Building 'Holistic' Business Process Modelling Skills for IS Graduates

Teaching Case

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Abstract

Business process modelling alleviates organizational complexity by documenting existing processes and identifying process-based software requirements and plays a critical role in many business transformation efforts. The demand for skilled process modelers is high and, on the rise, and many institutes are teaching process modelling as part of their IT and Business curricula in response. This teaching case provides pedagogical support for process modelling educators by complementing available teaching resources with a rich case study, which enables the transfer and evaluation of basic to advanced process modelling skills, and essential skills to manage process modelling efforts in organizations. It is based on a university case study which is embedded in the current context of continuous process improvement and business transformations with digitization efforts. The case design allows instructors to adapt it to suit their individual teaching needs and is supported with a rich set of teaching guidelines and additional ancillary material.

Keywords: Business process modelling, Teaching case, Capability building, Pedagogy, business process management, skills development, Higher education Sector

Introduction

A sound understanding of business processes is fundamental for mere day-to-day operations of any institution, and especially so for innovative and effective digital transformations. Process modelling deconstructs organizational complexity, document existing processes, identify process-based software requirements, and play a critical role in many business transformation efforts (i.e. in Enterprise Systems or RPA implementations or entire digital transformations) (Bandara et al. 2020). *"Growing reliance on process modelling has resulted in many large organizations having hundreds of staff (in various roles) involved in designing, maintaining and using sometimes thousands of models"* (Bandara et al. 2020, p. 1).

Process modelling is a critical knowledge area essential for ICT problem solving (Australian Computer Society 2015). Being able to *"apply modern process modelling approaches to identify and document existing and future processes"* is a core competency for all Information Systems (IS) graduates (Topi et al. 2017, p. 80). Many universities across the globe now have courses to address this skill demand (Bandara

et al. 2010; Recker and Rosemann 2009), and more and more programs have emerged over the years, with almost every IS department now teaching business process modelling in some shape or form. However, a common challenge (over decades) has been the lack of pedagogical resources to support the essential skills development (Bandara et al. 2010). Recent initiatives such as the 'Fundamentals of Business Process Management[1]', have attempted to address this gap, with textbooks and teaching resources made available to a global community of educators. Available resources for process modelling education is highly focused on the training of modelling language usage (i.e. Business Process Modelling Notations (BPMN) - the global process modelling standard) and some tool vendors (such as Signavio, Lucidchart, Camunda and Bizagi) provide useful tool-related training resources. While these support with developing foundational business process modelling skills, and are useful to teach essential concepts as they unfold in a syllabus one by one, they are highly 'piece-meal'. They are limited in the sense that they do not provide students the exposure to process modelling 'in real life' – which is far more complex than converting text representing process descriptions into BPMN models that uses different modelling notations. We argue that well designed teaching cases can address this gap by complementing existing resources bringing in authentic learning opportunities through the case.

Having its roots in the Harvard Law School (e.g. Garvin 2003), case-based teaching has become an established pedagogical technique in many higher education disciplines (e.g. Zimmerman 2002). While traditional learning techniques (as those on process modelling mentioned above) allow the student to acquire and absorb facts and theories in order to increase the body of knowledge available to her/him, case-based teaching employs constructivist mechanisms which require students to practice and to develop skills in social settings (i.e. planning the actual elicitation of process information as input for a model) that resemble genuine or simulated real-life situations. Case-based teaching have many benefits that can complement and add value to the current teaching approaches of process modelling. They (i) bring cognitive benefits to students (through the development of problem solving skills; development of judgment skills; development of ability to solve problems addressing multiple issues; development of ability to deal with ambiguity; development of an understanding of the real world; comprehension of material by students). (ii) Develop essential generic skill of students (such as oral communication skills; written communication skills; group interaction skills). And provide other affective benefits to students (such as student motivation; student interest in material; development of confidence) (adopted from Libby (1991).

This paper presents a teaching case that is designed to develop 'holistic' process modelling skills. We first outline the learning objectives and recommended teaching delivery in a modular structure. The case narrative is then presented preceding with a list of recommended student tasks.

