SOLVING REAL-WORLD PROBLEMS IN ACCOUNTING INDUSTRY USING CDIO FRAMEWORK

Daryl Aw Wei En (Lead), Ronnie Hoh, Yew Siew Meng, Germaine Lim, Ho Seow Hui

Singapore Polytechnic School of Business, Diploma in Accountancy

ABSTRACT

This paper shares the work done by final year students from the Diploma in Accountancy (SP Accountancy) at Singapore Polytechnic (SP) in solving real-world problems using the CDIO Framework. Guided by relevant sections of the CDIO Syllabus and Standards, it explains how robotic process automation (RPA) is used to conceive, design, implement and operate to produce a suite of digital solutions covering accounting, auditing, tax and corporate secretarial needs of Accounting Entities (AEs) in Singapore. The prototype solutions proved useful to the accounting industry, resulting in the Institute of Singapore Chartered Accountants (ISCA) signing a Memorandum of Understanding (MOU) with SP to further help its members adopt digital solutions. Another MOU was signed with the Singapore Accountancy Commission (SAC) to fund SP's RPA projects for the industry.

The paper explains the challenges faced by the accounting industry to adopt digital solutions. It also explains the challenges faced by SP Accountancy in securing meaningful final year projects (FYPs) which become the motivation for change.

The paper then explains how the CDIO Syllabus was use to pilot a new approach to executing FYPs. The paper describes in detail work done during the four stages of conceiving, designing, implementing and operating the suite of digital solutions.

The paper shares the finding of students' learning experiences under the new approach, and examines whether it can better prepare them with the necessary skills for the industry. Feedback from industry partners, which has largely been positive, are also shared.

This paper concludes with the author's reflection to investigate how the CDIO Framework can be used to improve the teaching in SP Accountancy at the course-level; and plans to move ahead with this new way of executing FYPs by expanding into other areas in the sector.

KEYWORDS

Robotics Process Automation, Accounting Entities, CDIO Syllabus Parts 3 and 4, CDIO Standards 1, 2, 5, 9 and 11.

THE CHALLENGES FOR ACCOUNTING ENTITIES TO ADOPT DIGITAL SOLUTIONS

Accounting Entities (AEs) typically provide audit and assurance services as well as other non-audit related services such as basic accounting services, tax preparations, corporate advisory services and consultancy services. AEs in Singapore are split into three main categories: Big Four AEs, Large AEs and Small and Medium Practices (SMPs).

The auditing industry works long hours. Overtime is the norm, especially during peak season, and most auditors would desire better work-life balance. Auditors are cognizant that many of their day to day tasks are automatable and thus are more open to adopting new digital skills to remain employable (Lee & Loke, 2017). Thus, there is potential for automation to enhance the quality of their audits. Automation could allow for 100% testing of high-risk accounts, something which is currently almost impossible to do due to the high volume of transactions, tight deadlines and limited manpower budget (Ang, 2013). This would greatly reduce the sampling risk in the audit.

In the Singapore Accountancy roadmap, a Digital Transformation for Accountancy (DTACT) programme was set up to aid SMPs as they adopt baseline technology. This is funded by Enterprise Singapore and administered by the Singapore Accountancy Commission (SAC). Institute of Singapore Chartered Accountants (ISCA) also has funding support for SMPs for curated digital solutions.

Despite the push for digital transformation by the Singapore government, the SMPs' process of performing the audit has not changed much through the years. The audit, tax and corporate secretarial work are still mostly done in Microsoft Word and Excel which is labour intensive and time consuming.

The team investigated reasons for the low adoption of existing digital solutions and identified the following pain points:

i. The initial set-up and on-boarding of existing audit client data into new auditing software would be time consuming and voluminous. There would be a need to retrain existing staff and have sufficient IT support. This unfamiliarity and the huge amount of set up required to adopt the digital solution hindered the AEs from adopting the existing off the shelf solutions.

ii. Existing work processes would have to be redesigned so that employees could harness higher productivity gains. However, if staff are unable to overcome the resistance to change and do not buy into the digital solution, they may end up abandoning the solution or even wasting more time resolving IT issues. In order to be successful, the adopter needs to be ready to combine the adoption of automation, with the discipline of process redesign and continuous improvement (Davenport & Brain, 2018).

iii. Cost considerations also weigh heavily on SMPs. Given their relatively lower revenues, the additional costs of maintaining the digital software – both in terms of subscription costs and manpower costs – were another deterrence.

iv. There is a 94% probability that the traditional role of an accountant or auditor is computerisable (Frey & Osborne, 2017). This has made staff fearful of being replaced by robots and hence resistant to change.

