

# Writing Technical (SE) Articles for a Broad Audience

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**IEEE  
Software**

# Agenda

- Essentials
- Top 10 Ways to Kill a Paper
- SE Publication Landscape
- *IEEE Software*
- 
- Group Activity
- Discussion



# Essentials of Writing for Technical and Scientific Audiences

# General tips

## IEEE GOLD Webinar

*A Survival Guide for Scientific Writing in the Academic and Professional Environments*

Matthias Reumann, IBM TJ Watson

<http://www.ieee.org/web/membership/gold/events/index.html>

# Understanding the environment

- Audience: who are you writing for?
  - Practicing professionals in your field
  - Academics who are experts
  - Broad audience with some familiarity of the topic
- Venue: what kind of publication is it?
  - Style and structure
- Process: how are submissions evaluated?
  - Peer-reviewed
  - Editor-reviewed
  - Shepherded
  - Professionally edited

# Reading Minds

EIC < Editors < Reviewers < Readers



What delights them? *Elusive*

What makes them cringe? *Easy*

*Constants:*

😊 quickly grasping the message

😞 pretensions

# The Writing Process

Draft it 25%

- Outline
- Add text

Let it Steep

- Sleep on it
- Get feedback

Refine it 40%

- Complete
- Diverge
- Glue

Finalize it 35%

- Revise/Converge (x2)
- Polish (x1)

# Writing for different audiences

- Journals: structured, impersonal
  - Intro, Background, Methods, Results, Discussion, Conclusions
  - **Emphasis on ease of locating information**
- Magazines: woven, more personal
  - Motivate and captivate reader
  - Deliver message
  - No predefined structure
  - **Emphasis on flow and message**

# Writing for a professional periodical

## McConnell's 7 desired attributes for technical articles

- Focus
- Clarity
- Accessibility
- Objectivity
- Humility
- Quick progression
- Brevity

## Clean style: clear, brief, focussed

- Decide on the story
- Stick to the story
- Use short, focussed sentences
- Avoid
  - tangents
  - weak constructions
  - impersonal introductions
  - filler words
  - *falling in love with your voice and thoughts*

## Professional periodicals: reviewers' and editors' perspective

- Relevance to practitioners
- Technical soundness
- Organization & focus
- Freedom from superficial arguments
- Context: positioning work in a greater context
- Novelty (for non-synthesis work)

# Different genres

- Tutorial
- Experience report
- Research study
- Synthesis work
- Proposal (method, tool, process, technology)
- Opinion piece

# Experience reports

- needn't mimic the style of a research contribution
- include relevant facts, sum up key points, and cite related ideas
- assume audience understands technology, methods and practices used
- assume they don't understand the application domain and don't want to
- present [actionable] lessons that will help others; provide enough details so others can understand the context
- discuss caveats along with advantages...

*Rebecca Wirfs-Brock*

# Proposals

- enable the practitioner to apply the notation or process to a real project without requiring unnatural leaps of faith or gaping simplifying assumptions.
- enable the researcher to unambiguously compare and contrast ideas in the paper to previous work in the area
- enable the reader to understand the purpose, activities, measures, and milestones of its process
- should have clear goals, be focused, be respecting of previous work, and defend its statements without question.
- be much more than an enumeration of a process with explanation

*Grady Booch*

# Opinion pieces

- Hard-to-win in this genre
  - Reviewers don't want to hear what they already know or can figure out on their own (dismissal by "lack of novelty") or will shoot the messenger if they disagree with the message
- Best suited to editorials written for a captive audience

# Validation

*It's getting increasingly difficult to publish work without any validation of its applicability*

Demonstrate value of work...

- *Empirically - controlled experiment, real-life case study, ...*
- *Experientially - collection of convincing anecdotes from own experience, repeated use in non-trivial contexts*
- *Theoretically - simulation, proof, feasibility study...*
- *By hearsay - based on supporting pieces of evidence from literature*

# Supporting your claims

"Reviewers spend much of their time scanning for your thesis statement and will read anything that looks like a claim as one. They will then be sure to check for supporting evidence."