Background

Case Design Details

This section presents the overall design and recommended principals behind the teaching case presented in the next section. In addition to following the guidelines for IS teaching cases presented by Farhoomand (2004), we followed a few other principles, which are shared here to assist educators who may wish to adapt this case (i.e. with further extensions) and/ or use a similar approach for deriving other process modelling case studies.

- Select a process context that all students will have some exposure to.

  Given the fact that domain knowledge assists with process modelling outcomes, we chose a process context where *all* students can guarantee to have some experience with – in this case a university's student enrollment process was chosen for this purpose. Such will equip the students to have the minimal required domain knowledge and focus more on the application (and learning) of the process modelling approach.

- Design the narrative to depict the challenges of 'real-life' process modelling

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[1]   See http://fundamentals-of-bpm.org/ for further details.

By this we mean to not only teach/ test the students BPMN modelling (which typical, already available process modelling case examples provide), but to also expose the student to the overall managerial aspects related to the act of modelling (such as process elicitation challenges, model quality assurance, managing the process modelling efforts in terms of ROI etc.)

- Plan the syllabus to first develop the skills in using BPMN before the students are exposed to the more managerial, deeper thinking aspects.

Table 1 outlines the related topics to be covered, in the form of modules and sub-topics. These modules/ sub-topics can be adopted to suit individual teaching contexts. The sources listed under the 'related resources' column provide the theoretical content for each topic covered, and the case study compliments this by providing experiential learning to the students for each topic. The case can be used to teach the content (i.e. as a running case used across the modules) and/or to assess knowledge acquired (i.e. as an assessment task for the students). Student tasks (as mapped in the last column of Table 1, with the indexed numbering) are outlined at the end of the case narrative and model answers are provided with the teaching notes for this case[2].

Modules	Key topics taught	Description	Related resources	Related student tasks
Module 1	Introduction to Business Process Management and process modelling	This is to provide the students with an overview of what process modelling is, its evolution, and its role in modern organizations.	Dumas et al. (2018, Ch. 1) Franz et al. (2010) Kirchmer et al. (2013)	1
Module 2	Introduction to BPMN	This module introduces BPMN and the basic notations of BPMN.	Dumas et al. (2018, Ch. 3)	2, 3, 5
Module 3	Gateways, Correctness	This module introduces more advanced BPMN elements (i.e. the extended BPMN notations) corresponding to actors and objects, as well as those required to model more complex situations such as interruptions and exceptions. Furthermore, the breakdown of a process into component subprocesses and the interplay of multiple processes in a value chain is also covered.	Dumas et al. (2018, Ch. 3, 4, 5 – section 5.4) Object Management Group (2011) Camunda (2020)	2, 3, 5
	Artefacts, Resources		Dumas et al. (2018, Ch. 3) Object Management Group (2011) Camunda (2020)	2, 3, 5
	Messages, decomposition, Value chains		Dumas et al. (2018, Ch. 3) Object Management Group (2011) Camunda (2020)	2, 3, 5
	Events and exceptions		Dumas et al. (2018, Ch. 3) Object Management Group (2011) Camunda (2020)	2, 3, 5
	Complex Events		Dumas et al. (2018, Ch. 3)	2, 3, 5

[2] Contact the authors to receive access to the teaching notes.

