Revolusi Industri 4.0 dan dampaknya terhadap Pendidikan Akuntansi – **Hasil Survey Dosen Prodi S1 Akuntansi di Indonesia**

SYAIFUL ALI, MIS., PHD.

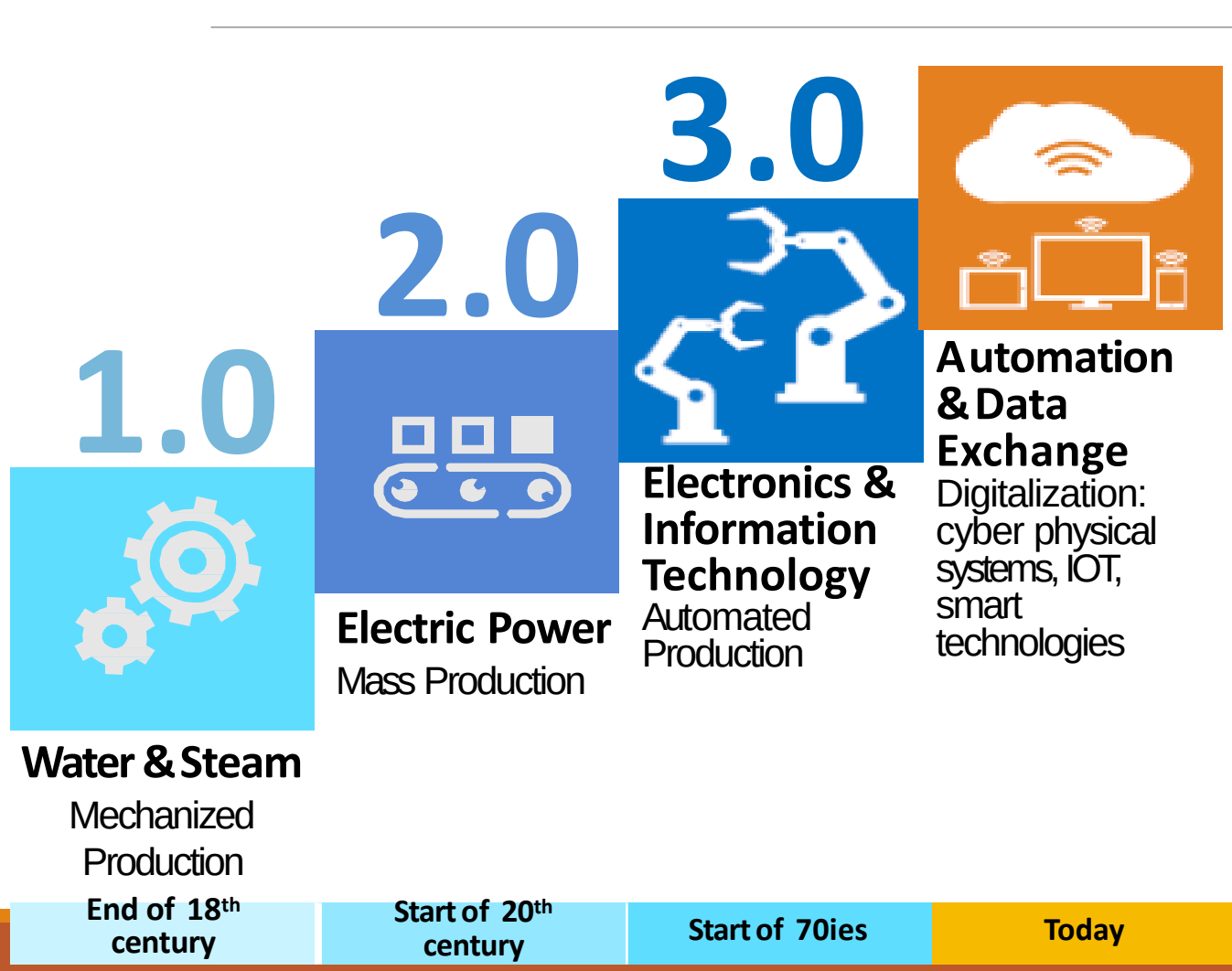
WORKSHOP FORUM PROGRAM STUDI S1 AKUNTANSI

DENPASAR BALI, 13 APRIL 2019

Agenda

1. Revolusi Industri 4.0
2. Dampak RI 4.0 terhadap Bisnis
3. Dampak RI 4.0 terhadap Akuntansi
4. Dampak RI 4.0 terhadap Pendidikan Akuntansi
5. Matakuliah Prodi S1 Akuntansi baru terkait RI 4.0
6. Dampak RI 4.0 terhadap Learning Outcome matakuliah Prodi S1 Akuntansi

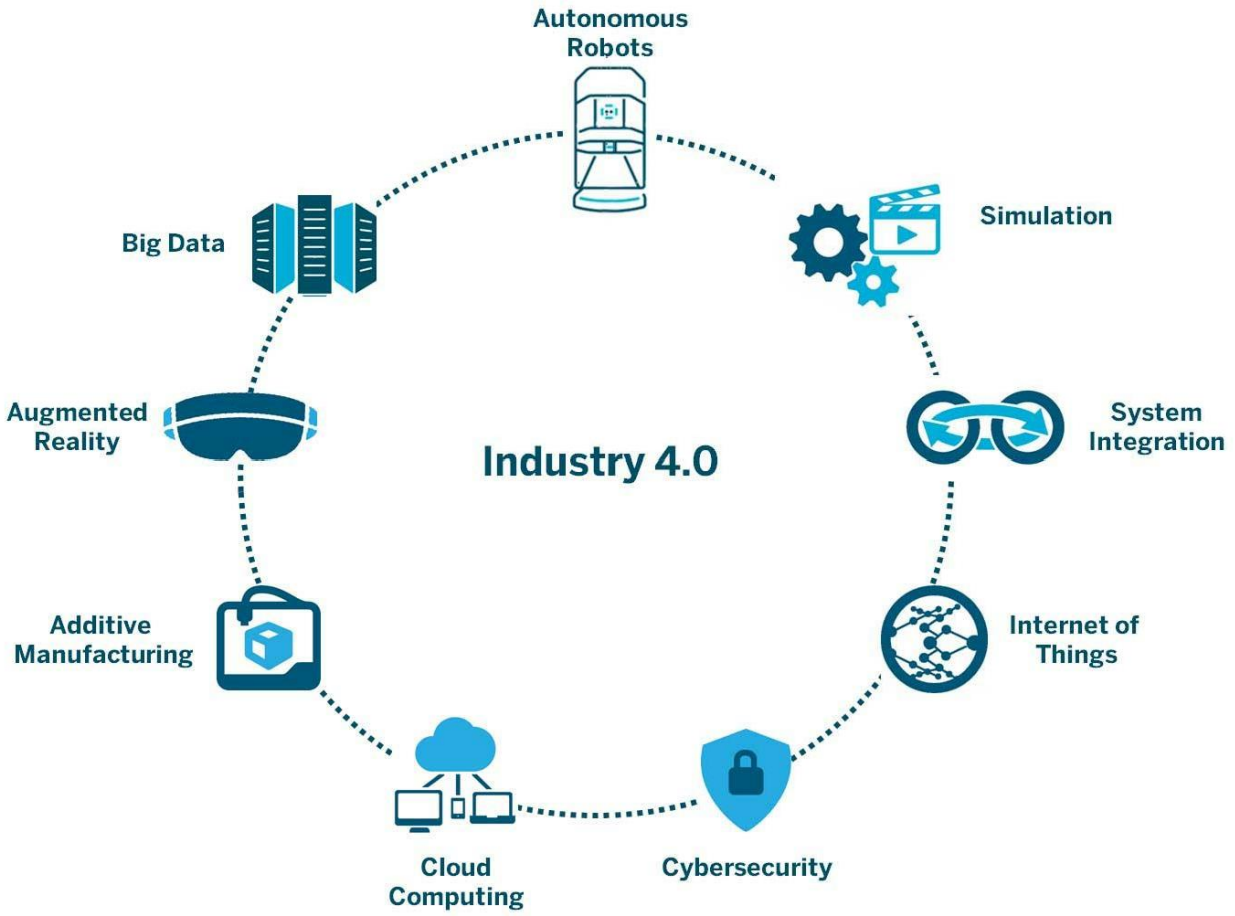
Digital Economy Implication: Industrial Revolution 4.0



- Exponential Change
- *Disruptive*
- Transformation in almost all of sector (e.g production, management, regulation)
- Main Impact: *inequality*, *security*, & *identity*