*William Cook*

## Multiple concurrent submissions

- Jeopardize viability of peer-review process
- Are against IEEE and ACM policies
- May result in sanctions, disciplinary action
- May ruin your reputation

# Getting attention: the abstract

*If you're fortunate:*

- Great majority will just read the title
- Small majority will just read the title & abstract
- A handful of people will read the paper

*Poor abstract*

- Editor screens your paper out
- Your paper ends up in the wrong hands
- Your paper ends up in the right hands, but you lost the chance to make a good first impression

# Writing an abstract

*The abstract is your four sentence summary of the conclusions of your paper... The first states the problem. The second states why the problem is a problem. The third is my startling sentence. The fourth states the implication of my startling sentence. An abstract for this paper done in this style would be:*

*"The rejection rate for OOPSLA papers is near 90%. Most papers are rejected not because of a lack of good ideas, but because they are poorly structured. Following four simple steps in writing a paper will dramatically increase your chances of acceptance. If everyone followed these steps, the amount of communication in the object community would increase, improving the rate of progress."*

Kent Beck, How to Get a Paper Accepted to OOPSLA, 1993

# Writing an abstract

*"The rejection rate for OOPSLA papers is near 90%. Most papers are rejected not because of a lack of good ideas, but because they are poorly structured. [Opening with a startling sentence, describing clearly why your problem is important, demonstrating that your solution works and convincing the reader that it is novel] will dramatically increase your chances of acceptance. If everyone followed these steps, the amount of communication in the object community would increase, improving the rate of progress."*

# Writing an abstract

- Summarize work
  - Problem
  - Solution/Method
  - ★ Results/Implications
- Omit
  - Background discussion
  - Citations

“Software process improvement is hypothesized to lead to better customer satisfaction. This topic has been the subject of a number of research studies [1, 2, 3], but no quantitative results have been reported. This paper presents a quantitative study of the impact of software process improvement initiatives on customer satisfaction.”

# Writing an abstract

**“Does software process improvement lead to better customer satisfaction? We have surveyed 286 IT managers from 83 Fortune-500 companies. 67% of the respondents reported a 50% increase in their organization’s customer satisfaction metrics following major software process improvement initiatives. 56% percent attributed the increase to resulting quality improvements and 20% to faster delivery times. The results indicate a positive cause-effect relationship between software process improvement and customer satisfaction in large organizations.”**