			Object Management Group (2011) Camunda (2020)	
	Choreographies	This module goes deeper into complex collaborative aspects of business processes, by means of choreography modelling. In particular, it goes deeper into correctness of communication between parties.	Object Management Group (2011)	2, 3, 5
Module 4	Starting the process improvement journey: Process enumeration through Process Architectures	Process modelling (and all other tasks related to process management efforts) need to start with proper process identification. This module focuses on how to enumerate the business processes in an organization, with a special focus on the derivation of Process Architectures.	Dumas et al. (2018, Ch. 2 – sections 2.1 & 2.2) Dijkman et al. (2011) Rosemann (2006c)	6 (Part a and Part b)
Module 5	Starting the process improvement journey: Process prioritization	This module is a continuation to the above module, where enumerated processes are then prioritized and selected. The role of process modelling in the overall process identification phase (enumeration and selection) is emphasized here.	Dumas et al. (2018, Ch. 2 – section 2.3) Rosemann (2006c)	6 (Part c)
Module 6	Model Quality management: Understanding what forms model quality and design of modelling guidelines	This module focuses on how to evaluate the quality of business process models, with a special focus on modelling guidelines (as a mechanism/ tool to achieve process model quality).	Dumas et al. (2018, Ch. 5 – section 5.4) Bandara et al. (2006) Mendling et al. (2010)	4, 7
Module 7	Effective Elicitation of process information and stakeholder Management	The quality of process models depends a lot on how well information is gathered and integrated. This is a challenging and resource consuming aspect which requires strong process elicitation skills, which this module focuses on.	Dumas et al. (2018, Ch. 5 – section 5.2) Hjalmarsson et al. (2015)	8
Module 8	Process modelling Success factors and avoiding common pitfalls	This provides a high-level understanding of the key things to avoid (pitfalls) and essential things to have (Critical Success Factors) when conducting process modelling projects- when modelling multiple processes across an organization.	Rosemann (2006a) Rosemann (2006b) Bandara et al. (2005) Bandara et al. (2020)	9

Table 1. Overview of the suggested modules (topics, resources and suggested chronological order)

Target Audience

This teaching-case study is designed to build business process modelling capabilities and is appropriate for both undergraduate and postgraduate students, as well as for training professionals in practice, who are seeking to gain process modelling skills.

Learning Objectives

There are 6 distinct learning objectives associated with this case study. They are listed below, while also showing alignment to Bloom's taxonomy[3] (Bloom et al. 1956) in *italics*:

i.   To be able to *analyze* the given case narrative to extract relevant information.
ii. To develop a thorough *comprehension* of process modelling practices (that covers the creation of high-quality process models, and the management of the act of modelling).
iii. Demonstrate the ability to *apply* common business process modelling languages and develop skills in their application to complex real-world problems, interacting with stakeholders and discovering their issues.
iv. Demonstrate *comprehension* of the principles of process modelling, and the fundamental characteristics and properties of a process model, independently of any specific modelling language or tool.
v.   Demonstrate the ability to *evaluate* the advantages and limitations of core process modelling languages for representing complex business processes and use them appropriately depending on purpose and audience.
vi. *Apply* managing process modelling projects efficiently by working individually as well as in a group and communicate the results of a process modelling project to a corporate environment.

Case Narrative

Emerging new Business models with the disruptive technologies and globalization of education providers are rapidly changing the shape of the higher education industry. Unlike in the past, universities cannot afford to simply depend upon the market or the government but need to take responsibility and initiative for adapting to the changing environment. Many universities have started organizational transformations and are applying business process management as a core mechanism, to assist them with these transformation journeys.

For these very similar purposes, the "University of Brilliance" (UoB) has commenced a whole-of-university wide Business Transformation (BT) initiative, with the aim of making 'true-impact' to their business operations. A main drive behind this is to identify areas for cost reduction and with a keen eye towards possible automation of business processes for long term, sustainable efficiency.

The university has put together a project team; the 'UXBPM' team - to drive this initiative forward. The UXBPM team have recruited your team as a group of junior Business Analysts, to help them with the initiative, specifically with the process modelling components.

Introducing the Case Organization and Proposed Program of Work

The "University of Brilliance" (UoB) is located in the city of 'Hometown', Australia. It was founded in 1955. It is an established university with over 45,000 students and more than 13,000 staff members (9500 academic staff and the rest professional staff). UoB is among the top 100 universities in the world.

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[3] Bloom's taxonomy categorizes educational goals into six distinct categories, namely Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. This is a well-regarded resource to support with the derivation of learning objectives.

It has 7 faculties: Medicine, IT, Science, Engineering, Arts, Social sciences and Business, each running multiple courses covering Bachelors, Honors, Masters and PhD programs. 50–80% of the student cohorts in each course are international students from over 125 countries.