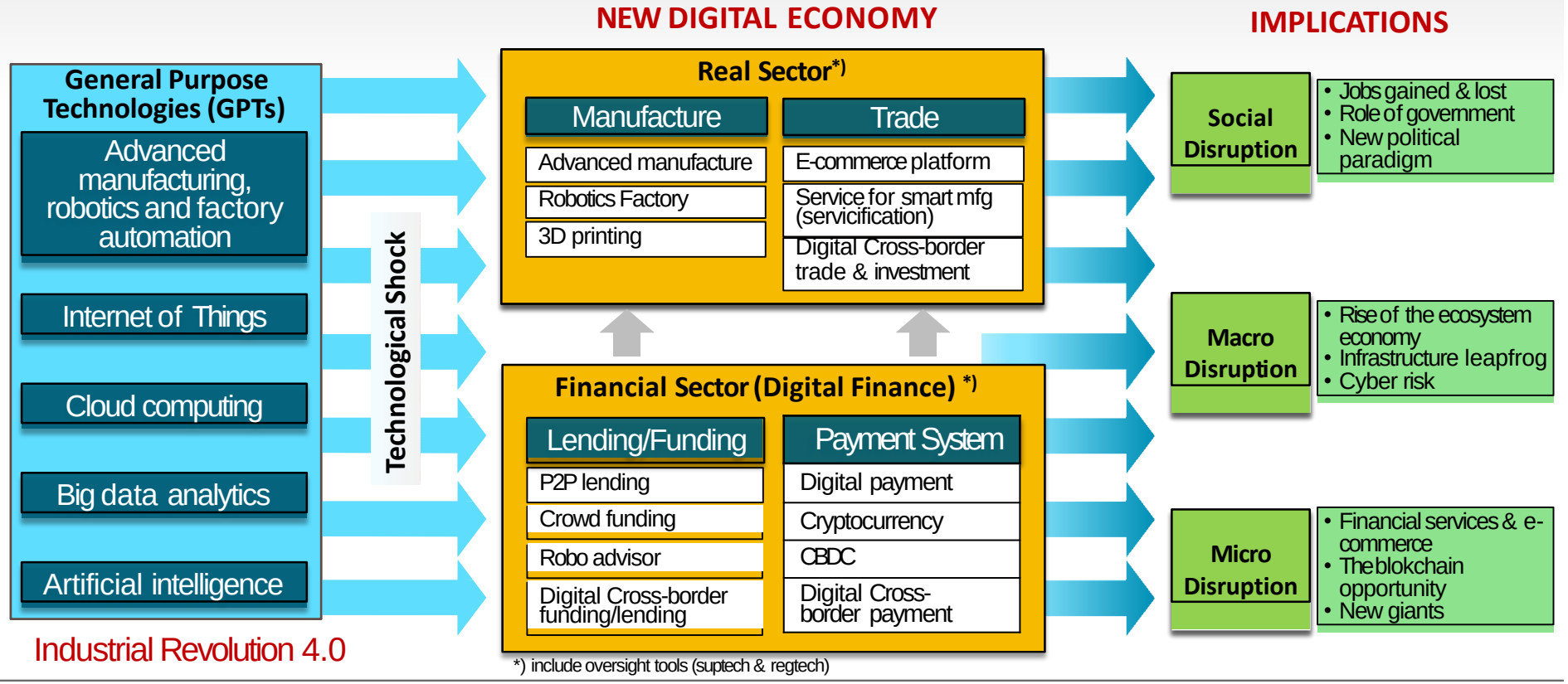
Schwab, 2015; Davis, 2016

There are 9 key technologies supporting Industry 4.0



BCG, Aethon

Digital Economy is triggered by The General Purpose Technologies (GPTs) which is lead significant impact to economy and financial



Yes, there's hype, but …

Human beings tend to overestimate things in the near term and underestimate them in the longer term.

1943

"I think there is a world market for maybe five computers."

—Thomas Watson

Chairman of IBM

1977

"There is no reason for any individual to have a computer in their home."

—Ken Olsen

Cofounder and former President of Digital Equipment

1998

"Touchscreen e-readers will never catch on."

—Bill Gates

Cofounder of Microsoft

1998

"The growth of the Internet will slow drastically … most people have nothing to say to each other! By 2005 or so, it will become clear that the Internet's impact on the economy has been no greater than the fax machine's. — Paul Krugman, Economist

Technological innovation and the impact on jobs

Some workers will compete with technology to deliver the same skills

Probability that computerization will lead to job losses within the next two decades

Job	Probability
Dentists	0.004
Athletic trainers	0.007
Clergy	0.008
Chemical engineers	0.02
Editors	0.06
Firefighters	0.17
Actors	0.37
Health care/doctors	0.40
Economists	0.43
Commercial pilots	0.55
Real estate sales agents	0.86
Technical writers	0.89
Retail salespersons	0.92
Accountants and auditors	0.94
Telemarketers	0.99

Man vs. machine …



HAL

… to man and machine



JARVIS

Source: "The Future of Employment: How Susceptible Are Jobs to Computerisation?" by C. Frey and M. Osborne (2013)

Dampak Revolusi Industri 4.0 terhadap Akuntansi

Dampak RI 4.0 terhadap proses bisnis akuntansi

Contoh-contoh dampak RI 4.0 terhadap akuntansi (ilustrasi aplikasi)

- Business process automation
- Big data/data analytics
- Blockchain
- Artificial intelligence
- Cloud computing

Computer vs human (capabilities) Hoffman (2017)

Computer:	Human
Structured problem solving Routine tasks Arithmeti and other type of mathematics	Unstructured problem solving Non-routine tasks Creativity Innovation Intuition Improvising Exploration Imagination Judgement (making a tough decision from incomplete information) Politics Identifying and acquiring new relevant information Compassion

Human-machine Teaming

Human + Electronic calculators: do math faster and with less errors.

1st indusrial revolution ➔ steam engines amplified the power of our muscles

4th industrial revolution ➔ assisted by computers, humans will spend fewer hours on noncore tasks and more on client service and creative work

Accounting professionals **need to be involved** in the creation and maintenance of the rules that drive many of automated processes in business.

Auditors **need to understand how** these automated processes work, what the rules are, and understand how to test if things are working as expected.

Veiechnick and Eggers (2017)

Dampak RI 4.0 terhadap proses bisnis akuntansi

Contoh-contoh dampak RI 4.0 terhadap akuntansi (ilustrasi aplikasi)

- Business process automation
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- Artificial intelligence
- Cloud computing

Business process automation

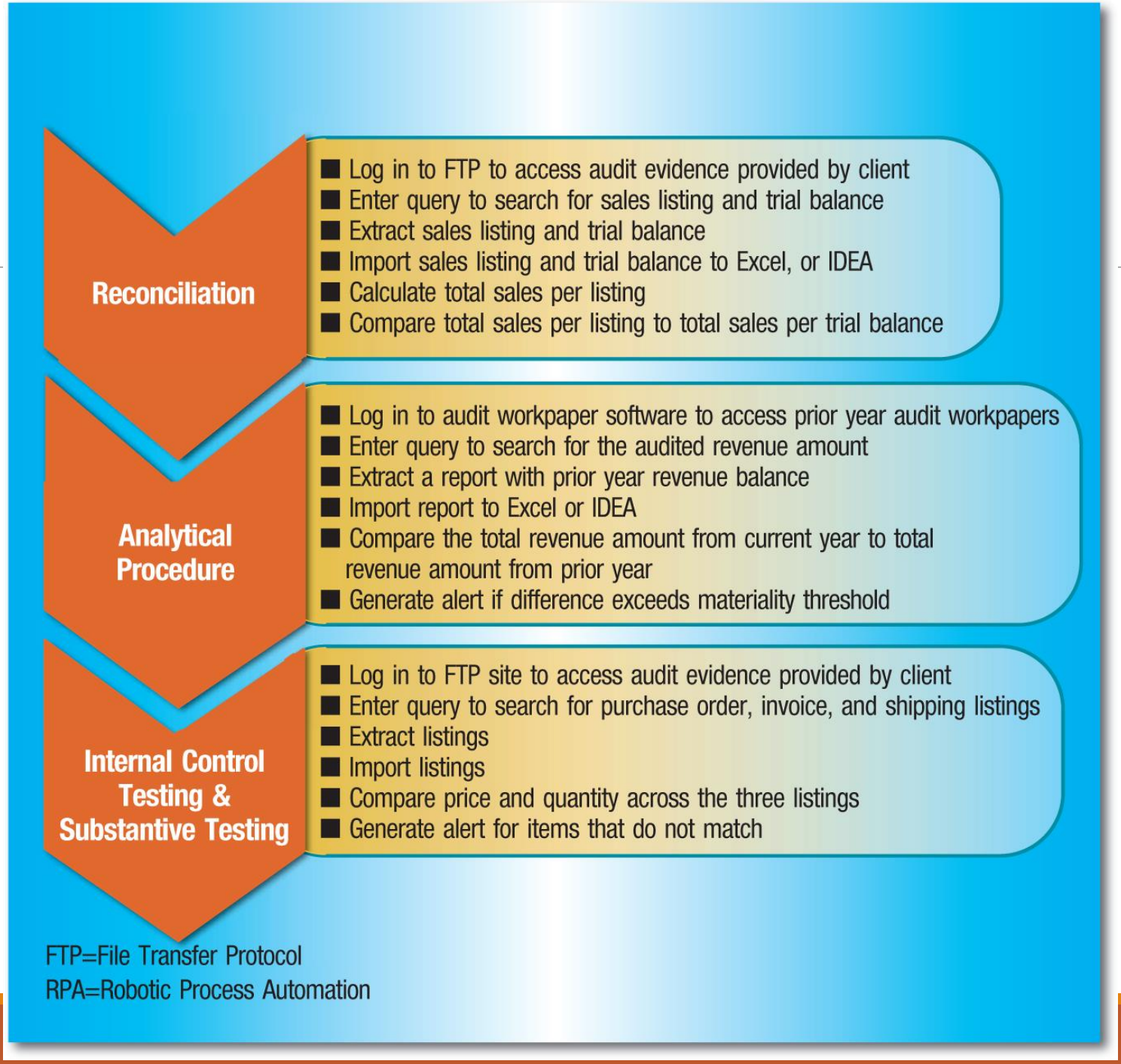
How Robotic Process Automation Is Transforming Accounting and Auditing