# Placing work in context

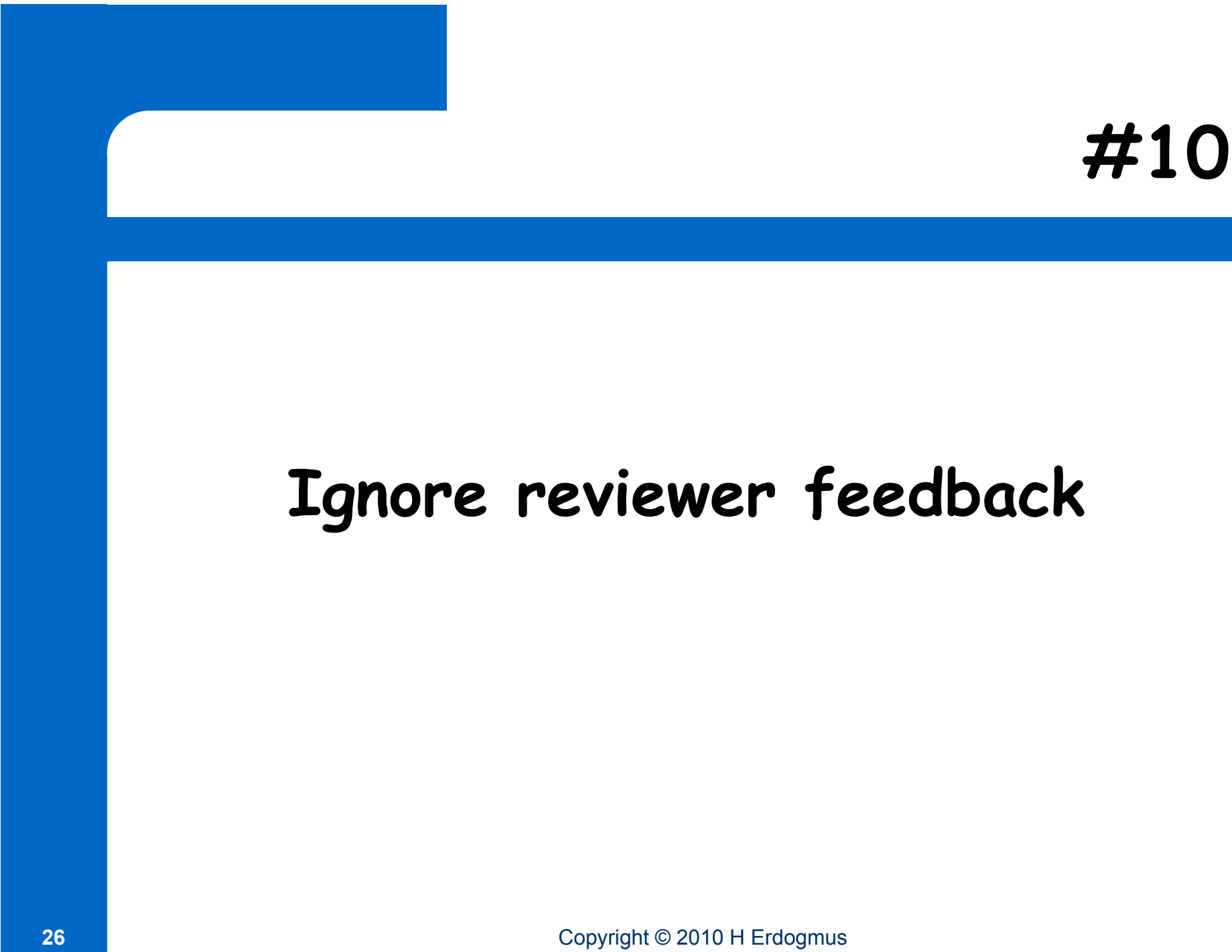
Beyond enumerating relevant work...

- Position work in a sufficiently broad landscape of related ideas
- Demonstrate that you're familiar with prior art without including a full-blown formal literature review
- Briefly explain the lineage and major influences

*For magazine-style writing: inlining, sidebars, tables, and illustrations are preferable to a separate "Related Work" section*



# Top 10 Ways to Kill a Paper



**#10**

**Ignore reviewer feedback**



**#9**

# **Stick to clichés**

**#8**

# **Borrow without due credit**



**#8**

**Don't worry about the language**

A large blue L-shaped graphic element is positioned on the left side of the slide, extending from the top to the bottom. It consists of a vertical bar on the left and a horizontal bar extending to the right from the top of the vertical bar. The horizontal bar has a rounded end on the left side.

**#6**

# **Ignore limitations**

#5

**Ignore context & prior art**

**#4**

**Rely on argumentation to  
push an idea**



**#3**

**Ignore your audience**



**#2**

**Be undeservedly  
authoritative**



**#1**

**Describe the work  
and stop**

# Top 10 Ways to Kill a Paper

1. Describe the work and stop
2. Be undeservedly authoritative
3. Ignore your audience
4. Rely on argumentation to push an idea
5. Ignore context and prior art
6. Ignore limitations
7. Don't worry about the language
8. Borrow without due credit
9. Stick to clichés
10. Ignore reviewer feedback

# General Tips

*How to Write a Good Technical Article*

[http://www.stevemcconnell.com/ieeesoftware/  
HowToWriteATechnicalArticle.pdf](http://www.stevemcconnell.com/ieeesoftware/HowToWriteATechnicalArticle.pdf)

*Tips for Software Authors*

[http://doi.ieeecomputersociety.org/10.1109/MS.  
2007.149](http://doi.ieeecomputersociety.org/10.1109/MS.2007.149)

