More Use of PHP, MySQL and ℝ

The core of storing data is to use PHP and send data to MySQL database.

Program 9.14: Sending data to MySQL database system

Start of discussed code Sending Data to MySQL

```
<HTML>
```

```
<HEAD>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8">
</HEAD>

Data was sent through server to the MySQL database.<br>
Pavel Stříž.<br><br>

<?php
$time=Date("Y.m.d H:i:s");
$from=$REMOTE_ADDR;

$connect=mysql_connect("195.178.94.159","root","bbbb");
mysql_select_db("textbook");

$result=mysql_query("INSERT INTO quotation VALUES('$author','$quotation',
    '$time','$from');");
mysql_close($connect);

echo "<b>Information sent to the server:</b><br><br>";
echo "Time:     ".$time."<br>";
echo "From PC:  ".$from."<br>";
echo "Citation: ".$quotation."<br>";
echo "Author:   ".$author."<br><br>";
?>

<a href="quotation.php">Let we send next quotation.</a><br>
<a href="listdata.php">I want to see a list of all quotations in
    the MySQL database.</a><br><br>
</HTML>
```

End of discussed code Sending Data to MySQL

The next alternative is to use PHP and store the data in textfile but that is not so effective or flexible as to use MySQL database.

The last step is to ask for formatted, grouped and sorted data as needed. This is one example for all:

Program 9.15: List of data from MySQL database system

Start of discussed code List of Data

```
<HTML>
<HEAD>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8">
</HEAD>
```

```
<b>All quotations from the MySQL database!</b><BR>
(Ranked from newest to oldest.)
<BR><BR>

<?php
$connect=mysql_connect("195.178.94.159","root","bbbb");
mysql_select_db("textbook");

$result=mysql_query("SELECT * FROM quotation ORDER BY time DESC");
mysql_close($spojeni);

echo "<table border=1><tr>";
echo "<td align=center><b> Author of quotation </b></td>".
     "<td align=center><b> Quotation </b></td>".
     "<td align=center><b> Incoming time </b></td>".
     "<td align=center><b> Sent from IP &#8470; </b></td>".
     "</tr>";

while($row=mysql_fetch_array($result)){
echo "<tr><td>";
echo $row["author"]."</td><td>";
echo $row["quotation"]."</td><td>";
echo $row["time"]."</td><td>";
echo $row["from"]."</td></tr>";
}
echo "</table>";
?>

<BR><b>End of list.</b><br>
<i>Quotations were taken from <a href="http://www.bartleby.com/quotations/"
   target="_new">http://www.bartleby.com/quotations/</a>.
</HTML>
```

End of discussed code List of Data

This is a principle showing an example. This technique works in many on-line market research situations.

If we need to know how many times some web pages were visited, we may use so-called counters. I want to point out three basic options:

1. Use PHP and count every visit.
2. Use PHP and store the IP number and the arrival time of the visitor. This is a good start when some analyses are required.
3. Use a bigger package such as AWStats.

From point 1 on page 162: Below is the simplest technique: we are storing how many times the website was opened or refreshed. Each website has its own file which is, of course, one of the main disadvantages.

Program 9.16: Counting website visits I

Start of discussed code Easiest Counter

```
<?php
$mp=fopen("./zkousky/counter.txt","r");
   $citac=fgets($mp);
   $citac++;
   pclose($mp);
$mp=fopen("./zkousky/counter.txt","w");
   fwrite($mp,$citac);
   pclose($mp);
?>
```

End of discussed code Easiest Counter

From point 2 on page 162: The second way is to store the date and IP number of the visitor. After some time we may do some analyses.

Program 9.17: Counting website visits II

Start of discussed code Average Counter

```
<HTML>
<HEAD>
<META http-equiv="Content-Type" content="text/html; charset=utf-8">
</HEAD><body bgcolor="#70d000">

<?php
$time=Date("Y.m.d");
$from=$REMOTE_ADDR;

$analysis="analysis.txt";
$save=fopen($analysis,"a");

fwrite($save,$time.", ".$from."\r\n");
fclose($save);
?>
</BODY>
</HTML>
```

End of discussed code Average Counter

From point 3 on page 162: On the Internet there are many external counters with different options and styles. For a start you may find this web page useful.[θ]

If we used an Open Source Software package such as AeOnServ,[ϑ] then we may find it useful to in-build AWStats,[ι] esp. if we are not programmers. An even more general tool is SNARE[κ] and on `http://www.sf.net/` there are Open Source choices for Apache log analysis and many more.

Let's mention one commercial product at the end of this section. Let it be the NetIQ Webtrends product.[λ] Because these analyses are important in ℮-business and ℮-commerce, there are a lot more similar products to this one.

Metaprogramming in Use for the CompStat 2004

I was a volunteer at the CompStat 2004[μ] (Computational Statistics) conference, 16th Symposium of IASC[ν] (International Association for Statistical Computing), held in Prague from August 23–27, 2004.

I helped with the data processing because I was neither capable of developing my own scripting or programming language nor able to use just one programming tool to successfully accomplish my tasks. I had to use the basics of metaprogramming principles to get the tasks done on time.

I mainly used concept of:
{HTML; PHP} → {MySQL} → {VBA in Excel} → {TEX}

[θ] ⟨http://www.cryer.co.uk/resources/websitecounters.htm⟩

[ϑ] ⟨http://sourceforge.net/projects/aeonserv/⟩

[ι] ⟨http://sourceforge.net/projects/awstats/⟩

[κ] ⟨http://sourceforge.net/projects/snare/⟩

[λ] ⟨http://www.webtrends.com/⟩

[μ] ⟨http://compstat2004.cuni.cz/⟩

[ν] ⟨http://isi.cbs.nl/iasc.htm⟩

- The first step was necessary to store data from hundreds of foreign conference participants effectively.
- The second step was necessary to get structured, filtered, sorted, and properly pre-formatted data from the main MySQL database.
- The last step was critical to obtain data in a two-column mode with a page balance as a PDF file with properly typeset accents accumulating names and addresses.

The relatively huge source codes are not concluded here. The final PDF is published on CompStat 2004 conference website.[ξ]

Nonparametric Statistics in Use

The nonparametric statistics are an outlier-resistant improvement of parametric statistics and parametric methods. Basically, there is at least one nonparametric equivalent for each general type of parametric test.

Among others, I use StatXact[o] software frequently and I have permission to publish and re-publish some very useful material: *A Road Map to the Exact Procedures in StatXact 7.*

Two years ago, in 2004, when Cytel company[π] was changing the structure of their web pages, they stopped presenting their road map file. I wrote an ℮-mail to Cytel company stating my disagreement and my arguments as to why the publishing of this file was important for the statistics community. They have started to re-publish it on their website for the public. Even more important I achieved their approval, which I consider as an honour.

I am presenting an analysis of market research / questionnaire. As I was invited as a statistician by the Department of Economics. So, algorithms were used to analyse marketing data and the research was published twice. Firstly as a conference paper **[[KDS05b]]** in English, and then as an article **[[KDS05a]]** in Czech.

[ξ] ⟨http://www.compstat2004.cuni.cz/⟩ → List of participants or directly as a file: ⟨http://www.compstat2004.cuni.cz/oznameni/adresar-def.pdf⟩

[o] ⟨http://www.cytel.com/Products/StatXact/⟩

[π] ⟨http://www.cytel.com/⟩

If we need to do an advanced analysis we may use a batch file or a direct ℝ program and run it through PHP as follows:

Program 9.18: Running `tt.bat` through web

Start of discussed code Run of Batch File

```
<?php
$mazec= exec('c:/tt.bat',$pivo);
for ($k=0; $k<=20; $k++) {
    echo $k." ".$pivo[$k]."<br>";
    }
?>
```

End of discussed code Run of Batch File

The direct use of ℝ program would look as follow on the lines below. This particular example must be run under Microsoft Windows because of the path use:

Program 9.19: Running ℝ program through web

Start of discussed code Run of ℝ Program

```
<?php
$mazec= exec("\"C:/Program Files/r/rw2001/bin/rterm.exe\"
    --no-restore --no-save <me.r >me.txt",$pivo);
for ($k=0; $k<=20; $k++) {
    echo $k." ".$pivo[$k]."<br>";
    }
?>
```

End of discussed code Run of ℝ Program

The `k` variable helps us to show messages from programs. ℝ source code `me.r` is run and the output is stored in `me.txt` file. After minor modifications we can view all messages from programs, not only the first twenty lines, or store messages to an external file for future study purposes.

We may also need to show the results as a PostScript or PDF file. This is the way how to do that:

Program 9.20: Running LaTeX through web

Start of discussed code Run of LaTeX

```
<?php
$mazec= exec('latex first.tex',$pivo);
$mazec= exec('dvips first.dvi',$pivo);
for ($k=0; $k<=20; $k++) {
    echo $k." ".$pivo[$k]."<br>";
    }
<a href="first.ps">Download my first postscript file I got
    through Internet Interface.</a>
?>
```

End of discussed code Run of LaTeX

Real-Time Statistical Computing

The real-time alerting and reporting systems are a necessary tool in complex data-mining techniques. One of the cheapest alternatives is shown in the example describing the data statistically. This problem-solving computing area is generally solved by using HTML and PHP languages.

Let's say we have a file `spc_data.txt` which stores the values: 10, 100, 12, 35, 45, 48 and 52. Let it be an external file which we can acces through the Internet somewhere. Values themselves can be of any meaning. The file `spc_data.txt` is updated from time to time.

Our task is to compute elementary statistical characteristics in real time.

The file `spc.php` shows one alternative way of how to do that:

Program 9.21: Real-time calculations over the Internet

Start of discussed code Real-time Calculations

```
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf8">
<meta http-equiv="refresh" content="5;spc.php">
<title>SPC Testing...</title>
</head>
<body>

<font face="Courier New">

<?php
echo "Hodnoty : ";

$file=fopen("spc_data.txt", "r");
while (!feof($file)) {
    $w++;
    $posledni=$hodnota;
    $hodnota=fgets($file);
    echo $hodnota." ";
if ($w==1){$hodnota=substr($hodnota,3,1000);} //kvuli UTF-8
    $soucet += $hodnota;
    $kvadrat += pow($hodnota,2);
}

fclose($file);
$w--;
$prumer=$soucet/$w;
$kvadrat=$kvadrat/$w-pow($prumer,2);

echo "<br><br>";
echo "Počet hodnot : ".$w."<br>";
echo "Poslední hodnota : ".$posledni."[j]<br>";
echo "Součet : ".$soucet." [j]<br>";
echo "Střední hodnota : ".$prumer." [j]<br>";
echo "Rozptyl : ".$kvadrat." [j^2]<br>";
echo "Směr. odchylka : ".sqrt($kvadrat)." [j]<br>";
?>

</body>
</html>
```

End of discussed code Real-time Calculations

Data / Hodnoty : 10 100 12 35 45 48 52

Number of values / Počet hodnot : 7
Last added value / Poslední hodnota : 52 [j]

Sum / Součet : 302 [j]
Mean / Střední hodnota : 43.1428571429 [j]
Variance / Rozptyl : 781.836734694 [j^2]
Standard deviation / Směr. odchylka : 27.9613435781 [j]

If the data is updated and the value of 60 is added, then the on-line result would look like:

Data / Hodnoty : 10 100 12 35 45 48 52 60

Number of values / Počet hodnot : 8
Last added value / Poslední hodnota : 60 [j]
Sum / Součet : 362 [j]
Mean / Střední hodnota : 45.25 [j]
Variance / Rozptyl : 715.1875 [j^2]
Standard deviation / Směr. odchylka : 26.7429897356 [j]

9.8 Analysis of Huge Files

I present three different variants of working with structured raw data files—modification, counting elementary characteristics and advanced calculations. All three variants are concerned with improving commercial software products.

Modifications to Huge Structured Data for Jaroslav Zaviačič – TEXT-Zaviačičovi

Mr. Zaviačič had huge data files and wanted to change specific things. Many people were surprised that these changes couldn't be done with Microsoft Excel and therefore they didn't know how to help, especially not with a tight deadline. The deadline was unavoidable because the competition date was close and the Czech competitors all needed training.

I used PHP scripting language which has almost no limitations—at least not the same as Microsoft Excel. I successfully made all the necessary changes. Everybody was satisfied with my work, including myself. I had solved a common problem occurring in big companies which many other people

had not been able to solve. Mr. Zaviačič received his lessons on time and the competitors could practice before the competition.