Search …

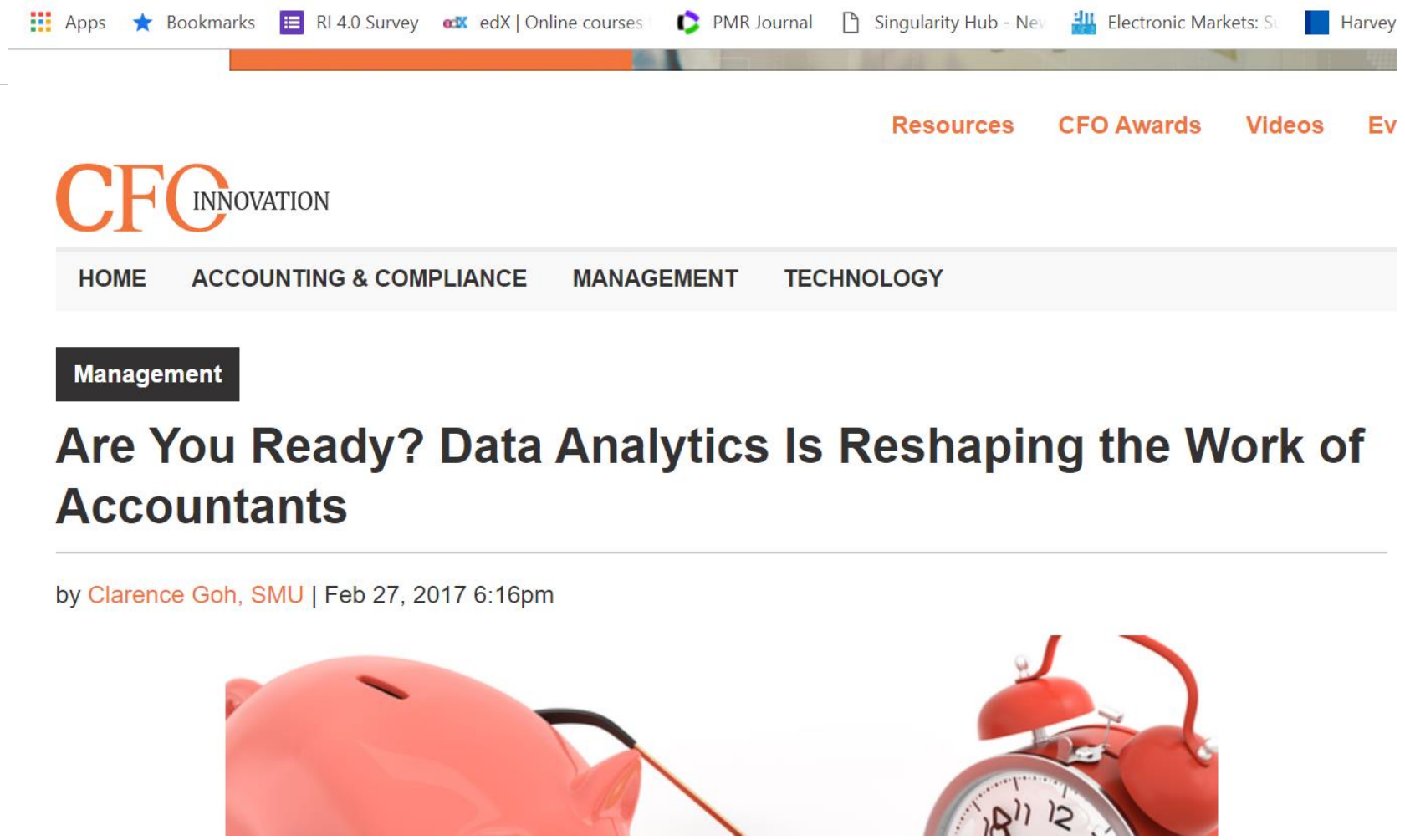
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Email Address*


Reconciliation
Log in to FTP to access audit evidence provided by client
Enter query to search for sales listing and trial balance
Extract sales listing and trial balance
Import sales listing and trial balance to Excel, or IDEA
Calculate total sales per listing
Compare total sales per listing to total sales per trial balance
Analytical Procedure
Log in to audit workpaper software to access prior year audit workpapers
Enter query to search for the audited revenue amount
Extract a report with prior year revenue balance
Import report to Excel or IDEA
Compare the total revenue amount from current year to total revenue amount from prior year
Generate alert if difference exceeds materiality threshold
Internal Control Testing & Substantive Testing
Log in to FTP site to access audit evidence provided by client
Enter query to search for purchase order, invoice, and shipping listings
Extract listings
Import listings
Compare price and quantity across the three listings
Generate alert for items that do not match
FTP=File Transfer Protocol
RPA=Robotic Process Automation

Big data/data analytics

- **Boost competitiveness**
- **Enhance financial reporting**
- **Manage risk**
- **Identify fraud**



Blockchain


ICAEW
ECONOMIA
ACCOUNTANCY JC
LOG IN
JOIN US
LEARNING AND DEVELOPMENT
MEMBERSHIP
TECHNICAL RESOURCES
GROUPS AND NETWORKS
FOR CURRENT ACA STUDENTS
AE
> Technic > Technol > Blockch > Features > Blockchain and the future of accountancy
Blockchain and the future of accountancy
Details on the potential of blockchain, its implications for auditors, how the accountancy profession can lead and what skills are necessary for the future.

Cloud computing

FEATURE / TECHNOLOGY

Cloud Computing: What Accountants Need to Know

BY ALEXANDRA DEFELICE

October 1, 2010



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TOPICS

Information Management and Technology

There's no arguing that "cloud computing" is gaining a great deal of momentum. Worldwide, cloud services revenue is forecast to reach $68.3 billion in 2010, a 16.6% increase from 2009 revenue of $58.6 billion, according to analyst firm Gartner Inc. So what does this mean to the accounting profession? What are the benefits and risks? Who are the vendors in the proverbial sky, and how do you know you can trust them with your data—or your clients' data, for that matter?

This article answers some of those questions and explains the history and future of the cloud.

The easiest way to think about cloud computing is as doing business on the Web, therefore eliminating the need for in-house technology infrastructure—servers and software to purchase, run and maintain. Unlike traditional software, which is distributed and deployed on-premise, cloud applications are designed for Web deployment. They are multitenant (delivered by one vendor to many customers), and users share processing power and space that is managed by

Lebih spesifik..pengaruh Teknologi Informasi Industri 4.0 terhadap Akuntansi?

Dampak *Internet of Things* (IoT) pada Akuntansi

Pengauditan	• **Membantu pengumpulan informasi keuangan dan operasional, serta data terkait audit lainnya dari organisasi dan pihak terkait secara real-time.**	**Vasarhelyi, 2016**
Internal Audit	• Tag RFID yang tertanam di produk dapat digunakan untuk memeriksa jumlah persediaan sehingga proses bisnis dan kekurangan pengendalian internal dapat dimonitor melalui *event log analysis.* • Auditor internal dapat mendeteksi pemborosan energi dengan membandingkan rencana produksi dan konsumsi energi *real-time*.	Vasarhelyi, 2016
Akuntansi Keuangan	• Model/pendekatan akuntansi yang mana sesuai dengan produk yang dihasilkan dari berkembangnya IoT, yaitu *pay-for-what-you-use models*.	Tucker, A. (2017).

Dampak *Big Data/Data Analytics* pada Akuntansi

Pengauditan	• **Memungkinkan prosedur audit diotomatisasi secara efektif dan diterapkan pada seluruh populasi** • **Auditor dapat mengumpulkan sejumlah besar data real-time terkait audit, sehingga jaminan yang diberikan bersifat komprehensif, tepat waktu, dan akurat** • **Dapat menganalisis, memodelkan, dan memvisualisasikan data untuk menemukan pola, mengidentifikasi anomali, serta mengekstrak informasi yang berguna lainnya untuk tujuan pemberian jaminan**	• **Appelbaum, Kogan, dan Vasarhelyi, 2017** • **Vasarhelyi, 2016** • **Earley, 2015**
Internal Audit	• Membantu peran auditor internal sebagai penasihat strategis dalam menganalisis data untuk menghasilkan informasi yang dapat ditindaklanjuti.	• Ernst & Young, 2015 • Vasarhelyi, 2016

Dampak Business Process Automation pada Akuntansi

Pengauditan	• **Dapat secara otomatis memberi tahu pihak terkait tentang transaksi abnormal secara real-time** • **Mengotomatiskan proses audit berulang dengan penilaian yang sederhana**	• **CPA Canada and AICPA, 2017** **Vasarhelyi, 2016**
Internal Audit	• Proses audit menjadi lebih efisien, membantu meningkatkan proses bisnis dan control.	Ernst & Young, 2017
Akuntansi Keuangan	• Meningkatkan efisiensi dan efektivitas dalam proses pembuatan laporan keuangan. Sebab, waktu yang dibutuhkan relatif lebih singkat saat proses telah terotomatisasi • Laporan keuangan yang dihasilkan relatif lebih akurat.	Krumwiede, K. (2016).

Dampak Business Blockchain/Distributed Ledger Akuntansi

Pengauditan	• **Adanya *smart contract* memungkinkan rekanan untuk mengotomatisasi tugas yang biasanya dilakukan secara manual melalui perantara pihak ketiga.** • **Teknologi *smart contract* dapat mempercepat proses bisnis, mengurangi kesalahan operasional, dan meningkatkan efisiensi biaya** • **Memungkinkan auditor untuk fokus pada transaksi yang lebih berisiko dan lebih kompleks**	**CPA Canada and AICPA, 2017**
Internal Audit	• Memberikan *secure audit trail* dari semua transaksi secara *real-time* kepada setiap peserta yang tergabung di dalam *network*.	Ernst & Young, 2017
Akuntansi Keuangan	• Blockchain dapat mengurangi aktivitas rekonsiliasi antar bank, karena sistem blockchain yang terintegrasi dapat melakukan otorisasi tunggal yang dapat diverifikasi oleh kedua belah pihak secara bersamaan.	• Venter, H. (2016). • ICAEW (2018)

Dampak Artificial Intelligence Akuntansi

Pengauditan	• **Dapat mengidentifikasi pola dan anomali yang tidak biasa yang membantu auditor untuk mendeteksi kecurangan.**	**Lord, 2017**
Internal Audit	• Mampu memonitor kontrol serta menandai ketidaksesuaian secara real-time • Mampu menganalisis mengapa masalah terjadi • Dapat mengkomunikasikan ketidaksesuaian kepada bisnis sehingga dapat segera dilakukan perbaikan • Menggeser peran audit internal untuk pengidentifikasi masalah menjadi mitra dalam memberikan solusi	Deloitte, 2018
Akuntansi Keuangan	• Kecerdasan buatan dapat mengakses informasi keuangan dari berbagai unit bisnis untuk membuat analisa mengenai performa keuangan terkini maupun membuat analisis prediktif yang dibutuhkan oleh pengguna laporan keuangan dalam membuat keputusan. • Dapat membantu perusahaan dalam membuat draft laporan tahunan atau draft publik expose secara objektif, karena dihasilkan secara otomatis oleh kecerdasan buatan.	• PWC. (n.d.) • IFRS. (2018)