As an outcome of its biannual corporate reviews, UoB recognized the need to address operational inefficiencies as part of the required organizational transformation. Given the age and size of the university, processes are complex and currently supported by a suite of in-house legacy systems, some too old to have any application programming interfaces (APIs). It was identified that administrative business processes at the university highly contributed to resource costs, time delays, diminished services, inefficiency, duplication, parallel effort across Faculties and Divisions and also created rework. In July 2018 the university recruited 'Systems Guru' consulting to develop systems upgrades to the complex suit of already existing in-house processes and to automate some of the manual processes, which unfortunately ended with much project delays and failed project implementations. A detailed report done by UoB's external auditors strongly recommended that the university's business processes be looked in to and improved first, prior to any further systems implementations or upgrades.

In recognition to this, in July 2019, Professor Smart, Vice Chancellor (VC) of UoB (a position comparable to a university Rector), proposed and laid the foundation for a university-wide process improvement effort and established the UXBPM team. The UXBPM team is expected to deliver a range of outcomes including improving user experience, visibility and control and reducing effort, cost and risk etc., through a program of process improvement initiatives. However, the UXBPM team is small with 3 full time Senior Business Analysts experienced with business transformations and 2 part time junior analysts, and a minimalistic annual budget to spend on contractual positions.

The UXBPM team report to the University Board's steering committee (this includes the Vice Chancellor, and 4 Vice-Chancellors (each responsible for Research, Learning & Teaching, External Engagement and Facilities Management), University Registrar, Deans of the 7 faculties and Division Heads of HR, Finance, IT, Asset management and Student Services). See Appendix I for an overview of the high-level Organizational Chart for UoB. While the majority of the steering committee have had no prior experience nor formal training on IT driven process improvements or business processes management (BPM) in general, they have seen other universities and institutions 'do BPM' and achieve diverse benefits from such, and want quick, yet robust outcomes coming through soon for UoB as well. The Vice Chancellor has made the criticality and sense of urgency very clear to all key stakeholders (as seen in university wide communications sent through – see Appendix II for an example) and depends on the UXBPM team to deliver tangible outcomes, in hope that the next external audit due in Dec 2020 will demonstrate a much improved status than the one before.

At present, one of the senior Business Analysts and both of the junior analysts of the UXBPM have already been allocated to address some critical issues that emerged in the recent systems upgrade at UoB's student enrolment support system. And the UXBPM team is under pressure to deliver the outcomes of a pilot project by end of August 2020, and detailed work plans for the new financial year by June 30th, 2020 as well.

The Pilot Project

Given the recent systems failures of the student enrolment support system, the student enrolment process (owned by the Division of Student Services) was selected as the pilot project. This is a process that is common to all 7 faculties and mentioned over 700 times as a 'pain point' in the 2019 student experience surveys rolled out. The as-is Student enrolment process is outlined below, and work is underway to systematically model this process as the first step towards re-designing the process and executing an IT supported business transformation in this area.

The as-is Student Enrolment Process

The enrolment process starts when a student submits all the required forms and documentation to the online enrolment system. As a first step, the academic qualifications of the student are verified with an external agency, and the student is given an academic score. Then, at the closing date of applications, a selection is made of the students based on their academic merits. Then, the payment is performed

followed by a visa application for international students, while in the meantime the advanced standing[4] requests[5] are processed. After all these steps have been completed, the student is registered for the course[5], and for the chosen units. Students have been asking for updates on the status of their enrolment applications, which can be done at any moment within the process. At any time during the process, a student can withdraw the enrolment application for a full refund or inquire about the status of the enrolment application.

Once the payment has been processed, a visa sponsorship application is made with the immigration department of the Australian government. If there is no reply from the immigration department within 20 days, a manual inquiry is made by the professional staff[6]. Once the approval has been received, the student is notified by professional staff and encouraged to lodge their visa application. After 30 days, the student is notified by an automatic system to inform UoB of any status changes in the visa processing. Once the student has notified UoB of the outcome, UoB verifies the granted visa with the immigration department. Unfortunately, in the current situation, it has occurred that already granted visas were cancelled by the immigration department, in which case UoB was notified, and provided the student with the option to withdraw the enrolment application with a certificate of acceptance, or to continue with a reduced list of units that could be taken online. If at any stage the student withdraws, UoB notifies the immigration department and recommends cancellation of the granted visa.