*How to Get a Paper Accepted at OOPSLA*

<http://www.sigplan.org/oopsla/oopsla96/how93.html>



# SE Publication Landscape

# SE literature

## Common SE topics

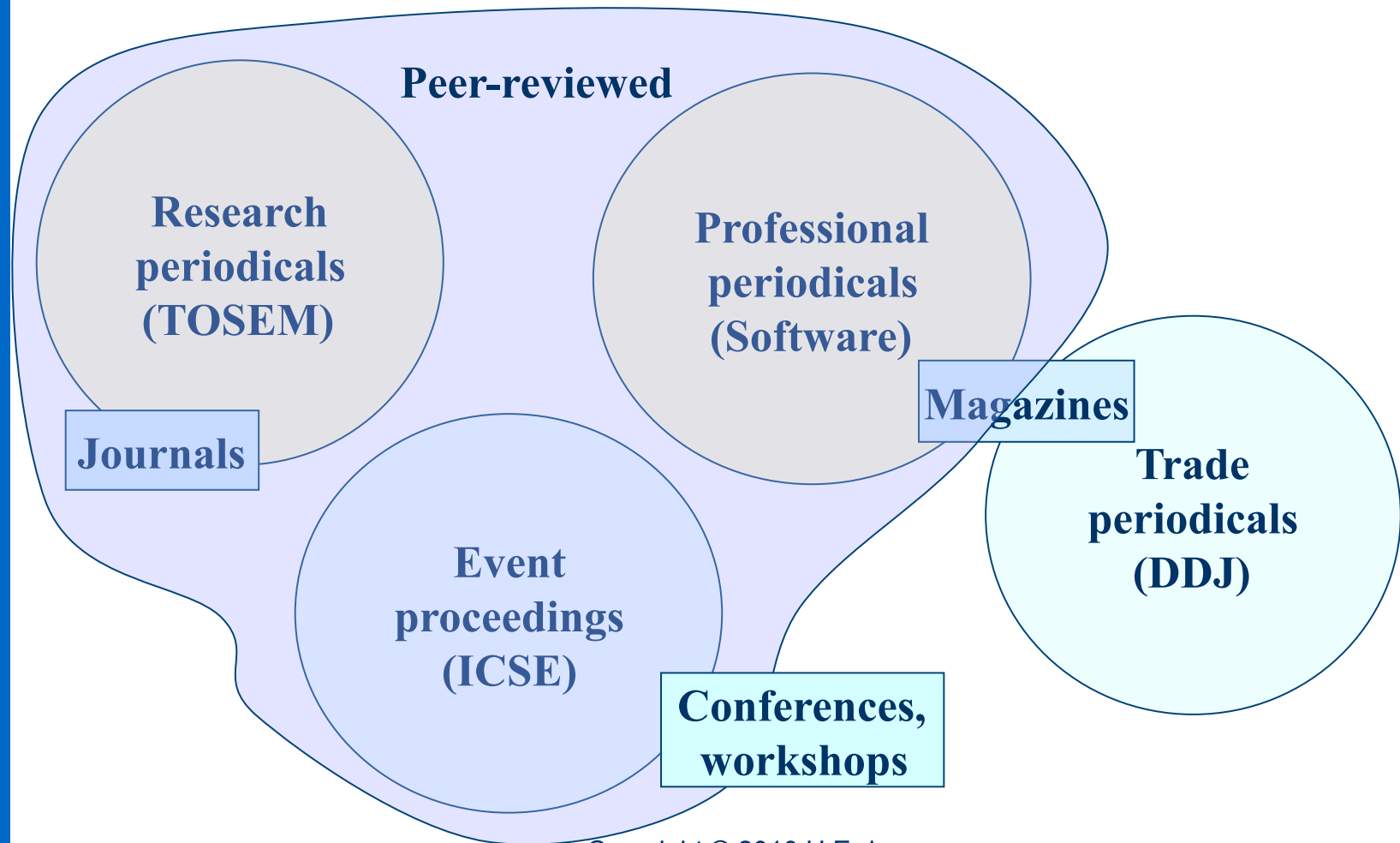
- Requirements
- Design/Architecture
- SD technology, tools & frameworks
- Programming technology
- SD methodologies, practices, & techniques
- Software process improvement
- Software economics
- Software quality
- Software metrics
- Software testing
- SD productivity
- Maturity frameworks
- Software project management
- Human aspects of SD
- *SE education*
- *Software specification*
- *Software V&V*