The task was to increase values in this original file:

```
LEKTION 1
13M:
Probíraná zkratka:

#1]
-#1]
0:2, 1:1

LEKTION 2
13M:
Probíraná zkratka:

#2:]
#1:]
-#2:]
0:3, 1:2
etc.
```

Lesson numbers had to be changed and nearly all numbers in the original files. The output had to be:

```
LEKTION 2401
13M:
Probíraná zkratka:

#2401]
-#1]
0:2402, 1:2401

LEKTION 2402
13M:
Probíraná zkratka:

#2402:]
#2401:]
-#2:]
0:2403, 1:2402
etc.
```

The source code looks like this:

Program 9.22: File modifications using PHP

Start of discussed code File Modification

```
<?php
$soubor="vstup.txt";
$moje=fopen($soubor,"r");
$text=fread($moje,filesize($soubor));

$soubor2="vystup1.txt";
$moje2=fopen($soubor2,"w");

/* echo $text; */

$k=0;

/* for ($k=0;$k<=filesize($soubor);$k++){ */
while ($k<=filesize($soubor)) {
if (substr($text,$k,8)=="LEKTION "){$c=1;
/* echo substr($text,$k,8); */
fwrite ($moje2,substr($text,$k,8));
$k=$k+8;
}
if ($c==1){$doc=$doc.substr($text,$k,1);}  else {
/* echo substr($text,$k,1); */
fwrite ($moje2,substr($text,$k,1));
}

if (substr($text,$k,1)=="\n" and $c==1){$doc=$doc+2400;
/* echo $doc."<br>"; */
fwrite($moje2,$doc);
fwrite($moje2,substr($text,$k,1));
$doc="";$c=0;}


if (substr($text,$k,1)=="\n" and $c==0){
/* echo "<br>"; */
/* fwrite($moje2,substr($text,$k,1)); */
}

$k++;
}
/* } */


fclose($moje);
fclose($moje2);
?>

<?php
$soubor="vystup1.txt";
$moje=fopen($soubor,"r");
$text=fread($moje,filesize($soubor));

$soubor2="vystup2.txt";
$moje2=fopen($soubor2,"w");
```

```
/* echo $text; */

$k=0;

/* for ($k=0;$k<=filesize($soubor);$k++){ */
while ($k<=filesize($soubor)) {
if (substr($text,$k,1)=="#" and substr($text,$k-1,1)!="-"){$c=1;
/* echo substr($text,$k,1); */
fwrite ($moje2,substr($text,$k,1));
$k=$k+1;
}
if ($c==1){$doc=$doc.substr($text,$k,1);}  else {
/* echo substr($text,$k,1); */
fwrite ($moje2,substr($text,$k,1));
}

if (substr($text,$k,1)=="\n" and $c==1){
if (substr($doc,strlen($doc)-3,2)==":]") {$doc=substr($doc,0,strlen($doc)-3);
    $doc=$doc+2400; $doc=$doc.":]";}
if (substr($doc,strlen($doc)-2,1)=="]") {$doc=substr($doc,0,strlen($doc)-2);
   $doc=$doc+2400; $doc=$doc."]";}

/* $doc=$doc+2400; */
/* echo $doc."<br>"; */
fwrite($moje2,$doc);
fwrite($moje2,substr($text,$k,1));
$doc="";$c=0;}


if (substr($text,$k,1)=="\n" and $c==0){
/* echo "<br>";  */
/* fwrite($moje2,substr($text,$k,1)); */
}

$k++;
}
/* } */

fclose($moje);
fclose($moje2);
?>

<?php
$soubor="vystup2.txt";
$moje=fopen($soubor,"r");
$text=fread($moje,filesize($soubor));

$soubor2="vystup.txt";
$moje2=fopen($soubor2,"w");

/* echo $text; */

$k=0;
```

```
/* for ($k=0;$k<=filesize($soubor);$k++){ */
while ($k<=filesize($soubor)) {
if (
( (substr($text,$k,1)==":" and substr($text,$k-1,1)=="0") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="1") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="2") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="3") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="4") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="5") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="6") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="7") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="8") or
(substr($text,$k,1)==":" and substr($text,$k-1,1)=="9") )
and
( (substr($text,$k,1)==":" and substr($text,$k+1,1)=="0") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="1") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="2") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="3") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="4") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="5") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="6") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="7") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="8") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)=="9") or
(substr($text,$k,1)==":" and substr($text,$k+1,1)==" ") )
) {$c=1; if (substr($text,$k+1,1)==" "){$ano=1;}
/* echo substr($text,$k,1); */
fwrite ($moje2,substr($text,$k,1));
$k=$k+1;
}
if ($c==1){$doc=$doc.substr($text,$k,1);}  else {
/* echo substr($text,$k,1); */
fwrite ($moje2,substr($text,$k,1));
}

if (substr($text,$k,1)=="\n" and $c==1 ){
$doc=$doc+2400;
if ($ano==1){$ano=0;
/* echo " "; */
fwrite($moje2," ");}
/* echo $doc; */
/* echo $doc."<br>"; */
fwrite($moje2,$doc);
fwrite($moje2,substr($text,$k,1));
$doc="";$c=0;}

if (substr($text,$k,1)==";" and $c==1){
$doc=$doc+2400;
if ($ano==1){$ano=0;
/* echo " "; */
fwrite($moje2," ");}
/* echo $doc.";"; */
fwrite($moje2,$doc);
fwrite($moje2,substr($text,$k,1));
```

```
$doc="";$c=0;}


if (substr($text,$k,1)=="\n" and $c==0){
/* echo "<br>"; */
/* fwrite($moje2,substr($text,$k,1)); */
}

$k++;
}
/* } */

fclose($moje);
fclose($moje2);
?>

Precislovani z <b>vstup.txt</b> do <b>vystup.txt</b> je hotove.<br>
```

End of discussed code File Modification

Number of Different Characters in a UTF-8 Coded Document for Jaroslav Zaviačič – TEXT-Zaviačičovi

From time to time you may need to know the number of characters in a document. You may also need the number of *different* characters in some documents as well. I have been meeting this problem on various occasions. The main challenge is that no automation exists and everything has to be calculated manually or semi-manually. You can do the manual calculation once or twice but definitely not hundreds of times.

The solved variant is more difficult. Mr. Zaviačič has hundreds of documents from various countries and he needs to know how many different characters there are. He needs to know this because of the frequencies of characters written in a stated country communication which is asymmetrically distributed, so he is able to set the training materials for the typewriter students correctly. For example, if he has Turkish or Russian documents in an electronic form, using only characters from an ASCII table it would not be enough for him, thereby he has to use an extended UTF coding and do some programming with strings and `FOR` cycles or `WHILE` loops.

The final source code looks like:

Program 9.23: Number of different characters in a UTF coded file

Start of discussed code Number of Chars

```
<?php
$pajovo=range(1,1000);
$text=range(1,1000);

$zacni=0;

$soubor="paja.txt";
$file=fopen($soubor,"r");

$sss="uloz.htm";
$uloz=fopen($sss,"w");

$doc=filesize($soubor);
echo "Velikost souboru je: ".$doc." bytů. <br>";
$doc=$doc-3;
echo "Znaků (bez zdvojených Enterů): ".$doc."<br><br>";

$znak=fread($file, filesize($soubor));
/*
echo $znak;
*/

$k=3;

while ($k<=filesize($soubor)){


$vyber=substr($znak,$k,1);
$aa=decbin(hexdec(bin2hex($vyber)));

$je=0;

if (strlen($aa)==8 and substr($aa,0,3)==110)
   {$vyber=substr($znak,$k,2);$k=$k+1;}
if (strlen($aa)==8 and substr($aa,0,4)==1110)
   {$vyber=substr($znak,$k,3);$k=$k+2;}
if (strlen($aa)==8 and substr($aa,0,5)==11110)
   {$vyber=substr($znak,$k,4);$k=$k+3;}

$k++;

/*
echo $k;
*/
$exis=0;

for ($l=1;$l<=$zacni;$l++){
if ($text[$l]==$vyber){$pajovo[$l]++;$exis=1;}
}
```

```
if ($exis==0){$zacni++;$text[$zacni]=$vyber;$pajovo[$zacni]=1;}
}

fclose($file);

/*
echo "<br><br>";
*/
echo "<table border=1>";
echo "<tr>";
echo "<td><b>Kód UTF-8</b></td><td><b>Znak</b></td><td><b>
    Četnost</b></td></b></tr>";
fwrite($uloz,"Kód UTF-8, Znak, Četnost\r\n");

for ($l=1;$l<=$zacni;$l++){
echo "<td>";
if (decbin(hexdec(bin2hex($text[$l])))==1101){echo "Enter Ia (=Ib), ";}
if (decbin(hexdec(bin2hex($text[$l])))==1010){echo "Enter Ib (=Ia), ";}
if (decbin(hexdec(bin2hex($text[$l])))==100000){echo "Mezera, ";}
if (decbin(hexdec(bin2hex($text[$l])))==0){echo "Konec souboru, ";}

fwrite($uloz,decbin(hexdec(bin2hex($text[$l]))).", ".$text[$l].", ".
    $pajovo[$l]."\r\n");

echo decbin(hexdec(bin2hex($text[$l])));
echo "</td><td>".$text[$l]."</td><td>".$pajovo[$l]."</td></tr>";
}
echo "</table>";

fclose($sss);
?>
```

End of discussed code Number of Chars

Statistical Analysis for Jaroslav Zaviačič

How to set the level of difficulty in a lesson for ten-finger touch-typing students is not a typical daily-life problem.

Still, we are able to solve this problem by using students' previous results which are collected during the year. If we have enough data, we can do some analyses and tell the responsible person the necessary conclusions. We are also able to recommend lessons to be changed or suggest changes in the order of the lessons.

At the beginning we have thousands of files. Each of them has this structure:

```
Anwender: Vihnárová Andrea

   0 1556 1.1.1600
   1 9996 7.9.2003
   2 1553 7.9.2003
   3 9996 7.9.2003
   4 1552 7.9.2003
   5 1554 7.9.2003
   6 1558 7.9.2003
   7 1560 7.9.2003
              etc.
```

Where 9996 means that training was stopped. The first column means the number of accomplished exercises, the second one is the number of the exercise and the last one is the exact date where the exercise was run.

The first task was to combine all the thousands of files into one single file. The number or names of files was the first unknown.

If we copy files into a single directory we can run a DOS command:

```
dir /w /a:A /s /b >moje.txt
```

After that we run `jource1.php` file which looks like:

Program 9.24: Putting files together

Start of discussed code Combining Files

```
<?php
$soubor="moje.txt";
$moje=fopen($soubor,"r");

$soubor2="moje.bat";
$moje2=fopen($soubor2,"w");

$pr=0; $zapis="copy ";

while (!feof($moje)) {
$text=fgets($moje);
```

```
/* echo $text; */
$exi=0;
for ($k=0;$k<=strlen($text);$k++){
if (substr($text,$k,9)=="vypis.bat" or substr($text,$k,8)=="moje.txt"){$exi=1;}
/* echo substr($text,$k,9)."<br>"; */
}
if ($exi==1) {/* echo "je <br>"; */} else {if ($pr==1 and $text!="") {$zapis.="\"".
    substr($text,0,strlen($text)-2)."\"."+";}}
if ($exi==0 and $pr==0) {$pr=1; $konec="\"".substr($text,0,strlen($text)-2)."\"";}
/* echo "<br>"; */
}
$zapis.=$konec;
$zapis.=" stu.txt";
/* echo $zapis; */
fwrite($moje2,$zapis);
echo "Vytvoreni souboru <b>moje.bat</b> bylo uspesne.";

fclose($moje);
fclose($moje2);
?>
```

End of discussed code Combining Files

After that we run created BAT file `moje.bat` which actually creates the huge single file.

The next step is to extract only the information needed. Let's use the following source code:

Program 9.25: Extracing necessary data from huge file

Start of discussed code Extracting Data

```
<?php
/* Zaverecna verze, robustni vuci delce zacatku.
Pavel Striz */

$soubor="stu.txt";
$moje=fopen($soubor,"r");

$soubor2="jource.txt";
$moje2=fopen($soubor2,"a");

while (!feof($moje))
{
$text=fgets($moje);
if (strlen($text)<8) {}
```

```
else
{
if (substr($text,5,4)=="der:") {fwrite ($moje2,"N");}
else
{
if (substr($text,0,4)=="   0") {/* echo "Jsem tu."; */}
else
{

$zacni=0;
$hodnota="";
$i=strlen($text)-2;
/* echo $i."<br>"; */

while($i>=0)
{
$i=$i-1;
if (substr($text,$i,1)==" " and $zacni==1) {break;}
if ($zacni==1){$me="";$me.=substr($text,$i,1);$me.=$hodnota;$hodnota=$me;}
if (substr($text,$i,1)==" " and $zacni==0) {$zacni=1;}
}

if ($hodnota=="9996" or $hodnota=="9997" or $hodnota=="9999")
   {} else {fwrite($moje2," ".$hodnota);}
  }
 }
}
}

fwrite($moje2,"N");

echo "Pripsani do <b>jource.txt</b> bylo uspesne.";

fclose($moje);
fclose($moje2);
?>
```

End of discussed code Extracting Data

The last step is to do the necessary analysis. Let's run the last piece of the source code:

Program 9.26: Analysing data and exporting analysis

Start of discussed code Analysing Data

```
<?php
$soubor="jource.txt";
```

```
$moje=fopen($soubor,"r");

$soubor2="analyza.txt";
$moje2=fopen($soubor2,"w");

$text=fgets($moje);
/* echo $text."<br><br>"; */

$zacni=1;
for ($k=0;$k<strlen($text)-2;$k++){
/* echo substr($text,$k,1); */
if (substr($text,$k,1)=="N"){

if ($prvni>$bigg){$bigg=$prvni;}
$celkem[$prvni]++;
if ($prvni<$doc){$uspech[$prvni]++;}
/* echo $prvni."   ".$doc."<br><br>"; */
$zacni=0;$prvni=""; $doc="";
/* echo "zverina"; */
}
if (substr($text,$k,1)==" " and $zacni==1) {if ($prvni=="") {$prvni=$doc;} else {

if ($prvni>$bigg){$bigg=$prvni;}
$celkem[$prvni]++;
if ($prvni<$doc){$uspech[$prvni]++;}
/* echo $prvni."   ".$doc."<br><br>";  */
$prvni=$doc;} $doc=""; }
if (substr($text,$k,1)==" "){$zacni=1;}
if ($zacni=1 and substr($text,$k,1)!="N"){$doc.=substr($text,$k,1);/*echo $doc;*/}
}

for ($m=1;$m<=$bigg;$m++){
if ($uspech[" ".$m]=="" and $celkem[" ".$m]!="") {$uspech[" ".$m]=0;}
if ($celkem[" ".$m]=="") {} else {
$ratio=$uspech[" ".$m]*100/$celkem[" ".$m];
/* echo $m." - ".$celkem[" ".$m]." - ".$uspech[" ".$m]." - ".$ratio."<br>"; */
fwrite($moje2,$m." - ".$celkem[" ".$m]." - ".$uspech[" ".$m]." - ".$ratio."\r\n");}
}
echo "Analyzy byly uspesne zapsany do <b>analyza.txt.</b>";

fclose($moje);
fclose($moje2);
?>
```

End of discussed code Analysing Data

After these steps we are able to do any analysis in Microsoft Excel, OpenOffice.org Calc or in any other specialised statistical or mathematical software.