THE CHALLENGES FACED BY SP ACCOUNTANCY IN OBTAINING FYPs

Singapore Polytechnic (SP) Diploma in Accountancy (SP Accountancy) introduced the Final Year Project (FYP) module in 2017, as an authentic learning experience to enhance the more theoretical learning of accounting in the traditional classroom context. The aim of the FYP was for students to apply their knowledge to the industry, build their portfolio and be better prepared for work or further studies. However, finding such projects was very challenging.

In the initial years, FYPs were pro-bono, and did not require complex accounting technical knowledge. FYPs were more focused on solving the physical manpower needs of the industry partners. Common project examples were physical stock-takes, reviewing inventory and fixed asset processes, performing fixed asset sighting, and data entry to adjust incorrect revenue journal entries. Other project examples included designing an analytics dashboard to track revenue and testing the usability of tax software. However, the outcomes of these project deliverables were commonly just prototypes, which the industry partners did not make use of. There was a mismatch of students' skill-sets and industry expectations. There was a gap between what the students learnt and what the industry partners required. The final year students had been taught basic accountancy skills in financial accounting, auditing, taxation and management accounting. However, the industry partners typically had more experience and technical competency than the students. Hence, it appeared that the industry partners did not have real needs for SP Accountancy students. It was challenging for the lecturers to find meaningful ways for the students to help the industry.

Furthermore, many other Institutes of Higher Learning (IHLs) in Singapore were also sourcing for accounting projects within the industry. These were students from the universities, such as The Singapore Institute of Technology's (SIT) Accounting Technology and Innovation Centre (ATEC) supported by SAC to work on projects for the accounting sector, and the Singapore Management University's (SMU) SMU-X program with pro-bono accounting projects. SP Accountancy students can be in a disadvantaged position as the university students tend to be viewed in a more favorable light, given their maturity (having served National Service) and studying in greater depth about accounting. SP had to compete with these universities for projects within the industry.

LECTURERS LEAD BY EXAMPLE BY APPLYING CDIO

The CDIO Framework was initially introduced to revamp engineering education. It stresses the process of conceiving, designing, implementing and operating a product, process, system or service that meets the needs of the industry (Crawley, 2007). Over the years, its adoption had expanded beyond the initial engineering disciplines to include other study areas such as biotechnology, food engineering, agriculture, textiles, and event management. The CDIO Framework consists of two major components: the CDIO Syllabus and the twelve CDIO Standards. The framework offers an alternative to produce better prepared and highly skilled engineers (Elamvazuthi, 2015), and could also be mapped in cross disciplinary curricula, such as Accounting, successfully. (Martin J., 2016)

To address the abovementioned challenges, the lecturers in the SP Accountancy team decided to adopt selected sections of the CDIO Syllabus, as well as several relevant Standards from the CDIO Framework to redesign how the FYP was executed. More specifically, the team took reference from Part Four of the CDIO Syllabus "Conceiving, Designing, Implementing and

Operating Systems in the Enterprise, Societal and Environmental Context: The Innovation Process", whereas the CDIO Standards made use of are: Standard 1 - The Context, Standard 2 - Learning Outcomes, Standard 5 - Design-Implement Experiences and Standard 9 – Enhancement of Faculty Competence.
The team then reviewed the skillsets that the SP Accountancy students developed in their three years in SP which could complement the needs of the SMPs and noted that there was a need to introduce IT centric modules in addition to their technical accounting knowledge. If the students are proficient in IT, they would be able to contribute to the digital transformation of the accountancy sector. The team identified Robotic Process Automation (RPA) as an emerging IT skillset to integrate into the FYP.

RPA uses logic-driven software applications that are programmed to execute certain tasks. RPA does not involve a physical robot that performs operational processes but a virtual robot on the computer. It also allows the user to automate manual and repetitive processes without needing any coding or programming background. RPA is able to integrate various software and processes can be completed with just the click of a button.