# Non-SE literature

## Common topics not ordinarily covered in SE lit

- *Almost never*
  - Data structures
  - Algorithms
  - Complexity theory
  - Operating systems
  - Databases
  - Networks
- *Not generally*
  - Social computing
  - HCI
  - Project management
  - Online collaboration
  - Web engineering
  - IS/Management Science
  - End-user SD
  - Security & Privacy

# Types of venues



# Research periodicals (journals)

Target scientific community (researchers, academics)  
- *narrow exposure*

- Offered by publishing houses, professional organizations, non-profit communities
- Archival
- Scholarly style
- Formal treatment
- Method underlying work important
- Scientific contribution, rigor valued
- Longer articles
- Not professionally copy-edited or laid out
- Command high academic standing

- TSE
- TOSEM
- IST
- EMSE
- SQJ
- SP-IP
- JSS
- IBM-SJ
- SP&E
- RE
- STV&R
- IEE-PSw
- JASE
- SEN

...

# Professional periodicals

Target scientific community, professionals, educators -  
*broad exposure*

- Published by professional organizations (IEEE, ACM)
- Archived (& indexed)
- Casual style
- Pragmatic treatment
- Relevance, timeliness, applicability valued
- Shorter articles
- Professionally copy-edited and laid out
- Rich editorial content: columns, letters, news, reviews, etc.
- Command academic standing, but in general considered inferior to top research periodicals in scholarly value

*SE specific:*

- Software

*Has SE content:*

*IEEE*

- Computer
- S&P
- IC
- ITPro
- Spectrum

*ACM*

- Queue
- CACM

# Trade magazines

Target practitioners, general public (both amateurs and professionals) - *broad exposure*

- Not always archived & indexed
- Casual style
- Pragmatic treatment
- Very timely, "hot off the press"
- Appeal, catchiness valued
- Shorter articles
- Anecdotal content: "how-to" & opinion pieces
- Professionally copy-edited and laid out
- Richest editorial content
- Does not command much academic standing
- *Increasingly focused on online delivery through portals*

- Dr Dobb's J
- Better Software

# Online publication & pre-publication

- *Online publication*: a delivery mechanism:
  - digital only
  - print with digital
  - portal
- *Pre-publication*: a temporary, early dissemination method until print version is available
  - *Will be available for IEEE Software soon...*

# Factors in choosing a publication venue

- ***Audience***: match to venue's type
- ***Topic***: match to venue's coverage areas
- ***Value of work*** (scientific, technical, practical): match to venue's ranking
- ***Status of work***: which stage? early, mature?
- ***Composition of editorial board or program committee***: do you know their work?

*Write to editors or PC if unsure...*

## Top-tier venues

*Relatively*

- High citation metrics
- High visibility
- Low acceptance rates

*So.. what does it take to get in?*

# Periodical citation metrics

**Impact Factor**: Average number of citations of articles over a two-year period divided by the number of articles published in the periodical in the same period.

**Citation Half-Life**: The number of years going back from the current year which account for 50% of the total citation received by the periodical during the current year.

**Immediacy Index**: Average number of times that an article, published in a specific year, is cited over the course of the same year.

Available from Thomson Reuters ISI Web of Knowledge  
<http://isiknowledge.com/jcr>

## Pitfalls of citation metrics

- Absoluteness
  - IF: Nature 28.75 vs. TOSEM 2.79 (2007 figures)
- Non-comprehensive
  - E.g., JASE excluded

# Alternative citation metrics

## Eigenfactor metrics

- **Eigenfactor Score:** "a measure of a journal's total importance to the scientific community"
- **Article Influence Score:** "a measure of a journal's prestige based on per article citations and comparable to IF"
- *Less absolute*
- *Account for interactions among fields and characteristics of each field based on citation network clustering*

[www.eigenfactor.org](http://www.eigenfactor.org)

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## Example comparisons ('07/'08)