Hasil Survey

Dampak RI 4.0 terhadap Pendidikan Akuntansi

Dampak RI 4.0 terhadap Pendidikan Akuntansi

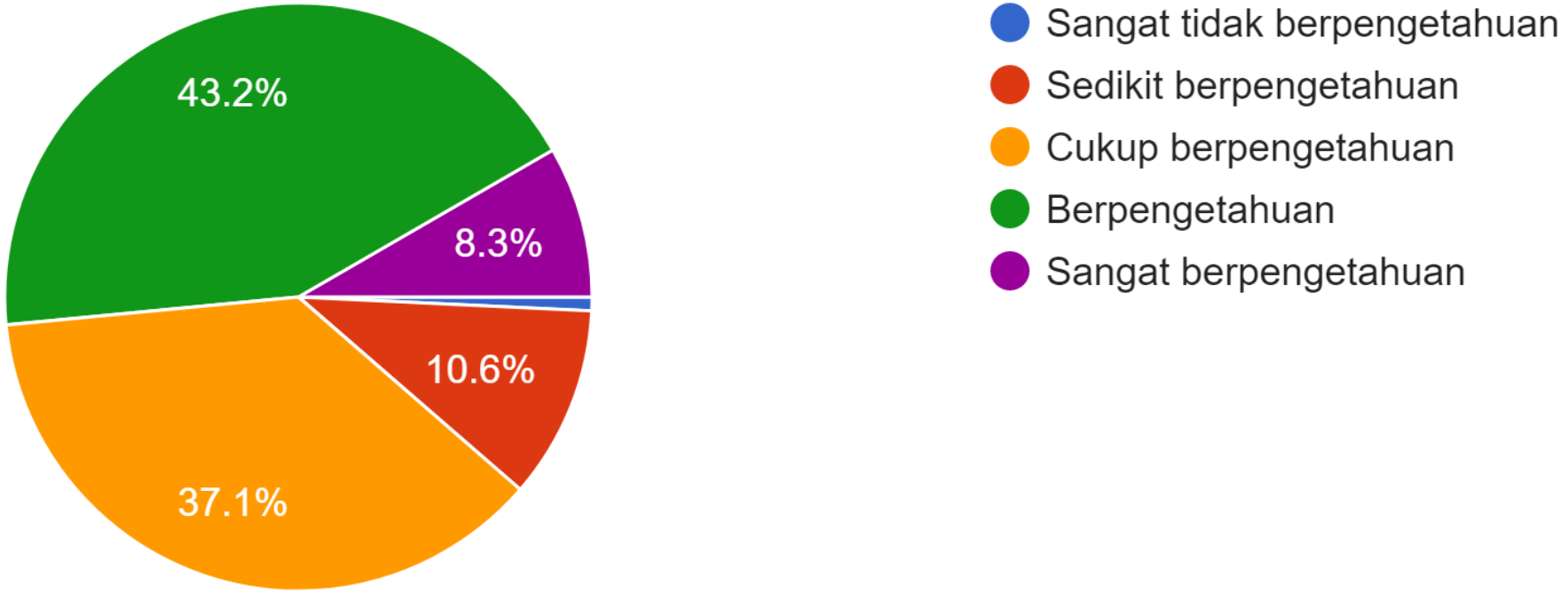
Hasil online survey

Dampak RI 4.0:

- Departemen
- Program studi
- Kurikulum (perubahan, termasuk matakuliah baru)
- Dosen
- Mahasiswa (skills yang diperlukan)

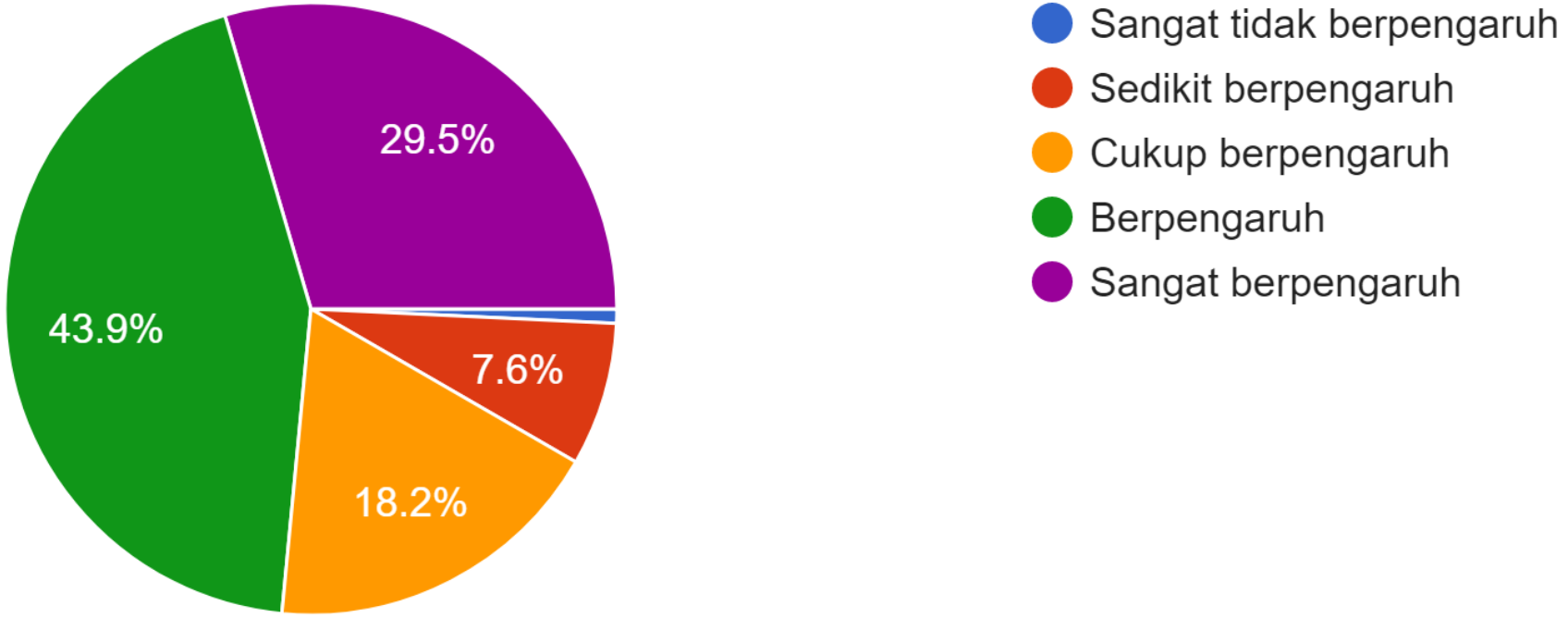
Q1. Sejauh mana pengetahuan Anda terhadap isu revolusi industri digital 4.0 dan pengaruhnya pada prodi/kurikulum akuntansi?

132 responses



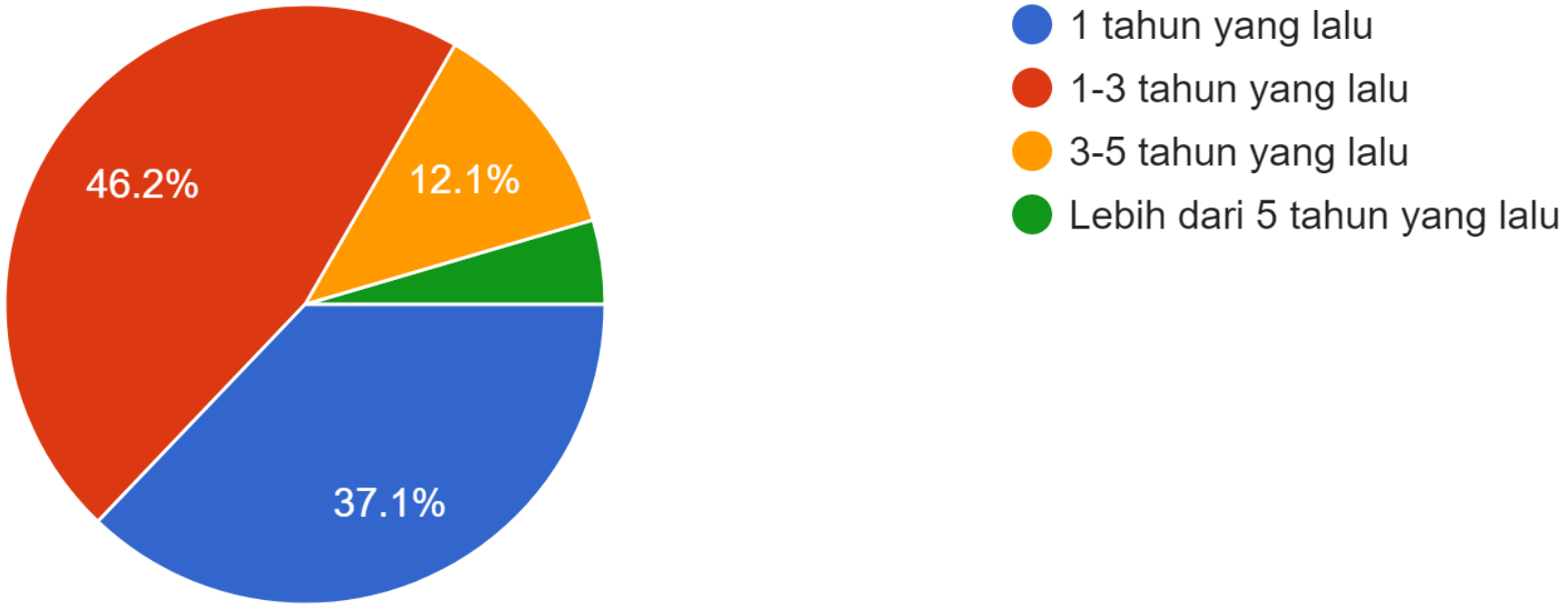
Q2. Menurut Anda sejauh mana isu revolusi industri digital 4.0 berpengaruh pada Prodi/Kurikulum akuntansi?