In 2018, only 1% of AEs in Singapore had adopted baseline robotic process automation (RPA). Though RPA had been implemented by many business organizations, the application of RPA to auditing remains largely unexplored (Moffitt, Rozario, & Vasarhelyi, 2018). From an auditing perspective, manual and repetitive audit tasks such as reconciliations, internal control testing, and detail testing can be automated (Huang, 2019). Based on the lecturer team's industry experience, other processes such as the annual roll forward of previous years' documents, reconciliations, and confirmations are some examples of repetitive processes which could be also automated.

SETTING KEY LEARNING OUTCOMES

As set out under the CDIO Standard 2 -- Learning Outcomes, the lecturers mapped out the desired learning objectives at each stage of the module as shown in Table 1:

Table 1: Learning Outcomes Mapped to CDIO

Assessment (Weightage for Final Grade)	Mapping to CDIO Syllabus	Mapped CDIO	Description of the Project Outcomes
CA1 (30%) Interim Presentation	2.1.1, 2.1.3, 2.4.4, 3.2.3, 4.3.1, 4.3.4, 3.2.2, 2.1.4, 2.4.3, 3.2.3, 4.4.1, 4.4.3	• Identify and formulate the problems and insights • Analyse interview and survey results • Evaluate needs and develop goals • Display critical thinking • Develop a Project Management Plan • Use correct grammar, spelling and logical organization in presentation materials	• Conduct quantitative user empathy studies and deep user interviews to develop insights on the project scope • Create persona • Conduct environmental scanning • Recommend draft solution ideas with prototypes • Develop a project management plan with timeline and team roles and areas of responsibilities • Demonstrate good presentation skills via infographics
CA2 (40%) Final Presentation	2.1.4, 2.2.4, 4.5.5, 2.1.4, 3.2.2, 3.2.3, 4.4.1	• Conclude study and make recommendations • Appraise possible improvements in knowledge discovery process • Evaluate the validation of performance to client needs (Improvements to make after clients mentoring session) • Conduct iteration until convergence to desired solution • Present recommendations • Demonstrate visual communication	• Produce a final output (dashboard, high resolution prototype, video, lesson package, RPA script, Caseware deliverable) by using technical knowledge • Make recommendations with technical knowledge • Make possible improvements using the feedback from stakeholders/clients
CA3 (10%) Reflection	3.2.2	• Identify key aspects of the learning process • Explain motivation for lifelong learning • Appraise one's own learning needs • Write with logical organization and clear language flow • Use correct grammar, spelling and punctuation	• Explain one key takeaway learnt in FYP • Explain one key challenge faced in FYO and how the student overcame it
PM (20%) Participation Marks	2.4.3, 2.4.4, 3.1.1, 2.5.5, 3.1.2	• Demonstrate creative and critical thinking • Form effective teams • Demonstrate respect for equity and diversity • Manage and participate in teams	• Attitude and aptitude: prepared for discussion, proactive participation, resourceful in resolving problems and self-directed learning to acquire new knowledge and skills • Teamwork: Display good team spirit, work well with peers and lecturers, proactively offer constructive feedback

To provide authentic learning experiences, a series of learning experiences were designed for students. These included field visits to AEs, deep user empathy studies, research on best practices and learning from industry subject matter experts. Facilitation and consultation sessions were also provided.

Students were grouped into teams of 4-6 members and are expected to work independently to collect data, provide interim updates, run a co-creation session and conduct the final presentation for the AEs. Teams will also have to work with each another to ensure that the final solutions are integrated, innovative, sustainable and viable. Students were also expected

to apply knowledge and skills learnt from previously completed modules, such as Design Thinking in Year 2.