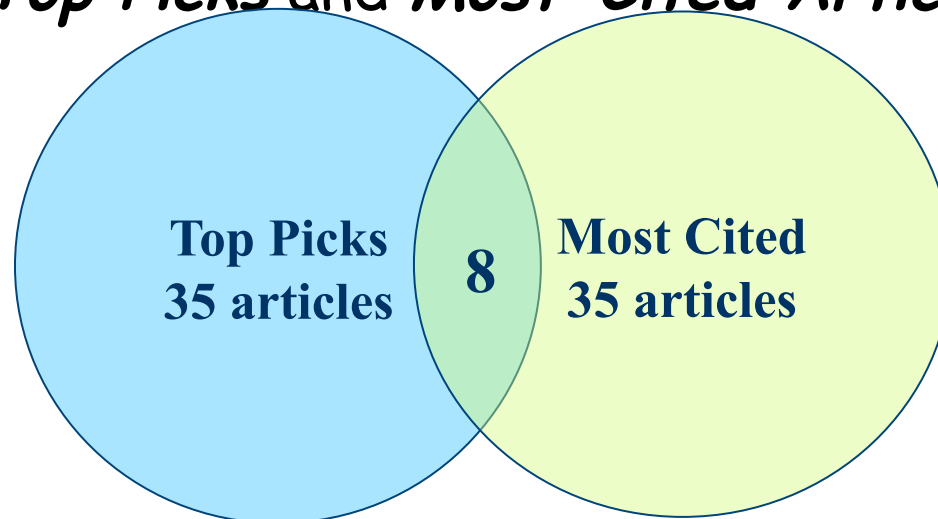
	IF* (Rank)	AI (Rank)	CE (Rank)
<i>Software</i>	2.10 (4)	0.787 (5)	45.4 (1)
<i>Dr. Dobbs</i>	0.02 (7)	0.148 (7)	13.3 (6)
<i>JSS</i>	1.24 (6)	0.376 (6)	87.5 (3)
<i>TSE</i>	3.57 (2)	1.244 (1)	42.6 (2)
<i>Computer</i>	2.09 (5)	1.053 (3)	28.2 (4)
<i>CACM</i>	2.65 (3)	0.979 (4)	5.5 (7)
<i>TOSEM</i>	3.96 (1)	1.178 (2)	16.9 (5)

\* '07

# Citation metrics & popularity

- A publication's prestige is based on individual articles' citation stats
- But citation stats are not everything
- Overlap between IEEE Software's 25<sup>th</sup>-anniversary

## *Top Picks and Most-Cited Articles:*



**See: IEEE Software  
Jan/Feb 2009**

# About *IEEE Software*

- Differentiation
- Target audience
- Desirables & undesirables
- Coverage Areas
- Composition
- Statistics

# *IEEE Software* - Differentiation

- Bridging
  - research and practice
  - theory and application
- Broad topic coverage
- Multi-level appeal
  - Programming → Process
  - Technical → Managerial

# *IEEE Software* - Target Audience

- **Reflective practitioner**
  - anybody participating in software development in any role (developers, process experts, architects, designers, testers, quality experts, usability experts , project and program managers, executives...)
  - from *small* to *large* to organizations
  - who has a desire to be on the leading edge, question status quo
- **Grounded researcher & educator**
  - who cares about the reflective practitioner

# *IEEE Software* - Desirables

- Practical advice
- Clear take-away message
- Information value
- Horizon-expanding appeal
- Broad accessibility
- Sophistication (wisdom from other fields)
- Novel, grounded ideas and opinions
- Balance (conviction *moderated by reflection*)