132 responses



Q.3 Sejak kapan Departemen Akuntansi Anda terakhir kali mereview kurikulum yang dipakai?

132 responses



Matakuliah yang memuat materi teknologi

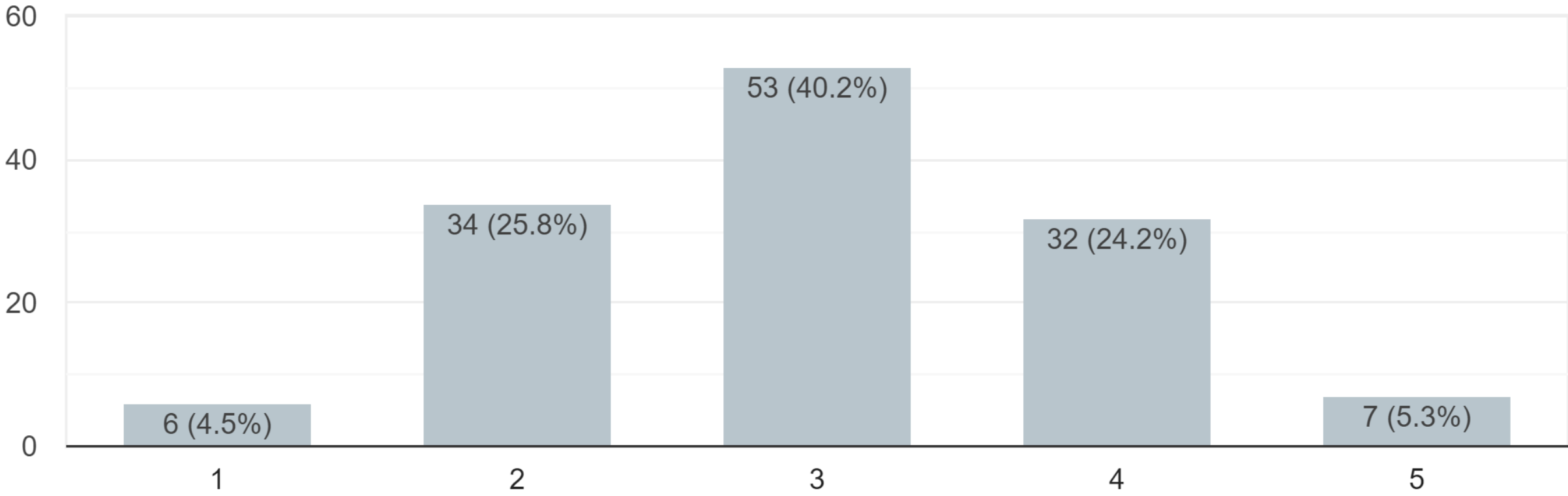
Mata Kuliah	Persentase
Sistem Informasi Manajemen	18,2%
Sistem Informasi Akuntansi	16,4%
Pengauditan	8,1%
Audit Sistem Informasi	6,6%
Manajemen Sistem Database	5,2%
Pengantar Akuntansi	4,6%
Sistem Pengendalian Manajemen	4,3%
Perpajakan	4,1%
Enterprise Resource Planning	4,0%
Akuntansi Manajemen	3,4%
Analisis Laporan Keuangan	3,0%

Matakuliah Paling terpengaruh RI 4.0

Mata Kuliah	Persentase
Sistem Informasi Manajemen	16.10%
Sistem Informasi Akuntansi	12.90%
Pengauditan	7.30%
Audit Sistem Informasi	6.30%
Manajemen Sistem Database	5.20%
Enterprise Resource Planning	4.40%
Pengantar Akuntansi	4.20%
Perancangan dan Analisa Sistem	4.10%
Akuntansi Manajemen	3.80%
Sistem Pengendalian Manajemen	3.80%
Analisis Laporan Keuangan	3.70%

a. Kurikulum Program Studi Akuntansi kami telah sepenuhnya mengintegrasikan teknologi informasi revolusi industri digital 4.0

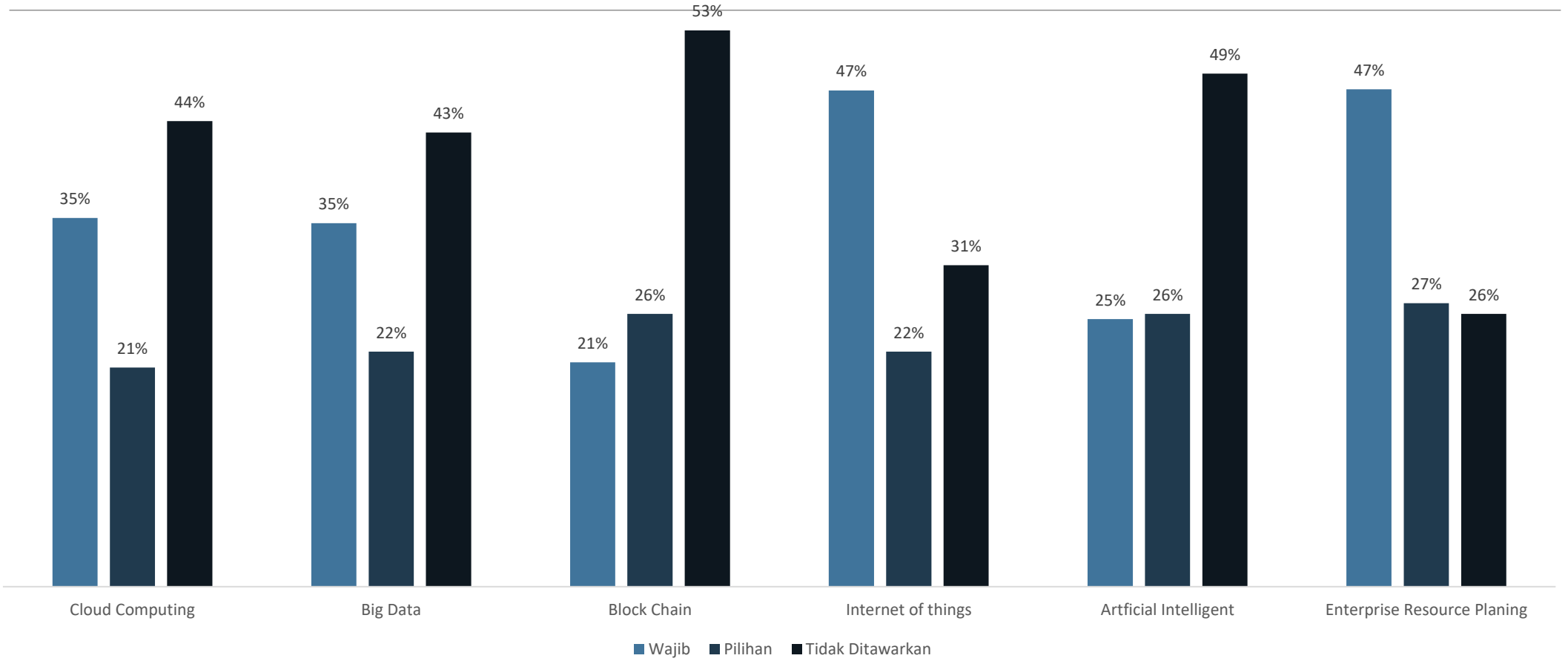
132 responses



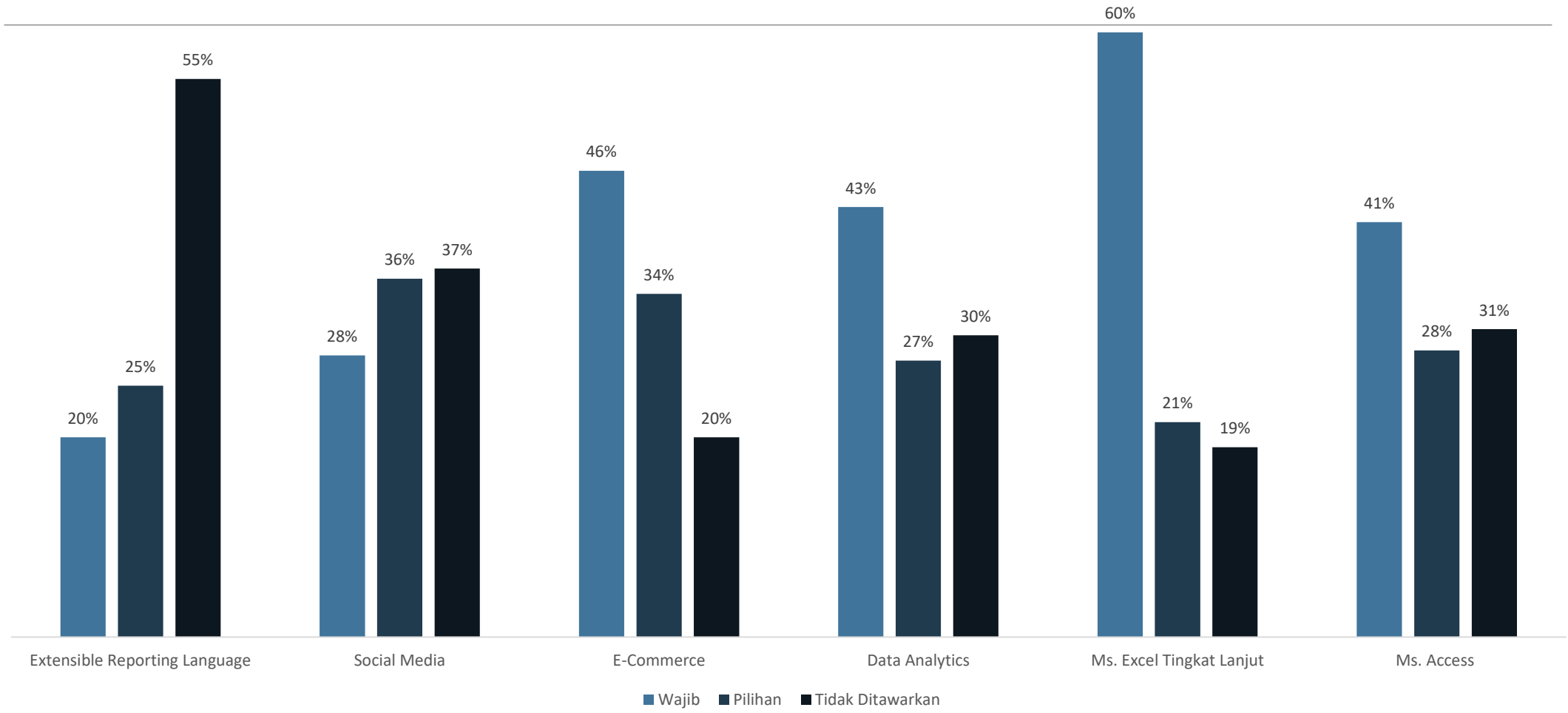
Apa yang dilakukan Prodi dalam mengantisipasi RI 4.0?