Each final year class consists of twenty students, on average. They were divided into four groups. The supervising lecturer assigned the students to groups based on specific criteria to form balanced teams using The Grumbler (Sparrow, 2021). The Grumbler teams were more balanced in terms of various criteria, such as gender, nationality, admission types, and grade point aggregate. These assigned groups replicate the real world working environment in the auditing industry as auditors are assigned into different teams to work on different audits. By ensuring that each team had a similar overall average GPA, each team was more likely to have the ability and capability to develop a successful solution for the project. Assigning students to groups has been shown to lead to better student performance and overall learning experience. (Colbeck, Campbell, & Bjorklund, 2000)

DEVELOPING FACULTY COMPETENCY IN TEACHING

If faculty are expected to teach a curriculum of personal and interpersonal skills, integrated with disciplinary knowledge, they need to be competent in those skills themselves. The lecturers first sought to enhance their existing skills by adopting a three-pronged approach:

i. Attend – All lecturers facilitating FYPs would first attend the RPA classes conducted by their experienced colleagues from another SP faculty so as to gain a basic grasp of the technology and start adopting the technology to automate their own work processes. The lecturers also took up online certifications by the software provider, which allowed them to learn at their own pace during their pockets of free time.

ii. Facilitate – The lecturers would then shadow their colleagues in teaching the RPA classes, to learn how to troubleshoot problems during RPA implementation and gather more real life use case examples.

iii. Adopt – the lecturers developed a basic RPA class, with real world accountancy use cases, for the Year 3 curriculum. Students who went through this class were expected to have basic RPA knowledge to start on simple RPA FYPs. Finally, lecturers marketed the student's RPA capabilities by offering them to existing AE partners as part of the FYP. This incentivised the AEs to try out a new software and gave the students and lecturers the chance to have the initial success stories for confidence building.

The supervising lecturer had the responsibility of engaging with the AEs before the students started on the projects, similar to how an audit manager would first attend a kick-off meeting with the audit client before the audit team started work. The lecturers would meet the AEs to firstly identify the specific needs and pain points of the AEs. This is a detailed understanding of the current processes of the AEs. The lecturer would then propose a skeleton solution to the AEs to assess the suitability, practicability and sustainability of the solutions. The lecturer's suggested solutions would be designed based on the capability of the students and the complexity of the project scopes, and also to manage the expectations of the industry partner. This also gives the lecturer confidence to be able to supervise his or her class with an expected outcome of the projects in mind.

CDIO – CONCEIVE & DESIGN STAGES

Under CDIO Standard 1, the Context, the concept of conceiving includes defining the customer and societal needs. This sets the context for the lecturers and students to better understand and define the AEs needs. Under the Conceive stage, the supervising lecturer had the responsibility of engaging with the AEs before the students started on the projects to firstly identify the specific needs and pain points of the AEs. This is a detailed understanding of the current processes of the AEs. The lecturer would then move to the Design stage, by proposing a skeleton solution to the AEs to assess the suitability, practicability and sustainability of the solutions. The lecturer's suggested solutions would be designed based on the capability of the students and the complexity of the project scopes, and also to manage the expectations of the industry partner. This also gives the lecturer confidence to be able to supervise his or her class with an expected outcome of the projects in mind.

When the students start on their projects, they are briefed on their project scopes. Each group will be assigned multiple processes to automate. The AE would have prepared the necessary documents and videos explaining the processes. The students would watch the videos and prepare a process map of all the current processes that they are working on.

During the kick off meeting, the students would interview the AE's staff. Each group would clarify any doubts about the existing processes. This is essential to understand the whole process so that the group can ensure the accuracy of their solution, and identify any pain points and needs of the AE.

Moving on to the Design stage, students would design an RPA script to automate the different processes. The students would combine their accounting technical knowledge as well as their IT skills to design the Framework of their solution. The lecturers would give feedback to help the students refine their prototype solution.

CDIO – IMPLEMENT & OPERATE STAGES

After incorporating the feedback from the AE, the students build the working robot to automate the process. The students would then visit the industry partner to implement the robot on their AE's hardware. The students would test out the robot on the AE's live data to check that the robot is working.

Typically, the implementation stage would be the most time consuming of the whole project. Hence the students would have, together with the help of the lecturer, designed the project management timeline to cater more time for implementation.

Table 2 below shows a summary of the different RPA robots that have been developed and deployed by SP Accountancy for our industry partners as part of the FYP.