Cell III: Promotion/Advertisement: A Printed Form

9.9 Lottery Ticket Games

A general lottery ticket game may consist of two parts. The game itself and the delivery of playing tools to customers. In the next two sections we may find the description of these two tasks.

Neither the detailed description nor any source codes are presented here. These two tasks would require a lot of space and that's not my purpose here in this doctoral thesis. My aim is to inform the public about the existence and importance of these challenges.

Lottery Ticket Game with Two Kinds of Jokers for Semma, s. r. o. (Ltd.)

The real world needs real mathematics and statistics. This problem is a typical example of aiming at customer loyalty.

This problem was one of the hardest I've solved recently. The game itself is a marketing tool which motivates new-comers and key-account clients to use the services more often and it intends to increase the customer frequency of buying the services of TNT Holding N. V. – TNT Express Czech Republic.

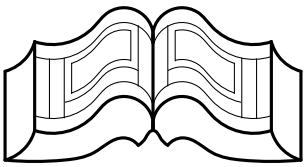
The customer (the player) puts together some tickets. Every ticket has one letter of the alphabet on it. After collecting enough tickets, the customer has a chance to set down one of the winning words or phrases to win a prize.

The task was to say how many letters, special tickets, black-white jokers and orange jokers (the gold colour was mentioned at the beginning of the co-operation but it was not the colour of the original contractor) should be printed. To keep the costs to the lowest possible level, on one hand, and on the other hand to be sure that the exact number of each winning prize would be withdrawn evenly during whole calendar year.

Travelling Salesman Problem for TOR Cheb, s. r. o. (Ltd.)

TOR Cheb, s. r. o. (Ltd.)[ϖ] employs salesmen all over the Czech Republic. Each salesman is responsible for customers in different geographical regions of the country. The management of the firm needed a tool to optimise their travelling routes in order to minimize their costs and travelling expenses.

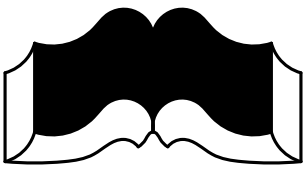
9.10 Frequent Typography Tasks



If we look at this open book closely we may recognise some basic typography blocks: the page itself, mirror of the page, where graphics can be placed, decorative rims, empty spaces which usually occure at the end of chapters or sections, and marginal notes.

I solved some kinds of problems in all basic blocks mentioned.

Linotype: Ornamental Pictures



Anywhere in the book, excluding book edges, ornamental pictures, text or graphics can be added. The old typography term for this was linotype. The modern collection of ornaments, initials, paper borders, ribbons, frames, and backgrounds is available at ARIDI server.[ρ]

Some examples are in print, as in a self-study textbook ⟦**SŘ07**⟧. Let's describe some elements in this textbook:

[ϖ] ⟨http://www.tor.cz/⟩

[ρ] ⟨http://www.aridi.com/⟩

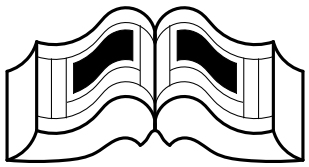
The flag with the year of publication as a piece of graphics is inserted on pages 3 and 322.

Ornamental graphics introduces all six sessions/parts on pages 15, 27, 57, 79, 111 and 219.

Graphics as a form of tempering technical text can be seen on page 5 as a Cartoon, then on pages 16, 28, 58, 80, 112 and 220. Next to these there are trapezoids filled with text on pages 16, 28, 58, 80, 112 and 220. The big object of TEX filled with various symbols is inserted on an exclusive page, 321.

Dropped capitals (Initials) are introduced on pages 42 and 302.

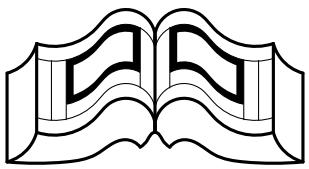
Product Description: 2D and 3D Graphics



This is a common area for nearly all firms when creating their price lists. We may see various forms of 2D and 3D graphics alike and forms of semi 3D graphics. Worth checking is Processing (Beta) website.[ϱ]

We can use bitmapped or vector graphics. We have tools for parametric and nonparametric preparations. One example of parametric vector graphics is shown on pages 87 – 89 in **[[SŘ07]]**. In the same textbook on page 304 is shown one form of 3D graphics with several 2D text transformations.

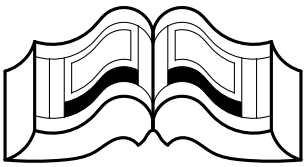
Decorative Rim: Surroundings of Pictures



[ϱ] ⟨http://www.processing.org/⟩

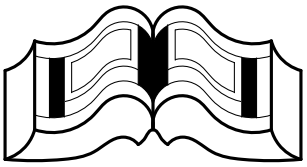
Decorative rims are a challenge to modern printed materials. It is a form of advertisement on the paper itself. I used rims over source codes. That's a simple option. The problem is which rims to use and how to add rims around objects which cross several pages.

Flexible Fulfilment of Empty Space



This problem is technically solved on pages 47 and 48 in ⟦**SŘ07**⟧. A basic example is shown on page 48 as well.

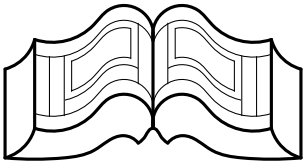
Marginal Notes



Marginal notes are used in different printed materials, in books, textbooks and practice books at universities, and in various annual reports. People use graphical symbols when the margin column is thin or they use a text summary of the paragraph when a margin column is quite wide.

In ⟦**SŘ07**⟧ we used two different styles of exclamation marks. It also depends on whether the mark is to be on an even or odd page. Please, browse this textbook to find them for yourself.

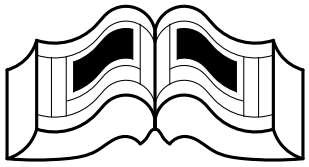
9.11 Advanced Typography Tasks



If we look at the open book one more time, we can recognise some other blocks. Next to the common mirror of the page can be typeset and placed almost everything, even a dictionary. We can distinguish more parts such as headings and footings, margins for the contents strip and finally the edges of the book itself.

I have solved some unique problems in these not-so-common and not-so-frequently discussed blocks.

Preparing a Bilingual Dictionary with Pronunciation



This task arose for the first time when I was preparing the textbook *Informatika pro ekonomy* [[**RSBJ04**]] for students of *Informatics for Economics* course. We, the authors of the textbook, needed to add an English→Czech Dictionary. From my point of view a dictionary without pronunciation help is not a very good dictionary.

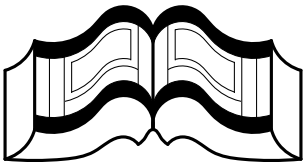
So, I decided to add the pronunciation to all the technical terms presented. In the dissertation I explain how I did it. I used phonetic fonts for TEX/LATEX created by the International Phonetic Association, [IPA] or [TIPA][σ] .

We are trying to complete full automation of this process.

The dictionary itself can be seen in [[**RSBJ04**, pages 243 – 248]] or [[**RSJ+06**, pages 243 – 248]]. Next, dictionaries are in print and concluded in [[**SČK07**, pages 266 – 273]] and [[**SŘ07**, pages 260 – 266]].

[σ] ⟨http://www2.arts.gla.ac.uk/IPA/⟩

Preparing and Typesetting Variable Headings and Footings

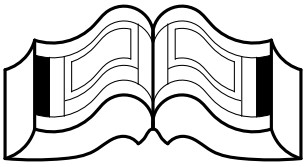


This section deals with the typesetting of headings and footings. It describes basic opportunities and ways of how to typeset them. It uses a standard package `fancyhdr` in nearly all examples. It shows ways of how to prepare variable objects which are usually page dependent in cases where the variable objects are dependent on each other. In addition, it can be found as a method which generates the whole or a part of a TEX document using `PHP` and `MySQL` tools.

The methods are introduces in ⟦**SŘ07**⟧ on pages 98 – 102. Another example can be found in this textbook in the footings. On the left side of the footing is written the English meaning of a proverb. On the right side can be seen the Japanese meaning of the same proverb written in Hiragana.

One more example can be found in textbook ⟦**RS05**⟧ where Murphy Laws in Czech are on the left side.

Automation in Typesetting Contents Strip



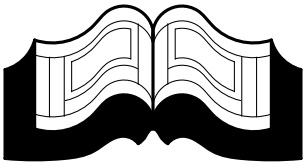
This section deals with the typesetting of the contents strip in a TEX document. I used a method of generating a part of the final text which is loaded into a master document.

I had been thinking about including an example in my dissertation but changed my mind because this probably doesn't belong to a Ph.D. thesis. However, it does belong in other publications.

The technical part is described in ⟦**SŘ07**⟧ on pages 102 – 105.

An example can be seen in ⟦**SS05a**⟧ on odd pages on the right side.

Typesetting on Book Edges



The technical parts of both methods, Strip Method and Portion Method, can be found on pages 105 – 109 in ⟦**SŘ07**⟧.

An example of the Strip Method should be printed in the textbook ⟦**SŘ07**⟧. There is only a tiny chance that in a textbook about typography the edges can be added. It is because of the formal layout of university textbooks. There will probably be no further opportunities for edge typesetting at this university.

Cell IV: Promotion/Advertisement: An Electronic Form

9.12 Templates for Theses for the TBU in Zlín

This section describes the results of the creation of templates for the electronic documents (theses) for the Tomas Bata University in Zlín and improving them upon requests from students, which were collected during their finals. The output that the University requires is a nicely-formatted and content-full paper work representing both the writer's knowledge and skills.

At the present time an electronic form of the thesis is required by the University so a formal presentation of the documents has to be stressed. This section brings a brief overview on what has happened so far and how the project will continue.

An example of a Masters Thesis written in OpenOffice.org style sheet file in English can be found on the University website.[ς]

For Microsoft Word

Thw manual and style sheet is published on the university website under the Chancellor directive number 5/2006.[τ]

For OpenOffice.org Writer

The manual and style sheet is published on the university website under the Chancellor directive number 5/2006.[υ]

For TEX in the LATEX Format

The manual and style sheet is published on the university website under the Chancellor directive number 5/2006.[φ]

[ς] ⟨http://web.utb.cz/cs/docs/ukaz_dip_prace.pdf⟩

[τ] ⟨http://web.utb.cz/cs/docs/sablona_word.zip⟩

[υ] ⟨http://web.utb.cz/cs/docs/sablona_ooo.zip⟩

[φ] ⟨http://web.utb.cz/cs/docs/sablona_tex.zip⟩

9.13 Document Clearing Macro for the TBU in Zlín Central Library

How to automatically clear an electronic manuscript from typographical mistakes, mis-spellings and typing errors is a tricky question.

My colleague, Michal Polášek, and I are trying to add at least some non-breakable spaces in the right positions in English and Czech documents automatically. This is a large piece of work because most people use one of the three desktop publishing systems—Microsoft Word, OpenOffice.org Writer or TEX.