Aktivitas	Persentase
Melakukan workshop/seminar untuk mereview kurikulum yang ada	30,3%
Mengintegrasikan materi teknologi informasi terkini ke dalam beberapa mata kuliah akuntansi yang ada saat ini	23,3%
Meningkatkan pelatihan kepada dosen program studi akuntansi terkait materi teknologi informasi terkini	18,9%
Mengintegrasikan materi teknologi informasi terkini ke dalam semua mata kuliah akuntansi yang ada saat ini	13,3%
Menambahkan mata kuliah baru yang terkait teknologi informasi terkini	11,2%
Tidak ada tindakan	3,0%

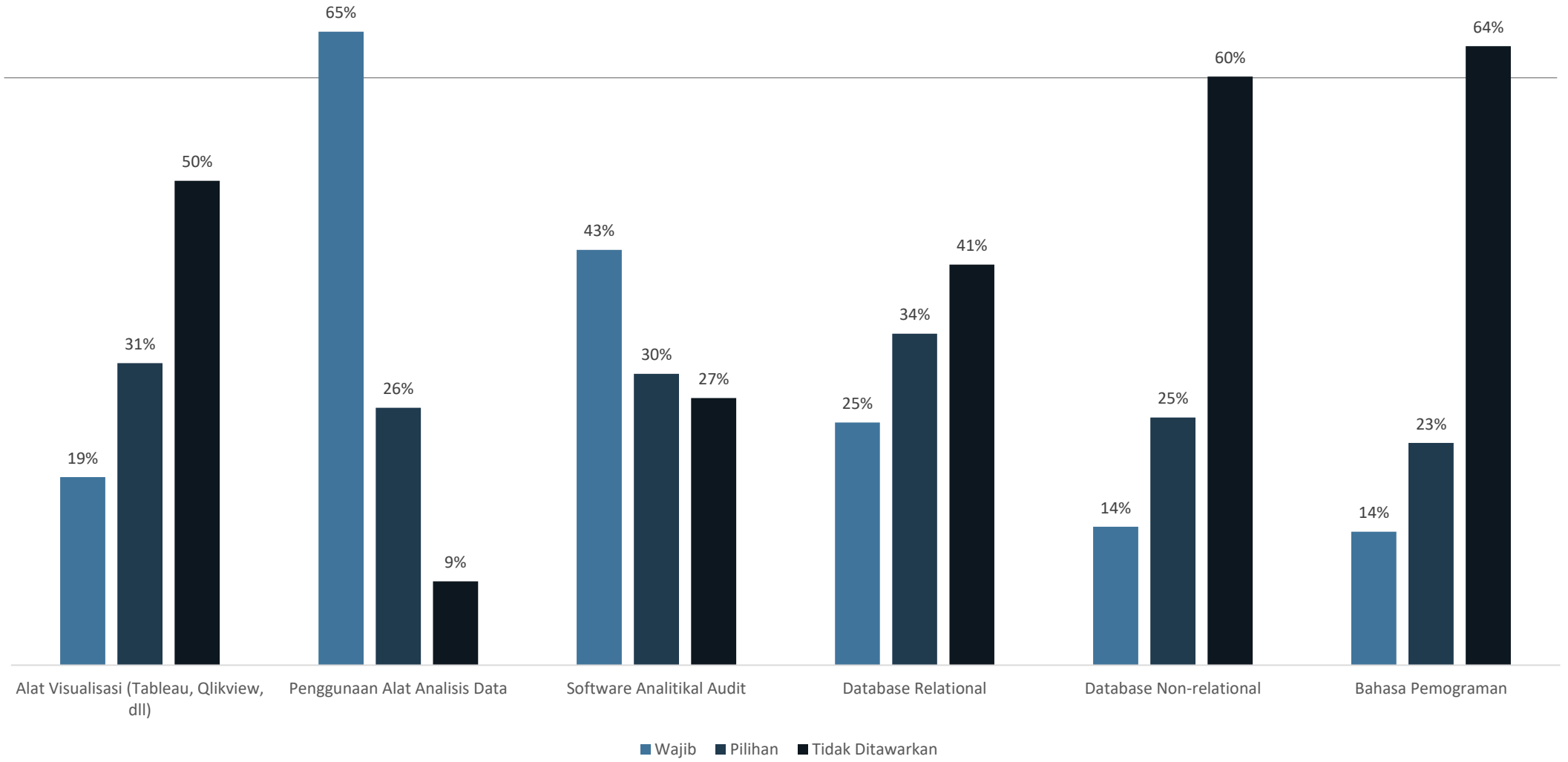
Materi-materi/matakuliah Teknologi terkait RI 4.0



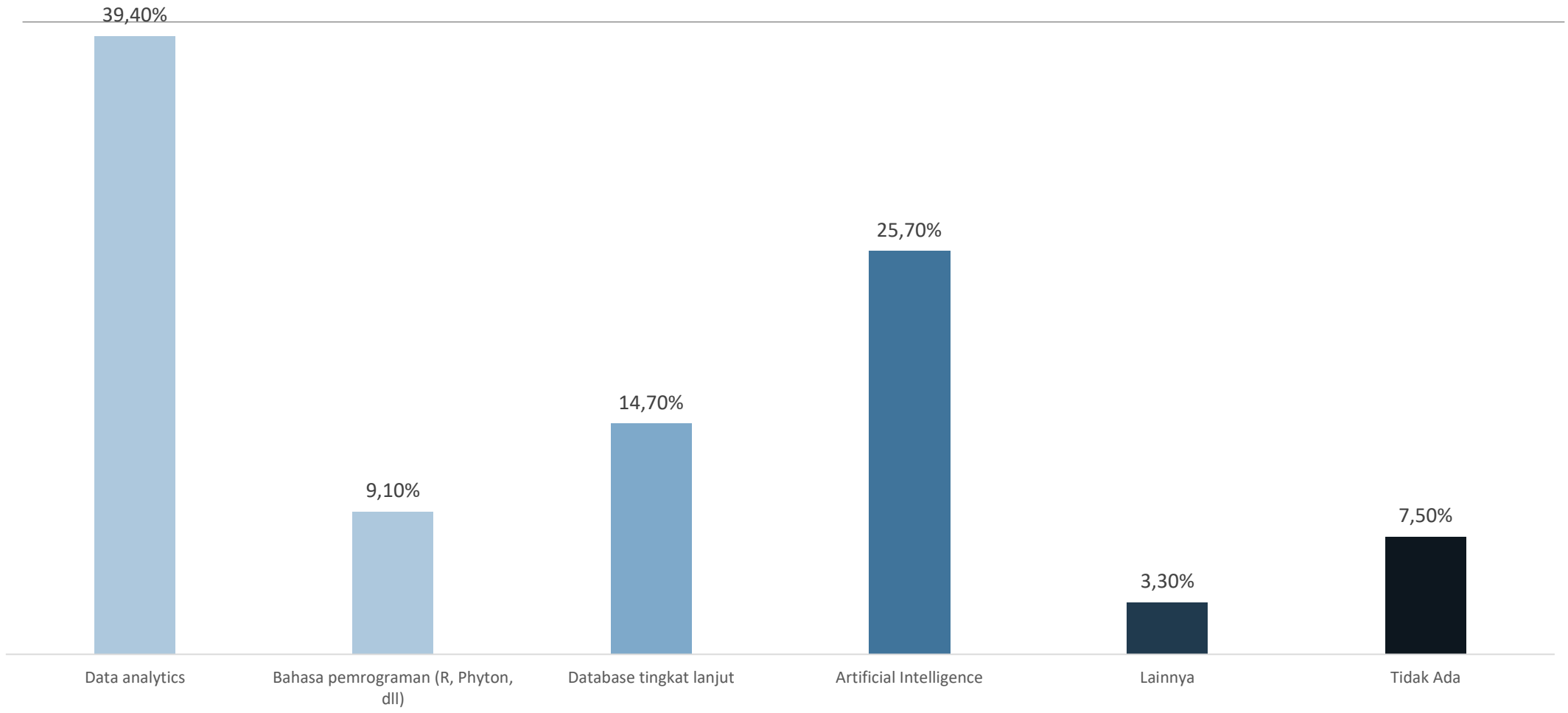
Materi-materi/matakuliah Teknologi terkait RI 4.0