Table 2: List of RPA robots developed and deployed by SP Accountancy students

Audit	Corporate Secretarial	Tax	Accounting	Others
•Confirmations •Preparation of audit documents •Roll-forward procedures •Automation of audit procedures •Automation of financial statements	•Annual General Meeting filing •Annual returns •Incorporation •Customer Due Diligence •Preparation, processing and managing of corporate secretarial documents	•IRAS tax filing •GST processing •Preparation of tax documents	•Data entry •Data extraction •Reconciliation of reports •Report generation and preparation •XBRL	•Timesheet •Practice management procedures •Automation of administrative procedures •Automation of payroll procedures

Once the robots are able to work with the live data, the students would guide the AE's staff to operate the robots. The students would prepare a manual to assist them in operating the robots. The students would also conduct a training for the AE's staff to use the robots. The students would do a final presentation to the industry partner to wrap up the project. This presentation would showcase the final solution, show the status of the implementation, and quantify the productivity gains.

EVALUATION OF WORK DONE: METHOD

The lecturer team investigated whether this new approach of integrating digital skills and adopting the CDIO method in the FYP better prepares students for the industry and the future.

Participants

To test the effectiveness of the FYP module in preparing students for their future careers, a pre-test and post-test survey was conducted with sixty students. We were interested in finding out if students achieved improvements in line with the Learning Outcomes within Table 1, such as critical and creative thinking skills and as well as digital skills. We were also interested in their perception of their futures in a field that seemed threatened by automation given that they now had a deeper understanding of the capabilities of RPA.

Data Collection

The data collection process began with the same survey sent out to students at the start of the FYP. The same survey was sent out to students after they had completed the FYP. The survey consisted of Likert-scale questions and one open ended question to gather other feedback. The following link shows the survey questions: https://forms.gle/2GYUZnRMqEUpiXnp9

Data Analysis

The survey results were exported into Microsoft Excel for analysis. The means were calculated for the different questions.

RESULTS & FINDINGS

Survey Results

The survey results show that students were able to apply design thinking to the projects (increase of 17%) and be more innovative and creative (increase of 14%) in their projects to produce an implementable and operating solution and not just a prototype. The survey results showed that students took more ownership and responsibility in their projects (difference of 4%). This is a result of and a co-relation to the high expectations of the AEs of the expected deliverables.

Table 3: Survey results on adopting the CDIO approach

	Pre-test	Post-test	Difference	Difference (%)
I was able to apply design thinking during the project.	3.72	4.33	0.62	+ 17%
I was able to innovate and be creative during the project.	3.72	4.23	0.52	+ 14%
I am responsible and take ownership of my work.	4.37	4.55	0.18	+ 4%

The survey results also show that students are more prepared for the industry as the new approach in the FYP module gives them the confidence that they have the necessary digital skills (increase in 13%), necessary presentation skills (increase in 12%) and the necessary accounting skills (9%). The experiment group shows that they have a better advantage (increase in 16%) over their peers in applying for university or work because the FYP gives them a better portfolio in their resume for university or jobs. This has differentiated our students from other IHLs, giving them more opportunities in their further studies or career. This has also allowed students who probably would miss the cut-off for universities, a second chance to get into the universities because of their FYP project.

Table 4: Survey results on preparation of students for the future

	Pre-test	Post-test	Difference	Difference (%)
FYP has given me an advantage over other peers in the hiring process / applying for university.	3.37	3.90	0.53	+ 16%
After doing my FYP, I am confident that I have the necessary digital skills for work.	3.63	4.10	0.47	+ 13%
I am confident that I have the necessary presentation skills for work.	3.75	4.20	0.45	+ 12%
I am confident that I have the necessary accounting knowledge for work.	3.72	4.03	0.32	+ 9%

After having examined the processes that could be automated as part of their FYP, students have a better perspective of what robots are able to do and not do. The survey results show that students are less threatened by robots (decrease in 11%) to replace their job roles, allowing them to see robots as a tool to leverage to face the future.

Table 5: Survey results on the perception whether robots will replace the accountant / auditor job role in the future

	Pre-test	Post-test	Difference	Difference (%)
Robots will be able to replace the accountant / auditor in the future.	3.27	2.92	-0.35	- 11%

The results of the survey were in line with the authors' expectations, in that an improvement in the overall confidence and technical skills was achieved.

Qualitative Feedback

Here is some qualitative feedback from the students which co-relates to the quantitative findings above. Overall, students had a positive experience in this module.

Feedback From Students

- "RPA helped me greatly in the aspect of critical thinking as well as honing my presentation proficiency. Compared to other non-accounting modules, RPA was definitely the one that I gained the most takeaway. In the future, I strongly believe RPA will be prevalent and I am grateful I had the opportunity to gain first hand exposure."