The core can be programmed this way:

Program 9.27: Core of clearing macro in VBA under Microsoft Word

Start of discussed code Core or Clearing Macro

```
Sub clearingmacro()

Selection.HomeKey Unit:=wdStory

Pismena = "aikosuvzAIKOSUVZ"
Ostatni = "0123456789+-*/"

    With Selection.Find
        .MatchCase = True
        .MatchWildcards = True
    End With

delka1 = Len(Pismena)
For k = 1 To delka1
    With Selection.Find
        .Text = "^0032" + Mid(Pismena, k, 1) + "^0032"
        .Replacement.Text = "^0032" + Mid(Pismena, k, 1) + "^s"
    End With
    Selection.Find.Execute Replace:=wdReplaceAll

    With Selection.Find
        .Text = "^s" + Mid(Pismena, k, 1) + "^0032"
        .Replacement.Text = "^s" + Mid(Pismena, k, 1) + "^s"
    End With
    Selection.Find.Execute Replace:=wdReplaceAll
Next k

    With Selection.Find
        .MatchCase = False
```

```
        .MatchWildcards = False
    End With

delka2 = Len(Ostatni)
For k = 1 To delka2
    For l = 1 To 10
        With Selection.Find
            .Text = Mid(Ostatni, l, 1) + Mid(Ostatni, k, 1) + " "
                    'Normální mezera."
            .Replacement.Text = Mid(Ostatni, l, 1) + Mid(Ostatni, k, 1) + " "
                    '"Tvrdá mezera."
        End With
        Selection.Find.Execute Replace:=wdReplaceAll
    Next l
Next k

End Sub
```

End of discussed code Core or Clearing Macro

9.14 New Mainstream for the *Competition in Correcting Text* Event [Vm]

We, my brother and I, have developed with Microsoft Word a Visual Basic for Applications macro code to improve and make faster correcting proofs which occur in a text for the *Competition in Correcting Text* events.

After a year and a half, we can say that this extended macro code has become one of the two mainstreams in this competitive event.

Information on the existence and functions of this macro code have been published twice as **[SS06, SS05b]**.

The reference manual in Czech can be downloaded from my website.[φ]

[φ] ⟨http://study.uis.fame.utb.cz/bracha/vd/⟩

10 Opening Knowledge to the Public: Knowledge Networks

Wikipedia dictionary is introducing knowledge networks history as:[α]

Definition 20 . . . *Knowledge Network* is British Columbia's public educational broadcaster.[a] Knowledge Network is providing high-quality, credible programming for people of all ages via TV and the Internet, the station strives to present its B.C. residents with a unique collection of programmes that appeal to a diverse group of people. Through showcasing inspiring and stimulating material, Knowledge Network works towards its goal of promoting lifelong learning in British Columbia. It began broadcasting on January 12, 1981.

[a] ⟨http://www.knowledgenetwork.ca/⟩

10.1 Terms Definition

Let's mention one current business skills training programme.

This server[β] provides business skills training through masterclasses and workshops for free.

Quote from their website:

(. . .) Masterclasses are always followed by informal networking sessions, over light refreshments, providing you with an opportunity to meet the speaker and other members. We also arrange monthly workshops with highly qualified facilitators, covering a variety of relevant business topics. These are a combination of theoretical and practical sessions, providing you with an opportunity to learn new skills.

[α] ⟨http://en.wikipedia.org/wiki/Knowledge_Network⟩

[β] ⟨http://www.theknowledgenetwork.co.uk/⟩

Worth checking is another server with on-line courses created in Macromedia Flash.[γ]

This server[δ] offers another definion of knowledge network (partly modified):

Definition 21 ... *Knowledge Network (KN)* is a project whose work helps to improve and simplify the electronic delivery and sharing of information.

It currently builds and manages secure websites and shared databases which enable information sharing across government departments and between officials working around the world. These include:

∗) intranets, extranets, internet hosted services and bespoke business support systems such as electronic,

∗) briefing systems are those delivered by departmental in-house suppliers and third party software houses.

These definitions of a knowledge network and its tools bring us to the knowledge tools definition:

Definition 22 ... *Knowledge tools* – in depth, interactive and educational online features.

In general, knowledge can be nearly everything, found nearly anywhere: as an article, a textbook, a scientific report, a software product, web pages etc. Shortly said:

Definition 23 ... *Knowledge* is anything useful to society.

10.2 Basic Tools of Getting Knowledge over the Internet

There are six basic tools we usually use nowadays, see enumerate list below. The list is sorted from oldest to newest tools. It is sorted for orientation purposes only.

[γ] ⟨http://online.nanopolis.net/⟩

[δ] ⟨http://www.cabinetoffice.gov.uk/e-government/responsibilities/kn.asp⟩

1. Web pages: using a simple HTML alternative.

2. Web pages: using Content Management Systems. Check this list and compare them yourself.[ε]

3. Using FTP protocol and FTP server side.

4. Direct Connect, e.g. via Strong DC++.[ζ]

5. eMule.[η]

6. BitTorrent, e.g. via ABC[θ] or others.[ϑ]

10.3 Selected Knowledgebases

I have selected a few knowledgebases available over the Internet directly or after downloading and installing a specific software product:

- SourceForge.net which includes information on rank, relevance activity, number of downloads, bug reports and updated (latest possible) version. The open source software packages are grouped by many criteria (license, operating system, programming language, topic, translations, user interface etc.). The server is multiply-mirrored.

- Answers Knowledgebase (FAQ) at Minitab.com, then Support. They present frequently asked questions on statistical issues.

- Statgraphics.com presents a series of PDF files.

- Cytel.com in StatXact product offers huge PDF file describing all theory, mathematical background and examples used in the software.

[ε] ⟨http://www.cmsmatrix.org/⟩

[ζ] ⟨http://strongdc.berlios.de/⟩

[η] ⟨http://www.emule-project.net/⟩

[θ] ⟨http://sourceforge.net/projects/pingpong-abc/⟩

[ϑ] ⟨http://en.wikipedia.org/wiki/Category:File_sharing_programs⟩

- ArenaSimulation.com in the ARENA product offers self-study materials as a series of additional files saved in a particular directory after the installation of the ARENA.
- After registration Spss.com offers a huge list of white papers.
- Jmp.com offers so-called Webinars (seminars on the Internet).
- Google.com recently presented a game where the data is collected during the playing of this game on-line.[ι]
- Processing.org introduces huge picture galleries created by bright new graphical tools.

10.4 Actual State at the Tomas Bata University in Zlín

There are several servers where important information and similar items are presented:

Main university WEB server:	`http://www.utb.cz/`
Server for study purposes:	`http://www.stag.utb.cz/`
Library server:	`http://aleph.utb.cz/`
Faculty web server:	`http://www.fame.utb.cz/`
Server for on-line courses:	`http://education.utb.cz/`

The next two servers are primarily focused on teaching purposes:

Department server:	`http://uis.fame.utb.cz/` or `http://195.113.96.198/`
My WEB and FTP server:	`http://study.uis.fame.utb.cz/`

The vice-dean for foreign affairs has received two major grants concerned with study purposes:

RIUS, Rozběh interuniverzitních studií, and

[ι] ⟨`http://images.google.com/imagelabeler/`⟩

EVENE, Erasmus Virtual Economics & Management Studies Exchange.

Both of these provide enough working space for faculty lecturers in the latest ℮-learning activities.

10.5 Suggested Readings

Before technical knowledge networks people needed to save knowledge as well. The book which should be checked and describes this topic in depth is **[[CPS03]]**.

For more about technical details on creating knowledge networks *see* books **[[FR02, HK04]]**.

The latest term and topic to focus on is a semantic web known as ontology-driven knowledge management. For more about this latest technical term *see* the book **[[DFvH03]]**.

10.6 Closing Notes

I would like to close this section about knowledge networks and bases, which definitely belongs to a stand-alone doctoral thesis, by a quotation from the book **[[DFvH03]]** from Chapter XIV entitled *A Future Perspective: Exploiting Peer-to-Peer and the Semantic Web for Knowledge Management*, Section 14.2 *A Vision of Modern Knowledge Management* on page 247 written by Dieter Fensel, Steffen Staab, Rudi Studer, Frank van Harmelen and also John Davies:

> Knowledge is one of the most crucial success factors for today's enterprises. Therefore, knowledge management (KM) has been identified as a strategically important capability.
>
> Clearly, KM is an interdisciplinary task, including human resource management, enterprise organisation and cultural considerations as well as IT. However, there is a widespread consensus that IT plays an important role as an enabler for many aspects of a KM solution.

11 Recommendations to University Lecturers

If we compare work at universities and in firms we may find similarities in their technical details, *see* Table 11.1 below.

The aim of our efforts is to increase effectiveness at universities as well as in profit-based firms because the teaching process is the key in the information society.

Table 11.1: Work at universities versus in firms

Technical Term	**Universities**	**Profit-Based Firms**
Electronic Forms	Students feedback	Online market research
	Final exams	Price list on website
Presentations	Lectures	Introducing firm
	Seminars	Reports at meetings
Log analyses	Downloads from FTP	Webpage visits
	Downloads from Torrent	Price list downloads
Webpage generators	Photos from conference	Photos from workshops
	Reports about students	Ordering products
Style sheets	Manuscripts	Annual reports
	Lecture notes	Reference manuals
200+ pages publications	Books	Price catalogues
	Textbooks	Tutorials
	Exercise books	Reference manuals
Large format printing	Scientific posters	Billboard & posters
Handling databases	Students & grades	Goods and services

From this point of view:

- Firms don't offer solutions for free to the information society.
- Lecturers at universities offer additional value to the information society but they are not effective all the time.
- We must force lecturers to behave effectively.

- End-user doesn't necessary force others to behave effectively. He or she only satisfies his/her needs. They do not have to be effective in the general sense.

This is my final list of hints and tips to university teachers, lecturers and practitioners:

- Invite co-lecturers if possible. They have enough time to prepare just a few lectures and they usually know the discussed topics more than you do.
- Prepare on the Internet a list of problems and their solutions. Present the list after the classes especially for those who didn't understand everything during the class or for people who were ill or missed the class.
- Create sound or movie sequences presenting discussed topics. Use any available technical equipment.
- Record your lectures and classes if possible, e.g. using a camcoder.
- Use screen recorders such as Bulent's Screen Recorder[α], Instant-Demo[β] or CamStudio.[γ] Save files as independent HTML files (for Linux users) or independent EXE files (for Microsoft Windows users). For converting purposes use VirtualDub[δ] or Auvid.[ε] To save space use codecs, e.g. DivX[ζ] or OggVorbis.[η]
- Do travel a lot. Use Erasmus/Socrates programmes or any other opportunities such as conferences, society meetings etc.
- Try to use the latest tools when teaching such as e-learning. In general, it saves a lot of time and you'd increase your effectivness.

[α] ⟨http://www.thesilver.net/⟩

[β] ⟨http://www.instant-demo.com/⟩

[γ] ⟨http://sourceforge.net/projects/camstudio/⟩

[δ] ⟨http://www.virtualdub.org/⟩

[ε] ⟨http://sourceforge.net/projects/auvid/⟩

[ζ] ⟨http://www.divx.com/divx/⟩

[η] ⟨http://www.free-codecs.com/download/DJBCP_Codec_Pack.htm⟩

- Record your own lectures and others as well. Make them available using WEB or FTP server. Find inspiration at Czech Silicon Hill server[θ] or try the author's server[ϑ] which is being filled with movie files during the completion of this thesis.
- Do use software during classes such as:
  - Statistical Analysis Methods:
    MuPAD,[ι] ARENA.[κ]
  - Informatics for Economics:
    AeOnServ,[λ] Macromedia tools,[μ] CamStudio,[ν] Arles page generator.[ξ]
  - Computerised Data Processing:
    Minitab,[ο] Statgraphics,[π] JMP,[ϖ] ℝ,[ρ] SPSS,[ϱ] StatXact.[σ]
  - DTP and Electronic Publishing:
    OpenOffice.org,[ς] TEX.[τ]
  - Quantitative Methods for Managerial Decision Making:
    WinQSB.[υ]

[θ] ⟨http://avc.sh.cvut.cz/⟩

[ϑ] ⟨http://study.uis.fame.utb.cz/courses/⟩

[ι] ⟨http://www.sciface.com/⟩

[κ] ⟨http://www.arenasimulation.com/⟩

[λ] ⟨http://sourceforge.net/projects/aeonserv/⟩

[μ] ⟨http://www.macromedia.com/⟩

[ν] ⟨http://sourceforge.net/projects/camstudio/⟩

[ξ] ⟨http://www.digitaldutch.com/arles/⟩

[ο] ⟨http://www.minitab.com/⟩

[π] ⟨http://www.statgraphics.com/⟩

[ϖ] ⟨http://www.jmp.com/⟩

[ρ] ⟨http://www.r-project.org/⟩

[ϱ] ⟨http://www.spss.org/⟩

[σ] ⟨http://www.cytel.com/Products/StatXact/⟩

[ς] ⟨http://www.openoffice.org/⟩

[τ] ⟨http://www.tug.org/⟩

[υ] ⟨http://www.amazon.com/exec/obidos/ASIN/0471406724/laureackeryou-20⟩

- Publish books, textbooks and practice books which contain more than 700 pages. Let them include detailed description of tasks and solutions.