Materi-materi/matakuliah Teknologi terkait RI 4.0

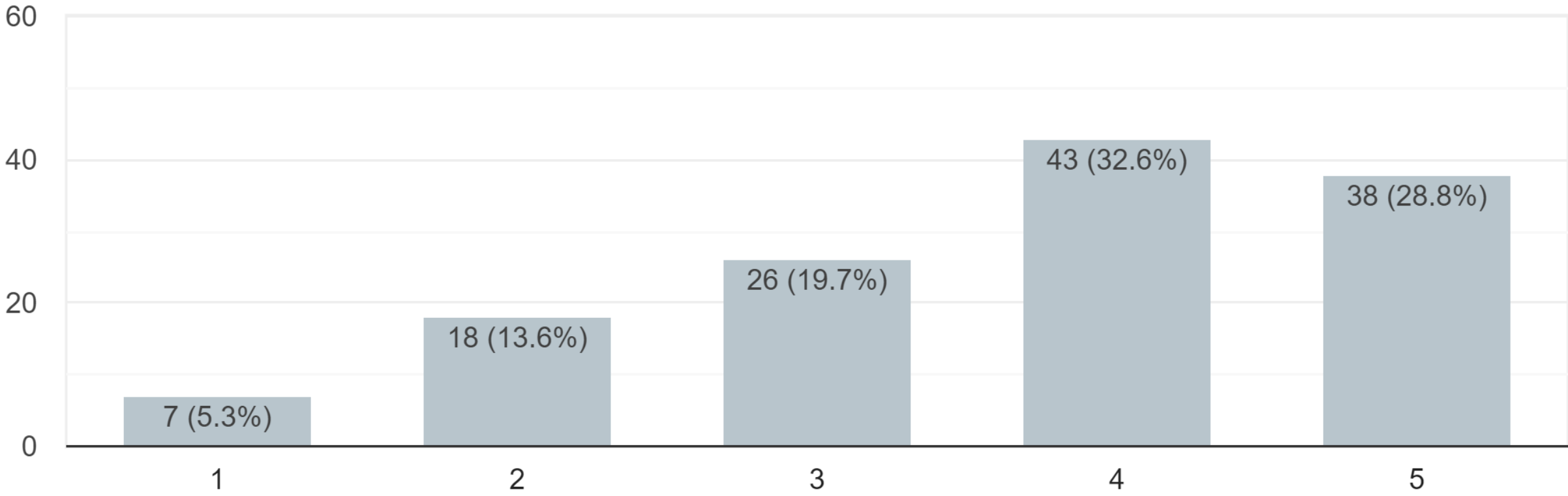


Matakuliah Prodi S1 Akuntansi baru terkait RI 4.0



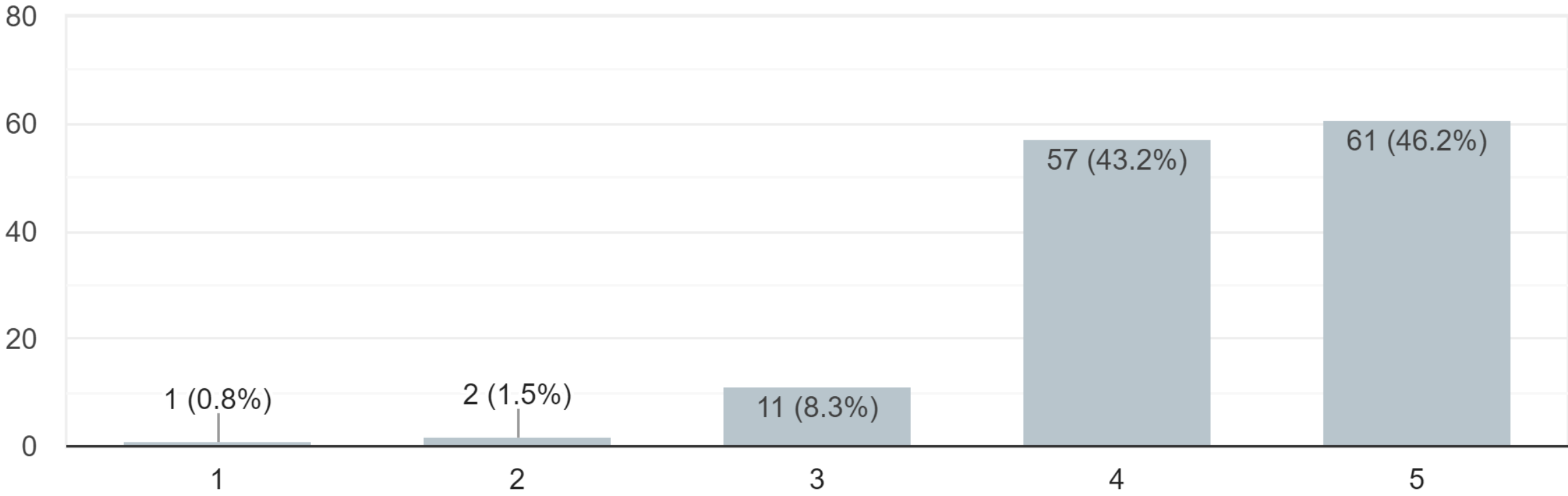
a. Hanya dosen akuntansi dengan pelatihan memadai untuk materi-materi tersebut

132 responses



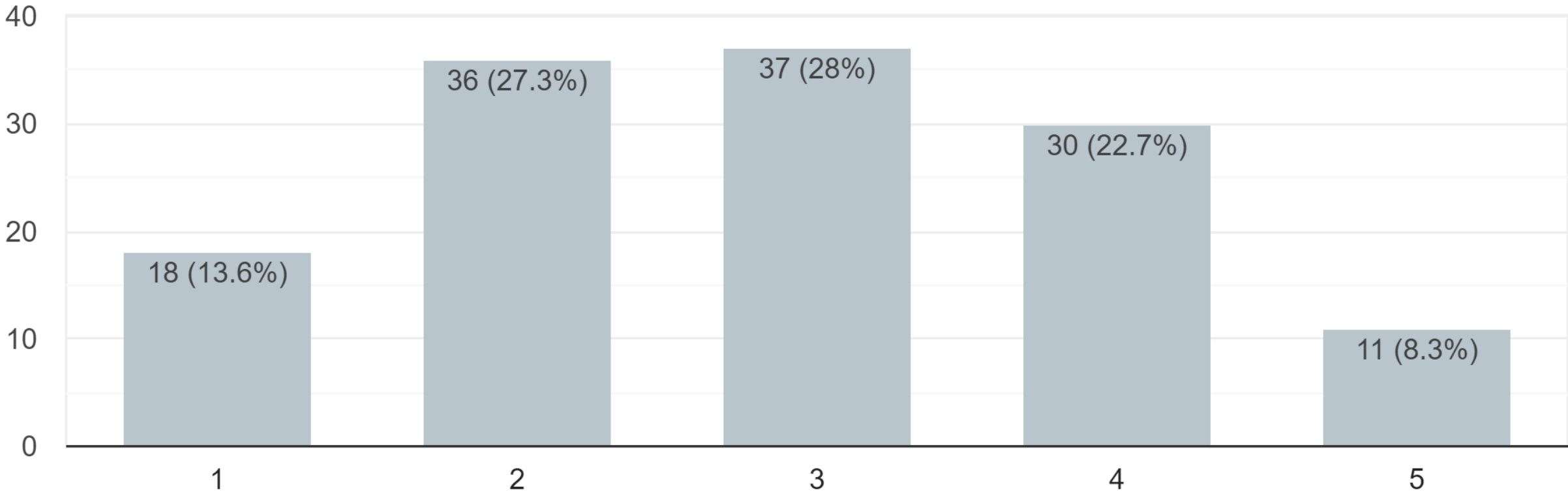
b. Team dosen yang terdiri dari dosen akuntansi dan dosen sistem informasi/ilmu komputer

132 responses



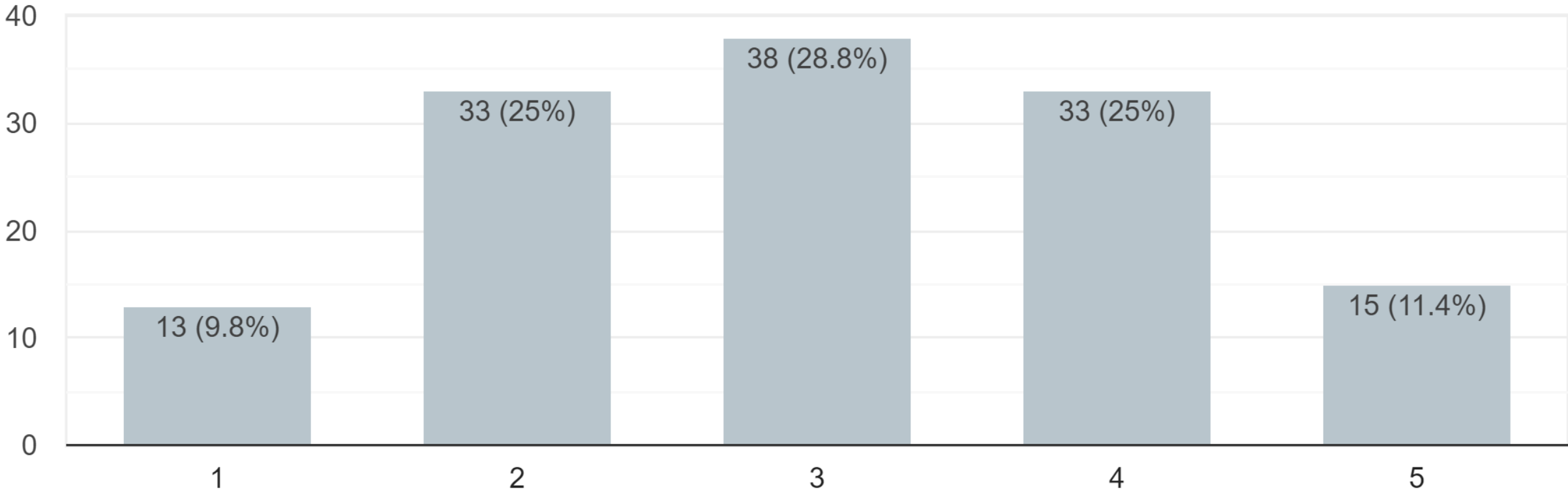
c. Dosen sistem informasi/ilmu komputer yang hanya bisa mengajar materi-materi tersebut

132 responses



d. Semua dosen akuntansi bisa mengajar materi-materi tersebut

132 responses



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Dampak RI 4.0 terhadap Learning Outcome matakuliah Prodi S1 Akuntansi

Materi baru yang perlu dimasukkan (wajib/pilihan)

Skills yang dibutuhkan

Materi-materi terkait Teknologi RI 4.0 di Prodi S1 Akuntansi

Mata Kuliah	Persentase
Internet of Things	63,5%
Big Data	62,4%
Penggunaan alat analisis data (SPSS, SAS, SATA, dll.)	59,4%
Cloud Computing	49,7%
Artificial Intelligence	38,6%
Penggunaan alat visualisasi (Tableau, Qlikview, dll.)	35,5%
Block chain	32,5%
Database non-relational (Hadoop dll.)]	26,9%
Bahasa pemograman (Java/Phyton, R, visual basic dll)	22,8%

Focusing on Technology-Enhanced Skills – not on a particular technology

- Promote experiential learning and uniquely human skills
- Prepare students for rapidly evolving economy
- Enable interdisciplinary learning
- Think from the perspective of users/customers to capture human values
- (Chialin, 2018)

Needed skills?