- "RPA would definitely benefit students and help them in their future from doing repetitive work. It also helps us to save time and be more productive to finish up certain projects as fast as possible. Investing ourselves in RPA would certainly be a very good investment for us in the future as I believe it will be a compulsory skill to have."

- "Since this project requires us to work together with real industry partners. It made me feel a sense of responsibility, that which I have not experienced before doing other projects. Personally, my FYP felt more than just a school project, it felt as though I had a legal obligation to ensure that our client was happy with our work, to the point that I would have continued to support our RPA robots if needed even after our FYP has ended. Not only that, through this project I was able to attain an important document which will improve my employability and acceptance to the university. That document is the testimonial letter from the industry partner, something which I would not be able to attain doing regular school projects. Furthermore, I was more industry ready as this project greatly improved my written and verbal communication skills."

INDUSTRY ENDORSEMENT

The AEs were impressed by what the students have automated in their projects. The following are some AE's testimonials from some of the FYPs:

- "Apen Chartered Accountants would like to commend Singapore Polytechnic for the successful execution of the RPA project implemented in our firm. Through the dedicated efforts of SP Accountancy students, the RPA project has automated and streamlined our firm's audit workflow. SP's strategic involvement in the project has enabled our company to increase its productivity and free up our auditors' time to perform more value-added work. We appreciate the excellent results produced by SP & its students and look forward to continued future digital project collaborations with SP to transform our firm!" - Apen CA

- "I am very happy to note that your project team has made good Progress on the RPA Automation Project, this tied in with the mission of AGN Network, which encourages close cooperation with Institutions of Higher Education to do R&D Work." - Audit Alliance LLP

By working on these RPA projects, the industry has recognised the importance and quality of the solutions done by the school. SP signed a MOU with the ISCA on 22 August 2019 to enhance the digital capabilities of the AEs in 2 main areas:

i. Developing certification courses in RPA that are customised for local AEs; and
ii. Supporting AEs in the adoption of audit software to automate and streamline their audit workflow.

The collaboration will allow SP Accountancy students to use RPA and other audit software to help AEs streamline their audit workflow and provide technological solutions. This collaboration is part of Infocomm Media Development Authority (IMDA)'s Accountancy Industry Digital Plan for the digital transformation of the accountancy sector in Singapore (IMDA, 2019).

On 11 May 2021, the SAC signed a MOU with SP to collaborate on a National Digital Consultancy Programme, through which SAC would fund RPA projects for AEs. This programme is called the RPA Adoption Support Scheme. SAC has also encouraged the other polytechnics in Singapore to scale up in RPA projects to help AEs in this national collaboration. SP will play a key role in training the other polytechnics and driving the adoption of RPA in AEs.

PLANS FOR FUTURE WORK

The lecturer team would also study the CDIO Framework in greater detail, for example, Standard 5, Design-Implement Experiences, to infuse these digital skills into the Year 1 curriculum at a basic level and begin performing simple RPA projects when attached to their internship companies when they come to Year 3.

Standard 7, Integrated Learning Experiences, can be further used to develop the students' personal and interpersonal skills through the integration of field trips, empathy studies and consultation with the AEs into the FYP journey.

The lecturer team is also looking into how the Framework can be used to improve the teaching in SP Accountancy at the course-level. One of the challenges faced during the project was the timeline in implementing and operating the robots which tended to be delayed. The team will review the timeline and project schedule to minimize such delays.

RPA can also be applied in other accounting areas such as forensic accounting, accounting analytics, financial accounting, management accounting and internal audit. The team plans to move ahead with the new way of executing FYPs by expanding into these areas, especially into forensic accounting and accounting analytics given that these are the two current trends in the sector.

CONCLUSION

It is important to infuse robotics and automation skills in the accountancy curriculum to prepare accountancy students to be industry ready. With the right skills and using the CDIO approach, this has allowed SP Accountancy students to innovate and develop various digital solutions for the accountancy industry. This has increased productivity in the sector and freed up time to allow the industry partners to focus on value-adding work. The project outcomes are successful and are recognized by the industry. This experiment has put SP Accountancy at the forefront of the transformation of the Digitalization Journey for Singapore's accountancy sector. Through these projects, our students are exposed to real world problems, making learning authentic and relevant.