  Be inspired with, e.g.:

  - statistics based book *Handbook of Parametric and Nonparametric Statistical Procedures* [[**She04**]] (Statistical Analysis Methods) containing 1193 pages,
  - statistics based book *Applied Statistics and Probability for Engineers* [[**MR03**]] (Applied Statistics) containing 706 pages,
  - mathematics based book *Multiple Criteria Decision Analysis. State of the Art Surveys* [[**FGE05**]] (Applied Mathematics) containing 1045 pages,
  - operations research based book *Operations Research. Models and Methods* [[**JB03**]] (Quantitative Decision Methods) containing 675 pages, or
  - LaTeX-based book *The LaTeX Companion. Tools and Techniques for Computer Typesetting* [[**MGB+04**]] containing 1090 pages.

- Publish articles, books, textbooks, and workbooks only in English.

12 Results and Discussions

I have solved a number of above-average problems taken from everyday, practical life.

Many of them were unsolved, untouched, or poorly solved compared to the present-day methods. There were usually no automation processes. The time I spent on finding solutions and programming was not counted to my full-time job at the Department of Informatics and Statistics and everything belongs to my Ph.D. studies.

Some of the problems were solved by other people but they did not present the solution to the public. If they offered the solution to the public then it would be for financial reward.

— — —

To be able to work with databases is a necessary tool for students of economics. Together with the Czech Statistical Office we are delivering lectures about databases every year.

The summary of this successful cooperation is:

- **First-year students.**
  Statistical Analysis Methods course:
  General lecture about CZSO.cz and its databases.

- **Second-year students.**
  Applied Statistics course:
  How to work with major CZSO.cz databases.

- **Fifth-year students.**
  Econometrics course:
  Specialized lecture about international databases.

13 Contribution to the Body of Knowledge

On the following lines you can read a list of benefits of this dissertation.

- I wrote this dissertation in English as the first one ever in the Faculty of Management and Economics, hoping to inspire the other students to do the same.
- I combined problem-based and computer-based learning with tricky tasks which arose in daily life. After solving them I expanded the solutions into the study materials in the FaME at the TBU in Zlín. I intend to continue doing so.
- I compared the experiences of our fourth-year university students with the Czech average and averages of other members of the European Union.
- I have found two voluntary courses taught in the faculty, in Czech, since 2004.
- I have found five courses taught in Erasmus/Socrates programmes, in English, since 2005.

I have gained an inestimable experience while, looking for priceless problems, writing my Ph.D. dissertation and being:

- a technical support at the international non mathematics-statistics oriented conference, Internet and the Competitiveness of Firms, in the years 2004 – 2006,
- a volunteer and technical support at the international mathematics-statistics oriented conference, CompStat 2004,
- a member of the Executive Committee of the Czech Statistical Society,
- a member of the Bulletin Board of the Czech Statistical Society.

14 Conclusions and Future Research

The courses in which I am guarantor and/or a teacher desperately need additional study support materials. That means the Czech courses and especially the English courses as well. The reality could be much better and more effective. The difficult real-world problems have taught me a lot. I am now in the position to collect, improve, solve, publish, and show them to the forthcoming generations.

The actual unsolved problem is to automate the evaluation of exams in the *Quantitative Methods for Managerial Decision Making* (QMMDM) and *Kvantitativní metody v rozhodování* (KMR) courses. This is also not a trivial task.

I am also working on a textbook for the *Quantitative Methods for Managerial Decision Making* course, and the textbook, practice book and solved-problem collection for the *Statistical Analysis Methods* course.

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Appendix B: Uncut Questionnaire (in Czech)

Dotazník Pavla Stříže z ÚIS FaME UTB ve Zlíně

Pozdrav a požádání posluchače denního studia čtvrtého ročníku FaME UTB ve Zlíně

Dobrý den paní kolegyně/pane kolego,

prosím o vyplnění a odeslání následujícího dotazníku (viz níže), jehož dílčí výsledky budou sloužit ke srovnání naší univerzity s průměrem v České republice a s dalšími zeměmi Evropské unie.

Výsledky dotazníkového šetření budou také použity pro úpravu/rozšíření předmětů DTP a elektronické publikování/DTP and Electronic Publishing, Počítačové zpracování dat/Computerised Data Processing a Kvantitativních metod v rozhodování/Quantitative Methods for Managerial Decision Making.

Pokuste se na otázky odpovídat pravdivě a úplně, protože jen v takovém případě má cíl tohoto dotazníku smysl. Dotazník může a nemusí být podepsán. Individuální údaje v takovém případě nejsou dále šířeny. Zaškrtněte vždy políčko pokud výrok/dotaz platí. Vždy lze vybrat více odpovědí. Dotazník Vám zabere cca 9-15 minut.

Jsem s poděkováním a pozdravem,

Pavel Stříž, v. r.
Ústav informatiky a statistiky FaME UTB ve Zlíně
email: striz@fame.utb.cz

Dotazník akademického roku 2005/2006

ČÁST I. Využívání Internetu. Vybrané otázky identické Evropským datům (ESDS). Použity EuroStatem i ČSÚ.

Partie k využívání mobilních telefonů.

1 Máte k dispozici pro svou vlastní potřebu mobilní telefon? ☐ (Zaškrtnout vždy při ano.)

2 Pokud ano, k jakým účelům využíváte mobilní telefon? (více možných odpovědí)

☐ k telefonování
☐ k posílání SMS
☐ k posílání MMS
☐ k zobrazení www stránek (WAP)
☐ k realizaci bankovních operací (mobile banking)
☐ k získávání informací přes SMS (zábava, zpravodajství, doprava, atd.)
☐ k nakupování zboží a objednávání služeb
☐ k jiným (hraní her, atd.)
☐ nepoužívám mobilní telefon

Partie k využívání osobních počítačů.

3 Máte v domácnosti osobní počítač? ☐

4 Pokud ano, jaké jsou nejdůležitější důvody pro které jste si pořídili osobní počítač? (max. 3 odpovědi)

☐ přání mé, dětí nebo sourozenců
☐ vytváření a ukládání různých dokumentů týkajících se rodiny (korespondence, dokumenty, adresy, atd.)
☐ využití k vzdělávání, přípravě do školy (úkoly do školy, práce s počítačem, jazykové vzdělávání, vzdělávání z CD-ROM, atd.)
☐ využití k pracovním účelům
☐ zábava (hudba, hry, filmy, atd.)
☐ připojení na internet
jiný důvod _____

5 Jak často (v průměru) jste použil/a osobní počítač? (v posledních 3 měsících)

☐ Každý den nebo skoro každý den
☐ 1-4 dny v týdnu
☐ Nejméně jednou za měsíc, ale ne každý týden
☐ Méně než jednou za měsíc

6 Už jste někdy: (více možných odpovědí)

☐ nainstaloval/a nějaký software, nebo hardware
☐ použil/a zipovací program
☐ vytvořil/a makro
☐ vytvořil /a webovou stránku
☐ vytvořil /a počítačový program za použití
☐ specializovaného programovacího jazyku (C, C++, Pascal, atd.)

Partie k využívání Internetu.

7 Máte v domácnosti přístup na internet? ☐

8 Pokud ano, jaké jsou nejdůležitější důvody pro které jste si pořídili připojení k internetu ? (max. 3 odpovědi)

☐ přání mé, dětí nebo sourozenců
☐ hledání informací, které nesouvisí s prací a vzděláváním (zprávy, počasí,

zdraví, cestování, sport, zajímavosti, reality, atd.)
☐ využití ke komunikaci (e-mail, telefonování, atd.) využití k vzdělávání nebo k přípravě do školy (hledání informací na internetu, práce s internetem)
☐ využití k pracovním účelům (kontakt se zaměstnavatelem a kolegy přes internet, hledání informací pro pracovní účely, atd.)
☐ zábava (hudba, hry, filmy, atd.)
☐ jiný důvod

9 Jak často (v průměru) jste použil/a internet ? (v posledních 3 měsících)

☐ Každý den nebo skoro každý den
☐ 1-4 dny v týdnu
☐ Nejméně jednou za měsíc, ale ne každý týden
☐ Méně než jednou za měsíc

10 Pokuste se odhadnout kolik hodin jste průměrně za týden strávil/a na internetu v posledních 3 měsících?

☐ 1 hodina (včetně) a méně
☐ Více než 1 hodina, max. však 5 hodin (včetně)
☐ Více než 5 hodin, max. však 20 hodin (včetně)
☐ Více než 20 hodin

11 Použil/a jste v posledních 3 měsících internet pro soukromé účely k: (více možných odpovědí)

☐ posílání/přijímání elektronické pošty „e-mailů“
☐ telefonování přes internet pomocí počítače
☐ využívání SMS brány (odesílání SMS a MMS zpráv na mobilní telefon)
☐ jiné činnosti v oblasti komunikace(chat, ICQ, videokonference atd.)

12 Použil/a jste v posledních 3 měsících internet pro soukromé účely k: (více možných odpovědí)

☐ vyhledávání informací o zboží a službách
☐ prohlížení/stahování on-line novin a časopisů
☐ vyhledávání informací v jízdních řádech
☐ vyhledávání služeb týkajících se cestování a ubytování
☐ vyhledávání/stahování odborných textů
☐ hraní/stahování počítačových her a hudby
☐ hledání práce, vložení životopisu na internet

☐ vyhledávání/vkládání inzerce, seznamka
☐ poslouchání rádia/sledování televize na internetu
☐ stahovaní freewaru nebo sharewaru „počítačových programů“

13 Použil/a jste v posledních 3 měsících internetové bankovnictví (pro soukromé účely)? ☐

14 Použil/a jste v posledních 3 měsících internet k činnostem souvisejícím se zdravím? A ke kterým? (více možných odpovědí)

☐ hledání informací o zdraví na internetu (nemoci, léčení, výživa, zlepšování zdraví, atd.)
☐ hledání kontaktů na zdravotnická zařízení, lékaře
☐ objednání se na vyšetření přes internet (on-line, e-mailem)
☐ on-line poradna/konzultace s lékařem
☐ Nepoužil/a

15 Koupil/a nebo objednal/a jste někdy nějaké zboží či služby přes internet pro soukromé účely? ☐

16 Prodali jste někdy nějaké zboží či služby přes internet pro soukromé účely (např. prostřednictvím aukcí)? ☐

ČÁST II. Partie k předmětu DTP a elektronické publikování / DTP and Electronic Publishing.

17 Vím, jak zapsat tvrdé mezery (non-breakable spaces):

☐ v HTML stránce
☐ v programu Microsoft Word
☐ v programu LaTeX

18 Vím, jak zapsat tvrdou pomlčku (non-breakable dashes):

☐ v HTML stránce
☐ v programu Microsoft Word
☐ v programu LaTeX

19 Vím, jak si ověřit správnost (validate) svých webových stránek. ☐

20 Jsem schopen/schopna si technicky připravit obdobný elektronický dotazník jako je tento v jazyku HTML (nemusí však fungovat odesílání)? ☐

21 Pokud ano, jsem navíc schopen/schopna zprovoznit odesílání dat a to za použití:

☐ PHP
☐ ASP
jiného skriptovacího jazyka: _____

☐ MySQL
☐ MSSQL
jiného databázového systému: _____

22 Jsem schopen/schopna připravit alternativní (plnící stejnou funkci) elektronický formulář ve formátu:

☐ DOC (plus jeho zamknutí)
☐ PDF (plus zaheslování proti editaci)
☐ FDF
ještě jinak: _____

23 Máte k dispozici osobní počítač, kde máte administrátorská (nejvyšší) práva? ☐

24 Jste si schopni sami nainstalovat webový (web-domain) server? ☐

25 Vím co znamená a jak si zhruba sám připravit vědecký plakát (scientific poster). ☐

ČÁST III. Partie k předmětu Počítačové zpracování dat / Computerised Data Processing.

26 Jste schopni dopočítat Chí-kvadrát test pokud Vám budou dodána data ve formě jednotlivých odpovědí?

☐ Z hlavy, ručně a bez nutnosti literatury
☐ Ručně s literaturou
☐ Za použití software

27 Jste schopni dopočítat Chí-kvadrát test pokud Vám budou dodána data jako tabulka četností?

☐ Z hlavy, ručně a bez nutnosti literatury
☐ Ručně s literaturou
☐ Za použití software

28 Jste schopni spočítat Pearsonův korelační koeficient?

☐ Z hlavy, ručně a bez nutnosti literatury
☐ Ručně s literaturou
☐ Za použití software

29 Jsem schopen/schopna pracovat s proměnnými a cykly v programech:

☐ BASIC
☐ Pascal
☐ DELPHI
☐ Java
☐ PHP
☐ C++
☐ Visual Basic
☐ Java Script
jiný: _____

ČÁST IV. Partie k předmětu Kvantitativní metody v rozhodování / Quantitative Methods for Managerial Decision Making.