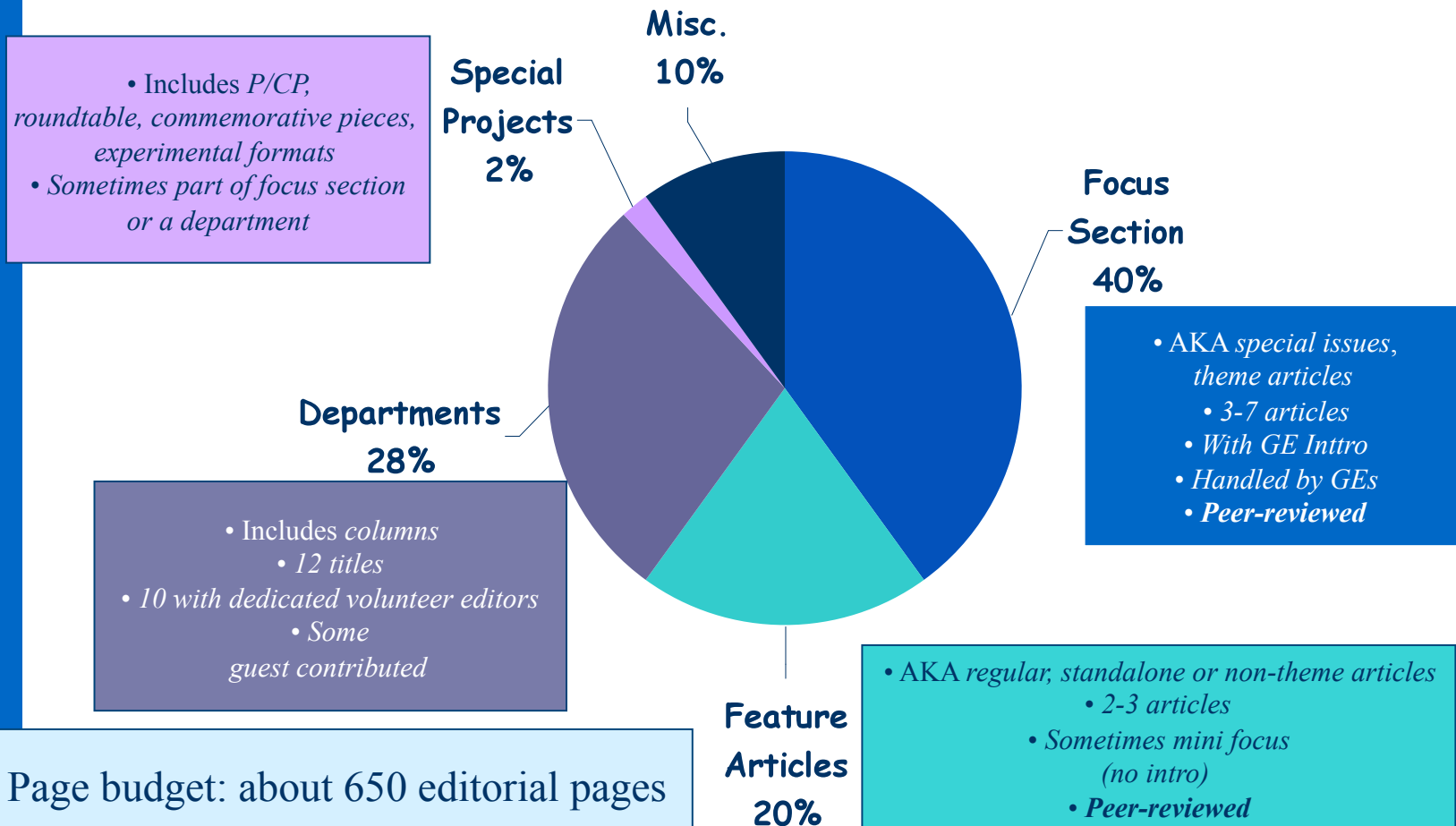
# *IEEE Software* - Undesirables

- Sales pitches
- Mainstream advice
- Mere demonstration of hard work or exemplary science
- Complexity that limits accessibility
- “We did it this way, and it worked well”
- Overly scholarly or formal treatment

# *IEEE Software* - Coverage areas

- Design & Architecture
- Management
- Quality
- Requirements
- Processes & Practices
- Empirical Results
- Development Infrastructure
- Distributed & Enterprise Software
- Human and Social Aspects
- Programming Languages & Paradigms
  
- *Education, Training, Professional Development*

# IEEE Software - Composition



# *IEEE Software* - Stats (2008)

Total submissions: 225 per year

Acceptance rates

- All articles: 22%

Timeliness

- Submission to 1<sup>st</sup> decision: 1.7 mo.
- Submission to final decision: 2.6 mo.

[www.kalemun.com](http://www.kalemun.com)



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