ACKNOWLEDGEMENTS

I would like to express my gratitude to Mr Cheah Sin Moh, for his invaluable advice and patient guidance during the writing of this paper.

FINANCIAL SUPPORT ACKNOWLEDGEMENTS

The authors received no financial support for this work.

REFERENCES

Ang, M. (2013, November). Audit Sampling. *ISCA Journal*, pp. 48-52.

Bierstaker, J. B. (2001). The impact of information technology on the audit process: an assessment of the state of the art and implications for the future. *Managerial Auditing Journal, Vol. 16 No. 3*, 159-164.

Colbeck, C., Campbell, S. E., & Bjorklund, S. A. (2000). Grouping in the Dark: What College Students Learn from Group Projects. *The Journal of Higher Education, 71(1)*, 60-83.

Crawley, E. M. (2007). *Rethinking Engineering Education - The CDIO Approach.* Springer US.

Davenport, T. H., & Brain, D. (2018). *Before Automating Your Company's Processes, Find Ways to Improve Them.* Retrieved from Harvard Business Review: https://hbr.org/2018/06/before-automating-your-companys-processes-find-ways-to-improve-them

Frey, C. B., & Osborne, M. A. (2017). The Future of Employment: How Susceptible Are Jobs To Computerisation? *Technological Forecasting and Social Change, 114*, 254-280.

Huang, F. (2019). *Three Essays On Emerging Technologies In Accounting.* Retrieved from Rutgers University Libraries: https://rucore.libraries.rutgers.edu/rutgers-lib/59927/

IMDA. (2019). *Accountancy Industry Digital Plan*. Retrieved from https://www.imda.gov.sg/programme-listing/smes-go-digital/industry-digital-plans/Accountancy-IDP

Lee, F. C., & Loke, H. Y. (2017, August). Will Robots Replace Accountants? ISCA Journal, pp. 38-41.

Moffitt, K. C., Rozario, A. M., & Vasarhelyi, M. A. (2018). Robotic Process Automation for Auditing. Journal of Emerging Technologies in Accounting (2018) 15 (1): 1–10.

Sparrow, M. K. (2021). The GRumbler. Retrieved from Harvard University: https://scholar.harvard.edu/msparrow/grumbler

Elamvazuthi, I. L. (2015). Implementation of a New Engineering Approach for Undergraduate Control System Curriculum using a Robotic System. Procedia Computer Science, 76, 34-39.

Martin J., Wackerlin D. (2016). CDIO AS A CROSS-DISCIPLINE ACADEMIC MODEL. 12th International CDIO Conference, (p. 15). Turku, Finland.

BIOGRAPHICAL INFORMATION

Daryl Aw is a Chartered Accountant and lecturer at Singapore Polytechnic. He is the lead in Strategic Partnerships in the SB Business Innovation Centre. He teaches auditing and accounting modules in SP Accountancy. He oversees the SP Accountancy FYP focusing on accounting technology such as Caseware Working Paper and RPA to automate audit, accounting, tax and corporate secretarial processes. In 2021, he emerged as the champion in the ISCA RPA Hackathon. Before joining Singapore Polytechnic, he was an auditor with EY.

Ronnie Hoh is a Chartered Accountant and a lecturer, teaching accounting related modules like Business Accounting and Financial Accounting. He is also part of the RPA Team at SB and has supervised various RPA and accounting technology projects.

Yew Siew Meng is a Chartered Accountant and Senior Lecturer, teaching modules in accounting, auditing and tax. She has experience in external audit and spent many years working in different MNCs handling a broad spectrum of work covering areas in accounting, reporting, compliance, credit control, tax and treasury.

Germaine Lim is a Chartered Accountant and lecturer, teaching various auditing and accounting modules in SB. She is also part of the RPA Team at SB and has supervised RPA projects.

Ho Seow Hui is a Chartered Accountant and lecturer, teaching various accounting modules. She is a dynamic professional, having worked more than 15 years in both external audit and finance at various MNCs. Her varied experience in finance includes financial and management reporting, ERP implementation, accounting policies, training, and M&A.

Corresponding author
Mr. Daryl Aw
+65 6772 1843
Daryl_aw@sp.edu.sg
Singapore Polytechnic
500 Dover Road, Singapore 139651