30 Pokud, tak jaký statistický software používáte?

☐ Minitab
☐ Statgraphics
☐ SPSS
☐ ℝ
☐ StatXact
☐ LogXact
☐ Nádstavby MS Excel
jiný (ne však WinQSB): _____

31 Pokud, tak jaký matematický/optimalizační software používáte?

☐ Řešitel MS Excelu
☐ Matlab
☐ MuPAD
☐ Mathematica
☐ Evolver
jiný (ne však WinQSB): _____

32 Pokud, tak v jakém software jste schopni provést simulace a simulační výpočty?

☐ Matlab
☐ Simulink
☐ Powersim
☐ DYNAST
☐ SIMUL8
☐ SIMPROCESS
jiný (ne však WinQSB): _____

33 Uvítal/a bych další partie (kvadratické, nelineární programování, více o simulování) v tomto předmětu nebo je kurz i tak dost těžký.

Napište mi prosím Váš názor: _____

ČÁST V. Obecné otázky, většinou nepovinné.

34 Podle čeho se Vám obecně nejlépe studuje:

☐ Kniha/Učebnice
☐ Skripta/Cvičebnice
☐ Dle přednášek
☐ Dle cvičení
☐ Dle internetových zdrojů
Chci se rozepsat: _____

35 ☐ Jsem muž.
☐ Jsem žena.

Napište mi, pokud tak uznáte za vhodné i:

36 Vaše jméno: _____

37 Váš email: _____

38 Zde je prostor na další poznámky: _____

{To je vše a data si přeji odeslat. Klikněte zde.}

{DATA BYLA ÚSPĚŠNĚ ODESLÁNA.}

{Děkuji ještě jednou za vyplnění tohoto dotazníku.}

{Pavel Stříž s pozdravem.}
{ÚIS FaME UTB ve Zlíně}
{email: striz@fame.utb.cz}

Note: This appendix is cited on page 95.

Appendix C: Used Software During Thesis Preparation

Here follows a list of main programmes used during this thesis preparation.

AeOnServ 1.5.25	OSS available at `www.sf.net`. Includes Apache 2, PHP 5, MySQL ver 12.22, phpMyAdmin.
ARENA 7.01	See `www.arenasimulation.com`.
JMP 6	Statistical software from `www.jmp.com`.
Microsoft Office 2003	Excel. See `www.microsoft.com`.
Minitab Release 14	Statistical software available at `www.minitab.com`.
OpenOffice.org 2.0.4	Calc. See `www.openoffice.org`.
ℝ version 2.4.0	See `www.r-project.org`.
Statgraphics Centurion XV	Statistical software available at `www.statgraphics.com`.
StatXact 7	Statistical software available at `www.cytel.com`.
TEX 3.141592	Mainly in the LATEX 2_ε format. See `www.tug.org`.
WinQSB v. 1.00	Optimisation software.

Note: This appendix is cited on page 97.

Author's Publications

(from the newest to the oldest in each category)

Textbooks and Exercise Books in English

[1] Pavel Stříž and Jozef Říha. *IN PRINT: TEX and Friends: Theses Preparation and Beyond (in English). TEX a příbuzné programy: příprava vysokoškolských kvalifikačních prací a ještě dále*. TBU, Zlín, 1st edition, 2007. 322 pages. 200 copies. ISBN 80-7318-XXX-X.

This textbook is supplementary material for the first-year students of the Faculty of Management and Economics at the Tomas Bata University in Zlín for courses DTP and Electronic Publishing and DTP a elektronické publikování. It covers TEX, BibTEX, MakeIndex and other support software tools.

Key words: TEX, typography, electronic publishing.

Textbooks and Exercise Books

[2] Pavel Stříž, Michal Čihák, and Roman Kasal. *IN PRINT: Exercise Book for Statistical Analysis Methods Course (in Czech). Cvičebnice do Metod statistické analýzy*. TBU, Zlín, 1st edition, 2007. 302 pages. 300 copies. ISBN 80-7318-XXX-X.

This exercise book is supplementary material for the students of the Faculty of Management and Economics at the Tomas Bata University in Zlín. It covers

probability, Bayes Theorem, and basic parts from mathematical statistics.
Key words: Probability, Mathematical Statistics.

[3] Pavel Stříž, Vladimír Rytíř, Petr Klímek, and Roman Kasal. *Lecture Notes for Statistical Analysis Methods Course (in Czech). Přednášky z Metod statistické analýzy*. TBU, Zlín, expanded 2nd edition, 2006. 172 pages. 200 copies. ISBN 80-7318-433-8.

This textbook is supplementary material for the students of the Faculty of Management and Economics at the Tomas Bata University in Zlín. It covers probability, Bayes Theorem, and basic parts from mathematical statistics.
Key words: Probability, Mathematical Statistics.

[4] Pavel Rosman, Pavel Stříž, Bohumil Juřenčák, Roman Jašek, and Radek Benda. *Informatics for Economists (in Czech). Informatika pro ekonomy*. TBU, Zlín, expanded 2nd edition, 2006. 250 pages. 500 copies. ISBN 80-7318-430-3.

The lecture notes offer survey information and pieces of knowledge from the areas of information science and information technology. They can be fundamental source of information for the theoretic encompassment subject matter in the object Informatics for the Economists. Ties together with the previously published title, which logically supports and updates pursuant to the current data level of knowledge.
Key words: Economy, Informatics, Information Technology, IS, IT, Hardware, Software.

[5] Petr Klímek, Pavel Stříž, and Roman Kasal. *Computerised Data Processing in Statistica Software. Analysis of Variance and Nonparametric Tests. Second Part (in Czech). Počítačové zpracování dat v programu Statistica. Analýza rozptulu a neparametrické testy – 2. díl. Studijní pomůcka pro distanční studium*. TBU, Zlín, 1st edition, 2006. 92 pages. 150 copies in 3 years. ISBN 80-7318-379-X.

This practice book is supplementary material for the second-year students of the Faculty of Management and Economics at the Tomas Bata University in Zlín. It covers Analysis of Variance (ANOVA) and nonparametric tests for 2 and more dependent samples and 2 and more independent samples.
Key words: Statistics, Analysis of Variance, ANOVA, Nonparametric Tests.

[6] Vladimír Rytíř, Pavel Stříž, Petr Klímek, and Roman Kasal. *Lecture Notes for Statistical Analysis Methods Course (in Czech). Přednášky z Metod statistické analýzy*. TBU, Zlín, 1st edition, 2005. 142 pages. 200 copies. ISBN 80-7318-353-6.

This textbook is supplementary material for the students of the Faculty of Management and Economics at the Tomas Bata University in Zlín. It covers

probability, Bayes Theorem, and basic parts from mathematical statistics.
Key words: Probability, Mathematical Statistics.

[7] Vladimír Rytíř and Pavel Stříž. *Managerial Decision Making Under Risk and Uncertainty (in Czech). Manažerské rozhodování v riziku a nejistotě*. TBU, Zlín, 1st edition, 2005. 130 pages. 200 copies. ISBN 80-7318-309-9.

The textbook is supplementary material for the students of the Faculty of Management and Economics at the Tomas Bata University in Zlín. It covers game theory, decision trees, minimin, maximax, minmax, Bayes Theorem, Laplace, Hurwitcz criteria, and an introduction to the artificial neural networks modelling approach.
Key words: Decision Making Under Risk and Uncertainty, Game Theory.

[8] Helena Seberová and Pavel Stříž. *Managerial Decision Making Under Risk and Uncertainty. Exercise book (in Czech). Manažerské rozhodování v riziku a nejistotě. Cvičebnice*. TBU, Zlín, 1st edition, 2005. 128 pages. 200 copies. ISBN 80-7318-307-2.

The practice book is supplementary material for the students of the Faculty of Management and Economics at the Tomas Bata University in Zlín. It covers game theory, decision trees, minimin, maximax, minmax, Bayes Theorem, Laplace, and Hurwitcz criteria.
Key words: Decision Making Under Risk and Uncertainty, Game Theory.

[9] Pavel Rosman, Pavel Stříž, Radek Benda, and Roman Jašek. *Informatics for Economists (in Czech). Informatika pro ekonomy*. TBU, Zlín, 1st edition, 2004. 248 pages. 600 copies. ISBN 80-7318-209-2.

The lecture notes offer survey information and pieces of knowledge from the areas of information science and information technology. They can be fundamental source of information for the theoretic encompassment subject matter in the object Informatics for the Economists. Ties together with the previously published title, which logically supports and updates pursuant to the current data level of knowledge.
Key words: Economy, Informatics, Information Technology, IS, IT, Hardware, Software.

In Proceedings in English

[10] Jan Firich and Pavel Stříž. Quality Assurance of Software Products. In *Proceedings from Second Annual Bata's Conference for Ph.D. Students*

(Recenzovaný sborník Mezinárodní Bat'ovy Doktorandské Konference), page 20, Zlín, April, 27, 2006. TBU. 270 copies. ISBN 80-7318-384-6.

The paper describes quality assurance processes of software products as well as quality expectations on both customer and producer sides. It provides a brief overview of modern software testing methods. The paper further documents the most common practices and approaches used during quality assurance and engineering processes for complex software systems. The authors also discuss test automation. An additional goal of this paper is to present an extended list of literature and Internet resources on this topic.

Key words: Quality Assurance, Software Testing, Test Automation, Test Case, Bug.

[11] Jozef Říha, Roman Kasal, and Pavel Střížˇ. Electronic Document Templates for the Tomas Bata University in Zlín. In *Proceedings from Second Annual Bata's Conference for Ph.D. Students (Recenzovaný sborník Mezinárodní Bat'ovy Doktorandské Konference)*, page 8, Zlín, April, 27, 2006. TBU. 270 copies. ISBN 80-7318-384-6.

The article describes the results of the creation of templates for electronic documents (theses) for the Tomas Bata University in Zlín, the Czech Republic, and improving them upon the student's requests which are collected during their finals. The output that the University requires is nicely-formatted and content-full paper work representing both the writer's knowledge and skills. Especially at the time when the electronic form of the thesis will be required by the University, the formal look of the documents has to be accentuated. The article brings a brief overview on what happened in the time run and how the project will continue in the future.

Key words: Template, Typography, Microsoft Word, OpenOffice.org, TEX, LATEX, AdminMOST.

[12] Jan Firich and Pavel Střížˇ. Quality Assurance of Software Products. In *Seszyty Naukowe EAS № 5 – Selected Perspectives on the Security of Entrepreneurship and Life*, page 15, Kraków – Zlín, March, 14 – 15, 2006. European Association for Security. 100 copies. ISBN 83-919932-4-8.

The paper describes quality assurance processes of software products as well as quality expectations on both customer and producer sides. It provides a brief overview of modern software testing methods. The paper further documents the most common practices and approaches used during quality assurance and engineering processes for complex software systems. The authors also discuss test automation. An additional goal of this paper is to present an extended list of literature and Internet resources on this topic.

Key words: Quality Assurance, Software Testing, Test Automation, Test Case, Bug.

[13] Jan Firich and Pavel Stříž. Quality Assurance of Software Products. In *Eighth International Conference Entitled "The Internet and Organisational Security"*, page 15, Zlín, March, 14, 2006. Tomas Bata University in Zlín, Faculty of Management and Economics. 100 copies. ISBN 80-7318-393-5.

The paper describes quality assurance processes of software products as well as quality expectations on both customer and producer sides. It provides a brief overview of modern software testing methods. The paper further documents the most common practices and approaches used during quality assurance and engineering processes for complex software systems. The authors also discuss test automation. An additional goal of this paper is to present an extended list of literature and Internet resources on this topic.

Key words: Quality Assurance, Software Testing, Test Automation, Test Case, Bug.

[14] Jitka Kloudová, Kamil Dobeš, and Pavel Stříž. Factors Influencing the Momentary Situation and Standing of Enterprises on the Market. In *Sixth International Conference on "Enterprise in Transition"*, pages 377–386, Split – Bol, Croatia, May 26 – 28, 2005. University of Split, Faculty of Economics. 300 copies. ISBN 953-6024-70-5.

A market research investigation was conducted in 2003 to discover which factors are the most significant for maintaining one's pace (and place) with the competition in 276 Czech enterprises. The aim of this research study was to map the environment of Czech enterprises from the perspective of the situational standing of that enterprise on the Czech market. Using the GE Matrix Model, it investigated whether the set of professionally-related activities in which the enterprise operates has an influence on the situational standing of these enterprises on their markets, i.e. the quality of the enterprise's management, the level (and quality) of marketing in the enterprise, the exploitation of the Internet in the marketing activities of that enterprise, and at the same time, control checks were made of the marketing activities through the perfomance of a Marketing Audit.

Key words: GE Matrix, Marketing, Management, Marketing Audit, Competitiveness.

In Proceedings

[15] Roman Kasal, Jozef Říha, and Pavel Stříž. Application of Genetic Algorithms in Production Planning. In *Proceedings from Second Annual Bata's Conference for Ph.D. Students (Recenzovaný sborník*

Mezinárodní Bat'ovy Doktorandské Konference), page 10, Zlín, April, 27, 2006. TBU. 270 copies. ISBN 80-7318-384-6.

The article deals with a real-world problem. It tries to optimize production planning problem in the firm Mitas, a. s., with many decision variables. It uses global optimization tool Genetics Algorithm in software Evolver and Travelling Salesman Problem solved in MATLAB. The authors knew well that the solution could not be the sought global minimum, but still the found solution saves 6/7 of the time of the firm's initial guess.