Be proactive; Get Retraining, Adapt, and Prosper

Learning formal logic (the basis of computer reasoning). It will help you understand the capabilities of computers and how to harness those capabilities.

Be able to help software vendors understand the software you really need. Be an active part of software developer team.

Table 1
Review of professional literature.

Author(s)/sponsoring organization	Title of article	Focus area	Skills identified
CGMA (2016)	Business Analytics and Decision Making – The Human Dimension	Managerial Accounting	• Curiosity (the ability to adapt a probing and questioning stance) • Ability to work with data • Understand the business context. • Ability to think in systems • Ability to use visualization tools and storytelling to communicate results.
Forbes Insights/KPMG(Forbes Insights 2015a)	A Focus on Change	Auditing	• Investigative financial skills • Understanding of data & analytics • Critical thinking and judgment • Communication skills
PwC (2015)	Data driven. What students need to succeed in a rapidly changing business world	Audit, Tax, Risk Management, and Consulting	• Core accounting knowledge skills • Ability to research and identify anomalies and risk factors in underlying data • Mine new data sources • Understand databases – both relational and non-relational • Ability to use statistics, visualization tools, optimization methods, machine learning, and predictive analytics • Identify and frame key business decisions • Extract data and run appropriate analytics to generate insights

			generate insights
IMA(ACCA & IMA 2013)	Big Data. Its Powers and Perils	Managerial and Financial accounting professionals	• Can ask the right questions • Can use predictive analytics tools • Can use statistical and analytical tools to understand the meaning of data and communicate the findings • Can use visualization tools to communicate and build dashboards.
Journal of Accountancy (Tschakert, Kokina, Kozlowski, and Vasarhelyi, 2016)	The Next Frontier in Data Analytics	All CPAs	• Understand data and how to manipulate it • Can identify key questions to be answered and understands the business data flow within the business context • Analytical mindset – inquiring nature and intellectual curiosity.

Forbes Insights/EY(Forbes Insights 2015b)	Analytics: Don't Forget the Human Element	All Accounting professionals.	• Statistical proficiency • Data mining • Visualization and reporting • Data extraction and transformation • Data quality and profiling • Data architecture
IMA and Robert Half (2016)	Building a Team to Capitalize on the Promise of Big Data.	Accounting and Finance professionals..	• Identify key data trends • Data mining and extracting skills • Operational analysis • Technology acumen • Statistical modeling and data analysis • Communication skills – verbal and written
Ernst and Young Foundation (2016)	Competency Framework: The analytics mindset	All Accounting Professionals	• Ability to ask the right questions • Ability to extract, transform and load relevant data • Ability to apply appropriate data analytics techniques • Ability to interpret and share the results with stakeholders.

Table 2
Suggested topics and skills by course for a focused approach.

Course	Topics and skills
Business Analytics (provided outside the Accounting department)	• Understanding data o Types of data o Retrieving data (Extract) o Cleaning data (Transform) o Loading data (Load) • Analysis skills o Descriptive statistics o Predictive statistic o Prescriptive statistics • Communication skills o Creating meaningful dashboards to convey information o Creating stories to convey results
Capstone course (provided within the Accounting Department)	• Critical thinking o Asking the right questions o Identifying issues o Ability to identify data needed to address the questions • Understanding data o Types of data o Retrieving data (Extract) o Cleaning data (Transform) o Loading data (Load) • Analysis skills o Descriptive statistics o Predictive statistics o Prescriptive statistics • Communication skills o Creating meaningful dashboards to convey information o Creating stories to convey results

Table 3
Suggested topics and skills by course using the integrated approach.

Course	Topics and skills
Accounting Information Systems	• Understanding data o Types of data o Databases – relational and non-relational o Retrieving data (Extract) o Cleaning data (Transform) o Loading data (Load) • Understand the business data flow within the business context • Critical thinking skills o Ability to identify data needed to answer relevant questions o Ability to assess the reliability, completeness, and security of data
Auditing	• Critical thinking skills o Asking the right questions/identifying issues o Ability to research and identify anomalies o Ability to identify data needed to address the questions/issue • Analysis skills o Sampling o Descriptive statistics • Communication skills o Written communication of results o Oral communication of results
Financial Accounting	• Critical thinking o Asking the right questions o Identifying issues o Ability to identify data needed to address the questions • Analysis Skills o Financial statement analyses ▪ Ratios ▪ Trends ▪ Comparisons o Descriptive Statistics • Communication Skills o Written communication of results o Oral communication of results

Management/Cost Accounting	• Critical thinking skills o Asking the right questions/identifying issues o Ability to research and identify anomalies o Ability to identify data needed to address the questions/issue • Analysis skills o Descriptive statistics o Predictive statistics (spreadsheet modeling and regression models) ▪ Budgeting ▪ Forecasting ▪ What-if-Scenarios o Prescriptive statistics ▪ Optimization models ▪ CVP models • Communication Skills o Written communication of results o Oral communication of results
Tax	• Critical thinking skills o Asking the right questions/identifying issues o Ability to research and identify anomalies o Ability to identify data needed to address the questions/issue • Analysis skills o Descriptive Statistics o Trends o Comparisons • Communication Skills o Written communication of results o Oral communication of results

Sekian, terima kasih.

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Syaiful Ali adalah staff pengajar tetap di Departemen Akuntansi Fakultas Ekonomi dan Bisnis di Universitas Gadjah Mada. Ia memperoleh gelar PhD di bidang Sistem Informasi Akuntansi, Master of Information Systems (MIS) dari University of Queensland Business School, Australia dan gelar sarjana di bidang akuntansi dari Fakultas Ekonomika dan Bisnis, Universitas Gadjah Mada, Indonesia.

Dr. Syaiful adalah anggota dari Ikatan Akuntan Indonesia, Kompartemen Akuntan Pendidik (IAI-KaPd) dan juga American Accounting Association. Minat penelitian dan pengajaran utamanya adalah sistem informasi akuntansi, tata kelola investasi teknologi informasi, corporate governance, dan IT for accounting education. Penelitiannya telah dipublikasikan di beberapa jurnal internasional seperti Information Systems Frontiers, International Journal of Accounting Information Systems, Journal of Information Systems, Journal of Global Information Management, dan Gadjah Mada International Journals.

Dr. Syaiful juga telah mempresentasikan makalah penelitian pada konferensi utama bidang sistem informasi dan akuntansi seperti Pacific-Asia Conference on Information Systems (PACIS), Asia/Pacific Research Symposium on Accounting Information Systems, Mediterranean Conference on Information Systems (MCIS), Australasian Conference on Information Systems (ACIS), American Conference on Information Systems (AMCIS), dan American Accounting Association (AAA) Annual Meeting-AIS Section.

Saat ini Dr Syaiful menjabat sebagai Sekretaris Departemen Akuntansi FEB UGM. Pengalaman pekerjaan lainnya yaitu visiting fellow pada School of Accountancy, School of Business, Queensland University of Technology, Sekretaris Direktorat Sistem dan Sumberdaya Informasi UGM, dan Senior Auditor pada Satuan Audit Internal UGM.

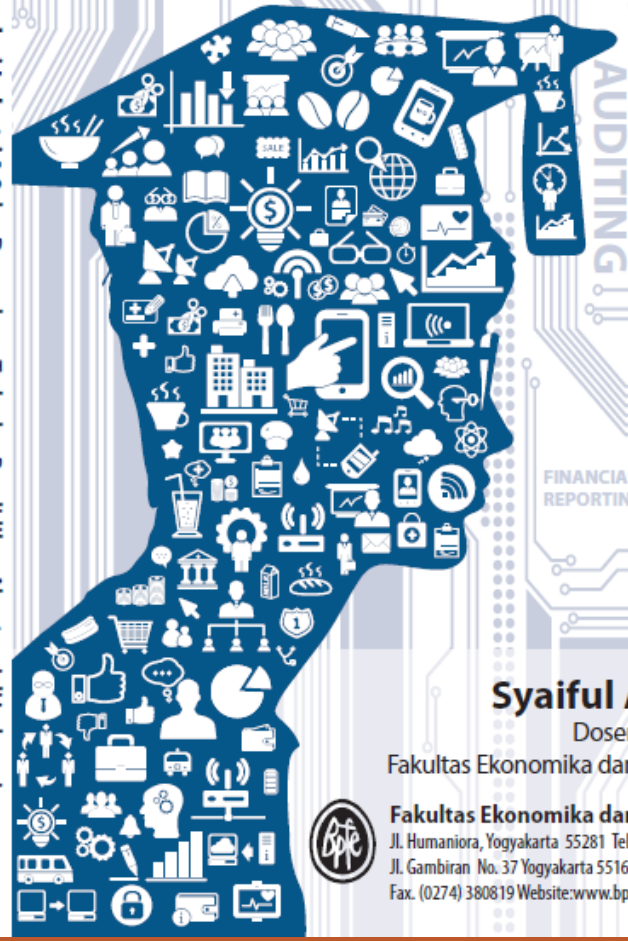
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