Key words: Production Planning Problem, Genetics Algorithm, Evolver, Travelling Salesman Problem, MATLAB.

[16] Jana Přílučíková, Michal Polášek, Lukáš Řezníček, and Pavel Stříž. Teaching in Erasmus/Socrates Programmes Experience. In *Proceedings from Second Annual Bata's Conference for Ph.D. Students (Recenzovaný sborník Mezinárodní Bat'ovy Doktorandské Konference)*, page 6, Zlín, April, 27, 2006. TBU. 270 copies. ISBN 80-7318-384-6.

The article describes a new experience in teaching courses and special programmes in English. It may be helpful and worth reading for graduating and doctoral students who may also become teachers in similar courses. The article deals with teaching in full-semester courses at the home university, the Tomas Bata University in Zlín, and in a few special programmes at Savonia Polytechnic in Varkaus, Finland.

Key words: Erasmus/Socrates Programme, Experience in Teaching in English, Preparations for Travelling.

[17] Pavel Stříž and Roman Kasal. Cooperation Between TBU in Zlín and Czech Statistical Bureau: Statistical Lexicon of Municipalities of the Czech Republic 2005 (in Czech). Spolupráce UTB ve Zlíně a ČSÚ: Statistický lexikon obcí České republiky 2005. In *First Bata's Regional Conference (I. Bat'ova regionalistická konference)*, page 4, Zlín, November 25 – 26, 2005. TBU. 150 copies. ISBN 80-7318-359-5.

The article describes potential points in mutual cooperation of the Czech Statistical Office with the Tomas Bata University in Zlín. The Cooperation Agreement, signed by the Tomas Bata University Rector prof. Petr Sáha and the Czech Statistical Office Chairman ing. Jan Fischer describes how these two parties will cooperate by mutual communication, sharing information, supporting scientific and research activities, also on projects of grant agencies and exchanging lecturers. We have had success in this field of cooperation. The next thing this article describes is a gift from the Czech Statistical Office, Regional Office Zlin, given to the Faculty of Management and Economics. It is the valuable book *Statistical Lexicon of Municipalities of the Czech Republic 2005*.

Key words: Czech Statistical Office, TBU in Zlín, Cooperation, Statistical Lexicon.

[18] Pavel Stříž and Roman Kasal. Trends of Employment from Different Points of View (in Czech). Vývoj vybraných ukazatelů dle klasifikace zaměstnání. In *First Bata's Regional Conference (I. Bat'ova regionalistická konference)*, page 11, Zlín, November 25 – 26, 2005. TBU. 150 copies. ISBN 80-7318-359-5.

The article compares the development of the employment indicators used in KZAM and CZ-ICSE classifications in Zlín's region, the Czech Republic and in the European Union. The data is taken from the official resources such as publications from the Czech Statistical Office <http://www.czso.cz/>, *Employment in Europe 2003, Recent Trends and Prospects* prepared and published by DG Employment and Social Affairs in close collaboration with Eurostat <http://europa.eu.int/>, and publications presented by Laborsta server <http://www.ilo.org/>. The article is focused on selected and specific labour indicators. It discusses the employment in Services, Industry, and Agriculture. It analyses the time series and tries to forecast a short-term prediction of these indicators in percentage of total employment.

Key words: Employment, Labour Analysis, Zlín Region, Czech Statistical Office, EU.

[19] Jozef Říha and Pavel Stříž. Typesetting References and Bibliography in Selected OS DTP Systems (in Czech). Sazba Seznamu literatury ve vybraných OS DTP systémech. In *Proceedings from First Annual Bata's Conference for Ph.D. Students (Sborník I. ročníku Mezinárodní Bat'ovy Doktorandské Konference)*, page 6, Zlín, April 21, 2005. TBU. 270 copies. ISBN 80-7318-257-2.

Almost everyone has an opportunity to write a huge number of various documents for many occasions. There is an amount of different typographic systems at various levels of popularity and quality. Earlier or later people choose one desktop system and they do not care much about the others. Usually they know too little about them from the other people or articles. This article points to Open Source typographic systems which do not cost us a single penny, in an ideal situation. The article mentions two typographic systems: OpenOffice.org Writer and TEX, in particular. The preparation of the Bibliography and its citations is shown in both systems.

Key words: Open Source, DTP Systems, OpenOffice.org Writer, TEX, Bibliography.

[20] Pavel Stříž, Miroslav Červenka, and Martin Štěpánek. Installing a Web-Domain Server on a Local Computer (in Czech). Instalace WWW serveru na lokálním počítači. In *Proceedings from First Annual Bata's Conference for Ph.D. Students (Sborník I. ročníku Mezinárodní Bat'ovy Doktorandské Konference)*, page 4, Zlín, April 21, 2005. TBU. 270 copies. ISBN 80-7318-257-2.

What may not be seen at first sight is that a web-domain server can be installed on every local computer with installed TCP/IP as it can be seen so many times browsing the Internet. Still if we are not connected to the Internet we can work with a local PC as it is the server. Many programming languages take this advantage. Web tools, including installing server, were installed separately and it was time-consuming work of configuring specific files for novices. This article mentions an easy way of installing the web-domain server under the operation systems Linux and Microsoft Windows. In this article is shown the method of installing server and its additional tools. It also points to packages, which prepare all configuration files, special tools and one of the Content Management Systems, for the user.

Key words: Installing Web-Domain Server, Apache, PHP, MySQL, CMS.

[21] Jozef Říha and Pavel Stříž. Open Source DTP Systems (in Czech). Open Source DTP systémy. In *Proceedings from Seventh Conference Internet and Enterprises' Competitiveness (Sborník VII. ročníku konference Internet a konkurenceschopnost podniku)*, page 6, Zlín, March 16, 2005. TBU. 250 copies. ISBN 80-7318-269-6.

Almost everyone has an opportunity to write a huge number of various documents for many occasions. There is an amount of different typographic systems at various levels of popularity and quality. Earlier or later people choose one desktop system and they do not care much about the others. Usually they know too little about them from the other people or articles. This article points to Open Source typographic systems which do not cost us a single penny, in an ideal situation. The article mentions two typographic systems: OpenOffice.org Writer and TEX, in particular. The preparation of the Bibliography and its citations is shown in both systems.

Key words: Open Source, DTP Systems, OpenOffice.org Writer, TEX, Bibliography.

[22] Pavel Stříž, Miroslav Červenka, and Martin Štěpánek. My Computer, My Server (in Czech). Můj počítač, můj server. In *Proceedings from Seventh Conference Internet and Enterprises' Competitiveness (Sborník VII. ročníku konference Internet a konkurenceschopnost podniku)*, page 4, Zlín, March 16, 2005. TBU. 250 copies. ISBN 80-7318-269-6.

What may not be seen at a first sight is that a web-domain server can be installed on every local computer with installed TCP/IP as it can be seen so many times browsing the Internet. Still if we are not connected to the Internet we can work with a local PC as it is the server. Many programming languages take this advantage. Web tools, including installing server, were installed separately and it was time-consuming work of configuring specific files for novices. This article mentions an easy way of installing the web-domain server under the operation systems Linux and Microsoft Windows. In this article is shown the method of installing server and its additional tools. It also points to packages, which prepare all configuration files, special tools and one of the Content Management Systems, for the user.

Key words: Installing Web-Domain Server, Apache, PHP, MySQL, CMS.

[23] Pavel Stříž and Radek Benda. CMS by Plain Black as a Support Tool for Teaching (in Czech). Podpora výuky pomocí CMS firmy Plain Black. In *Proceedings from Conference MendelNET 2004 (Sborník konference MendelNET 2004)*, page 7, Brno, November 26, 2004. MZLU. 300 copies. ISBN 80-7302-088-2.

The paper in the proceedings points to the Content Management System WebGUI made by the firm Plain Black. The paper mentions possibilites from the points of view of server administrator and a common Internet user. The server with this CMS is used especially for the learning process and the paper shows the designed structure of our web pages.

Key words: Intranet, Portal, CMS, E-Learning.

[24] Jiří Kropáč and Pavel Stříž. MS Excel Files as a Support Tool for a Teaching Statistics (in Czech). Soubory v Excelu pro podporu výuky matematické statistiky. In *Proceedings from Conference Pedagogical Software 2004 (Sborník konference Pedagogický software 2004)*, pages 293–296, České Budějovice, June 10, 2004. JČU. 300 copies. ISBN 80-85645-49-1.

The article shows an alternative way how to teach and support statistics. It describes options of prepared Microsoft Excel files which were created at the Department of Informatics and Statistics, Faculty of Management and Economics, Tomas Bata University in Zlín.

Key words: Microsoft Excel, Teaching Statistics, Mathematical Statistics.

[25] Pavel Stříž. Preparing PDF files as a Study Support (in Czech), Příprava elektronických podpor v PDF. In Bedřich Zimola, editor, *Proceedings from Conference eLearning at Universities 2004 (Sborník příspěvků konference eLearning ve vysokoškolském vzdělávání 2004)*, pages 140–145, Zlín, May 18 – 19, 2004. TBU. 100 copies. ISBN 80-7318-190-8.

The paper in the proceedings describes basic possibilities of preparing PDF files. It mentions the options such as Open Source printer devices, direct output from OpenOffice.org Writer and TEX.

Key words: PDF, Printer Devices, Writer OpenOffice.org, TEX.

[26] Pavel Stříž and Radek Benda. Using WebGUI as a Support for the Learning Process (in Czech). Využití WebGUI pro podporu vzdělávacího procesu. In Bedřich Zimola, editor, *Proceedings from Conference*

eLearning at Universities 2004 (Sborník příspěvků konference eLearning ve vysokoškolském vzdělávání 2004), pages 146–151, Zlín, May 18 – 19, 2004. TBU. 100 copies. ISBN 80-7318-190-8.

The paper in the proceedings points to the Content Management System WebGUI made by the firm Plain Black. The paper mentions possibilites from the points of view of server administrator and a common Internet user. The server with this CMS is used especially for the learning process and the paper shows the designed structure of our web pages.

Key words: Intranet, Portal, CMS, E-Learning.

[27] Pavel Stříž and Radek Benda. Intranet Portal at the DIS on FaME in Zlín (in Czech). Intranetový portál ÚIS FaME ve Zlíně. In *Proceedings from Sixth Conference Internet and Enterprises' Competitiveness (Sborník VI. ročníku konference Internet a konkurenceschopnost podniku)*, pages 188–192, Zlín, March 17, 2004. TBU. 250 copies. ISBN 80-7318-162-2.

The paper in the proceedings points to the Content Management System WebGUI made by the firm Plain Black. The paper mentions possibilites from the points of view of server administrator and a common Internet user. The server with this CMS is used especially for the learning process and the paper shows the designed structure of our web pages.

Key words: Internet, Intranet, Portal, CMS, E-Learning.

[28] Pavel Stříž. Preparation of PDF Files (in Czech). Příprava PDF dokumentů. In *Proceedings from Sixth Conference Internet and Enterprises' Competitiveness (Sborník VI. ročníku konference Internet a konkurenceschopnost podniku)*, pages 48–52, Zlín, March 17, 2004. TBU. 250 copies. ISBN 80-7318-162-2.

The paper in the proceedings describes basic possibilities of preparing PDF files. It mentiones the ways of Open Source printer devices, direct output from OpenOffice.org Writer and TEX.

Key words: PDF Format, Printer Devices, OpenOffice.org Writer, TEX.

[29] Pavel Stříž. Printed Stuff Accessory : Internet (in Czech). Doplněk tištěných materiálů : Internet. In *Proceedings from Second Conference STAKAN Teaching Statistics in the Czech Republic (Sborník prací semináře STAKAN Výuka statistiky v ČR II)*, pages 117–128, Prague, May 23 – 25, 2004. Matfyzpress. ISBN 80-239-4086-4.

The paper in the proceedings describes basic possibilities of publishing data files on the Internet. It introduces examples of Czech and English web pages with published data files. The paper mentions advantages and disadvantages of this way of printed stuff publishing and publishing web pages.

Key words: Teaching Statistics, Publishing Data Files, Internet.

[30] Pavel Stříž. Application of Artificial Neural Networks to the Game of Bridge (in Czech). Aplikace umělých neuronových sítí v karetní hře bridž. In Jaromír Antoch, Gejza Dohnal, and Jan Klaschka, editors, *Proceedings from Conference ROBUST 2002 (Sborník prací dvanácté zimní školy JČMF ROBUST'2002)*, pages 278–291, Prague, January 21 – 25, 2002. JČMF. 250 copies. ISBN 80-715-900-6.

В этой стате автор исследует некоторые аспекты игры бридж, где ос обое внимание удельяеця возможности изпользования нейронных сетей. Наряды с использованием искуственных нейронных сетей автор уделяет особое внимание возможности использования некоторых алгорифмов. В предисловии стати автор кратко представляет бридж. Приводит примеры попыток использования искуственных ней ронных сетей и в дры гих играх: нарды, покер, шахматы и так далее. Автор тестирует воз можности простых искуственных нейронных сетейпри помощи команд, угадывания количества выигрышных попыток состороиы как защиты так нападения и способность раздичать итоговые диаграммы игроков. В заключении автор размышляет о развитии учебного материяла.

In the paper, the author discusses some basic aspects of the game/sport bridge, especially with a view to the possibilities of using artificial neural networks. Furthermore, the author discusses the applicable algorithms (from the field of artificial intelligence). In the beginning, the author briefly introduces the game of bridge. The author presents attempts and tendencies of using artificial neural networks in the games of backgammon, poker, chess, and go. The author also examines the learning abilities of simple artificial neural networks in the bidding, guessing the number of winning tricks for offensive and defensive side, and the ability to discern between the different playing methods in the endgame. In conclusion, the author proposes a development of bridge study materials.

Key words: Artificial Neural Networks, Game of Bridge, Study Support Materials.

Articles

[31] Jozef Říha and Pavel Stříž. (Not only) English-Czech dictionaries for StarDict (in Czech). (Nielen) anglicko-české slovníkové databázy pre StarDict. *ABC of Linux. (abclinuxu.cz – Linux na stříbrném podnose)*, 2006. [on-line]. ISSN 1214-1267.

The article informs about convertable English-Czech dictionaries for StarDict implementation for Linux and Windows.

Key words: English-Czech dictionary, StarDict, Linux.

[32] Martin Stříž and Pavel Stříž. Office Suite OpenOffice.org (in Czech). Kancelářský balík OpenOffice.org. *Prospects – Magazine for Written*

and Electronic Communication. (Rozhledy – časopis pro písemnou a elektronickou komunikaci), 82(7):1–1, 2006. 15 500 copies. ISSN 1214-5653.

The article informs about an open source free office suite OpenOffice.org, as an alternative to commercial office suite Microsoft Word.
Key words: Free Office Suite, OpenOffice.org, Microsoft Office.

[33] Pavel Stříž and Martin Stříž. VBA Macro for Author's Proof Competition Practically (in Czech). Velké makro prakticky. *Prospects – Magazine for Written and Electronic Communication. (Rozhledy – časopis pro písemnou a elektronickou komunikaci)*, 82(6):1–1, 2006. 15 500 copies. ISSN 1214-5653.

The article informs about the new Visual Basic for Applications macros in Microsoft Word for the author's proof competition. This paper is practically oriented.
Key words: Typesetting, VBA, Author's Proof Competition.

[34] Roman Kasal, Petr Klímek, Jozef Říha, and Pavel Stříž. Application of Genetic Algorithms to Planning Production in the Firm Mitas, a. s. (Reprinted scientific poster, in Czech). Aplikace genetických algoritmů v procesu plánování výroby ve společnosti Mitas, a. s. (přetištěný vědecký poster). *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(Special edition):40–41, 2005. 250 copies. ISSN 1210-8022.

This is an example of real-world scientific posters from the conference Robust 2006.
Key words: Typesetting, MS PowerPoint, Scientific Posters.

[35] Jozef Říha and Pavel Stříž. Scientific Poster Preparation (in Slovak). Príprava posteru. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(Special edition):21–31, 2005. 250 copies. ISSN 1210-8022.

The article shows various ways of preparing scientific posters in Microsoft PowerPoint or LaTeX.
Key words: Typesetting, MS PowerPoint, TeX, LaTeX, Scientific Posters.

[36] Jozef Říha and Pavel Stříž. Presentation Software for LaTeX (in Slovak). Prezentačný software pre LaTeX. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(Special edition):1–13, 2005. 250 copies. ISSN 1210-8022.

The article shows various ways of preparing presentations in LaTeX.
Key words: Typesetting, TeX, LaTeX, Presentations.

[37] Martin Stříž and Pavel Stříž. Vm – VBA Macro for Author's Proof Competition (in Czech). Vm – makro pro korekturu textu. *Prospects – Magazine for Written and Electronic Communication. (Rozhledy – časopis pro písemnou a elektronickou komunikaci)*, 81(4):1–1, 2005. 15 500 copies. ISSN 1214-5653.

The article informs about the new Visual Basic for Applications macros in Microsoft Word for the author's proof competition.

Key words: Typesetting, VBA, Author's Proof Competition.

[38] Jitka Kloudová, Kamil Dobeš, and Pavel Stříž. Factors Influencing the Momentary Situation of Enterprises on the Market (in Czech). Faktory ovlivňující situační postavení firmy na trhu. *Economics and Management (Ekonomie a Management)*, 8(1):134–141, 2005. 700 copies. ISSN 1212-3609.

A market research investigation was conducted in 2003 to discover which factors are the most significant for maintaining one's pace (and place) with the competition in 276 Czech enterprises. The aim of this research study was to map the environment of Czech enterprises from the perspective of the situational standing of that enterprise on the Czech market. Using the GE Matrix Model, it investigated whether the set of professionally-related activities in which the enterprise operates has an influence on the situational standing of these enterprises on their markets, i.e. the quality of the enterprise's management, the level (and quality) of marketing in the enterprise, the exploitation of the Internet in the marketing activities of that enterprise, and at the same time, control checks were made of the marketing activities through the perfomance of a Marketing Audit.

Key words: GE Matrix, Marketing, Management, Marketing Audit, Competitiveness.

[39] Pavel Stříž. Seeking for the Centre of a Bullet (in Czech). Hledání středu kulek. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(2):15–17, 2005. 250 copies. ISSN 1210-8022.

The article describes one of the methods to find the centre of a bullet. It uses the scripting language PHP and a symmetry of the object.

Key words: Seeking Centre of Bullet, PHP, Symmetry, Asymmetry.

[40] Pavel Stříž. ROBUST 2004 (in Czech). ROBUST 2004. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(1):13–20, 2005. 250 copies. ISSN 1210-8022.

The article describes an international conference Robust 2004 – Robust Statistics. It also discusses the effectiveness of current algorithms and computers.

Key words: Statistics, Robustness, Conference, Effectiveness.

[41] Pavel Stříž and Jozef Říha. TEX-Collection 2003 and 2004 (in Czech). TEX-Collection 2003 a 2004. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 15(4):4–7, 2004. 250 copies. ISSN 1210-8022.

The article informs about and describes the TEX Collections from the years 2003 and 2004.

Key words: TEX, Typesetting, Mathematical Formulae.

[42] Pavel Stříž. Meeting of CSTUG Members in Brno (in Czech). Setkání TEXistů v Brně. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 14(4):10–16, 2003. 250 copies. ISSN 1210-8022.

The article summarizes the meeting of CSTUG members in Brno in 2003. The article shows to the reader some variable headings and footings in simple examples and the advantages toward the common WYSIWYS editor Microsoft Word.

Key words: CSTUG, Brno, TEX.

[43] Pavel Stříž. A Young Enthusiast's View on STAKAN III (in Czech). STAKAN III z pohledu mladého nadšence. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 14(2):9–14, 2003. 250 copies. ISSN 1210-8022.

The author informs about an international conference entitled STAKAN III, which was a meeting of teachers of statistics. The author is pointing to a few interesting lectures and to a few URLs on the Internet, which were mentioned at the conference.

Key words: Statistics, Teaching Statistics, Teachers of Statistics, STAKAN III.

[44] Pavel Stříž. A Young Enthusiast's View on ROBUST'2002 (in Czech). ROBUST'2002 z pohledu mladého nadšence – aneb... *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 13(2):21–25, 2002. 250 copies. ISSN 1210-8022.

The author informs about an international conference entitled ROBUST'2002, which was a meeting of mathematicians and statisticians. The author is pointing to a few interesting lectures and minor mathematical problems, which were mentioned at the conference.

Key words: ROBUST'2002, Robust Statistics, Mathematical Problems.

Articles: Informative

[45] Gejza Dohnal and Pavel Stříž. Preface to the Special Edition of Booklet (in Czech). Úvodní slovo k mimořádnému číslu. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(Special edition):1–1, 2005. 250 copies. ISSN 1210-8022.

[46] Gejza Dohnal and Pavel Stříž. A Report About new TEX Template for Booklet (in Czech). Informace o novém TEXovém stylu pro Informační bulletin. *Bulletin of the Czech Statistical Society (Informační Bulletin České statistické společnosti)*, 16(2):18–19, 2005. 250 copies. ISSN 1210-8022.

Scientific Posters in English

[47] Jitka Kloudová, Kamil Dobeš, Pavel Stříž, and Roman Kasal. *Factors Influencing the Momentary Situation and Standing of Enterprises on the Market in the Czech Republic*. Scientific poster presented at the conference Robust 2006, January 23 – 27, 2006. A1 format.

Scientific Posters

[48] Roman Kasal, Pavel Stříž, Jozef Říha, and Petr Klímek. *Application of Genetic Algorithms to Planning Production in the Firm Mitas, a. s. (in Czech). Aplikace genetických algoritmů v procesu plánování výroby ve společnosti Mitas, a. s.* Scientific poster presented at the conference Robust 2006, January 23 – 27, 2006. A1 format.

Citations and Re-prints

[49] KPMS MFF UK, ČStS, and JČMF. *Statistics in the Czech Republic (mainly in Czech). Statistika v České republice*. Czech Statistical

Society (Česká statistická společnost), Prague, 1st edition, 2005. [CD-ROM]. 250 copies. ISBN 80-86732-23-1.

Re-published papers in proceedings [[29, 30]] and articles [[41–44]].

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Key words: Probability, Statistics, Teaching Mathematical Statistics, ℝ and MuPAD.

Author's Curriculum Vitae

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Education:

1993–1997	Business Academy in Bučovice
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2003–2005	Half-time employee, lecturer, Ph.D. student. Faculty of Management and Economics, Tomas Bata University in Zlín, Czech Republic
September 2005 to the present	Full-time employee, lecturer, Ph.D. student. Department of Informatics and Statistics, Faculty of Management and Economics, Tomas Bata University in Zlín, Czech Republic

Language knowledge:

English	Active: Writing, Reading, Listening, Speaking

Professional interests:
Mathematics, Probability & Statistics, Informatics and Typography.

Hobbies:
Virtual sniper shooting (in PC games), food, the game of bridge.

Abroad activities:

Month/Year	*Accepting Institute, Town, Country*	*Period*	*Lecturing*
List of Lectures			
9/2005	*Savonia Polytechnic, Varkaus, FI*	*9 days*	*8 hours*
∗ Multimedia Presentations			
11/2005	*Savonia Polytechnic, Varkaus, FI*	*14 days*	*19 hours*
∗ Preparing Web Pages; Adobe Photoshop; Macromedia Flash			
∗ Scenarios in Microsoft Excel			
∗ Basics in Visual Basic for Applications – Microsoft Word and Excel			
∗ Internet Connections and Costs in the Czech Republic			

Teaching and lecturing activities

Course guarantor and lecturing (academic year 2006/2007):

- DTP and Electronic Publishing (Erasmus/Socrates; taught in English)
- Computerised Data Processing (Erasmus/Socrates; taught in English)
- Statistical Analysis Methods (Erasmus/Socrates; taught in English)
- Informatics for Economists (Erasmus/Socrates; taught in English)
- Programming and Web & On-line Calculations (Erasmus/Socrates; taught in English)
- Oral and Poster Presentations (Erasmus/Socrates; taught in English)
- DTP and Electronic Publishing (DTP a elektronické publikování; taught in Czech)
- DTP and Electronic Publishing course offered in RIUS project; ezDTP (DTP a elektronické publikování; taught in Czech)

Teaching only (academic year 2006/2007):

- Kvantitativní metody v rozhodování (Quantitative Methods for Managerial Decision Making; taught in Czech)
- Počítačové zpracování dat
  (Computerised Data Processing; taught in Czech)

Computer skills:

Mathematical software: Matlab (basics), WinQSB.

Statistical software: R (basics), Minitab, Statgraphics, Statistica.

Programming: Java (basics), BASIC, VBA, PHP, MySQL.

Desktop publishing: Microsoft Office, OpenOffice.org, TEX.

Membership:

- Czechoslovak TEX Users Group (since January 2003)
- Czech Statistical Society
  (Česká statistická společnost, since January 2002)
  - Member of the Executive Committee (voted; from January 2005)
  - Member of the Editorial Board (voted; from January 2005)

Grant participation:

- Virtual University courses support (using EDEN environment):
  - Decisions Under Risk and Uncertainty
    (Rozhodování při riziku a nejistotě, in Czech)
  - DTP and Electronic Publishing
    (DTP a elektronické publikování, in Czech)
  - Applied Statistics
    (Aplikovaná statistika, in Czech, with Ing. Petr Klímek, Ph.D.)
  - Econometrics
    (Ekonometrie, in Czech, with Ing. Petr Klímek, Ph.D.)

  - Computerised Data Processing
    (Počítačové zpracování dat, in Czech, with Ing. Petr KLÍMEK, Ph.D. and RNDr. Helena SEBEROVÁ)
- RIUS project: CZ.04.1.03/3.2.15.1/0067, `http://www.esfcr.cz/`

  ezDTP course guarantor and lecturer (taught since the winter semester of the academic year 2005/2006 in Czech)

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