Professional staff assigns students an academic score based on several criteria, partly assisted by input of academic staff members. After the closing date of enrolment applications, the highest-ranking students are admitted, as many as there are places available.

Payments are performed by an automated system that interacts with UoB's standard payment provider. Sometimes, transactions are successfully disputed well after being approved, which voids the payment retroactively, and consequently the application or enrolment.

In their initial application, students can include requests for advanced standing of particular units. For each such request, professional staff identifies the unit coordinator[7] and forwards the request to the unit coordinator for assessment. The unit coordinator might get in touch with the student to obtain more information regarding the advanced standing request; if the student does not respond within 10 working days, the decision will be negative. On a positive decision of the unit coordinator, the decision is registered in the student progress information system.

The Work Plans for Future

While the student enrolment process was chosen as the first area to focus on, the UXBPM team is aware that moving forward, a more systematic approach to prioritizing the target processes for process improvement is essential, and that they will need to get the buy-in and support from the business-area heads and their staff to roll things out. This includes upskilling selected staff from the business areas to be able to accurately capture their current processes in the form of business process models, identity areas of improvement, and when possible execute process improvements with the support of the UXBPM team.

Business Process Modelling is a core component in all the process improvement and analysis techniques that the UXBPM team will apply, but given the few number of staff, the team lacks the essential man-power needed to elicit information and commence modelling the processes.

Furthermore, given the infancy of the UXBPM team (it been established only very recently), important foundational work essential for an effective university-wide approach for process modelling and analysis is not developed yet, and noted as a 'urgent must to' in UXBPM team's operational plans due to be completed within the next 4-5 weeks. This includes the development and deployment of process

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[4]   Advance standing is gaining credit for a course by recognizing prior learning experiences.

[5]   'Course' refers to the program (i.e. Bachelor of Nursing, Master of IT) and 'units' are the subjects the students complete within a course.

[6]   Which does not imply that the staff executing other core processes in UoB are not professionals.

[7]   A unit coordinator is the academic staff member in charge of the design and delivery of a unit.

modelling guidelines, a process architecture and a detailed roadmap to plan and implement the process modelling, analysis and design efforts.

Mr. Harrison Ford, Director of the UXBPM team has progressed with some preliminary planning with these, deciding the following:

a) That the most feasible business model for the UXBPM team to deliver UoB VC's expectations, is to become a permanent internal center of excellence, which focuses on developing continuous process management and business transformation capabilities within UoB's key divisions. Thus, the intention is to train selected staff from each of the business areas (i.e. the faculties and divisions) at UoB, so they can read, model and maintain their business process models and eventually also analyze and design continuous improvements. Mr. Fords seeks to create a culture where each business areas 'owns' their processes and continuous improvement becomes the 'DNA' of UoB staff.

b) Process modelling guidelines need to be developed urgently. They should be designed in a manner that can be applied across for all the upcoming process improvements efforts at UoB, and cater for both the experienced process modelers (i.e. the members of the UXBPM team, including contractors), and the novel process modelers from the business areas.

c) That a process architecture (PA) that is concise yet complete, easy to maintain, and can cater for short-term (i.e. document processes), mid-term (i.e. improve processes), and long-term (i.e. Automate processes) goals be designed. The UXBPM team will own this artefact and this will provide the key input to corporate decisions such as the next selected BTs that will take place.

d) And finally, that the Student enrollment process be modelled in sufficient depth (making use of the modelling guidelines and PA derived).

Mr. Ford has approached you to assist with (b), (c) and (d).

Student tasks

1. Provide an overview of your understanding of the case study.
    1.1 What has been the journey to date (in an overview)?
    1.2 What role does process modelling play within this overall journey?
    1.3 What are the tasks required of you?

2. The BPMN specifications (see latest version V 2.0.2[8]) list some elements – such as events, gateways, activities and pools and lanes – as 'basic' elements, while all others (– including subtypes of the above) are considered to be part of the 'extended' notation set. Some are with the view that some of the extended BPMN notations are 'too complex' and one should model as much as possible using only the basic set. What is your opinion on this? - explain your answer using the context of this case study (i.e. see Task 5 below).

3. [Optional task] Select any process that you are familiar with and model it from end-to-end applying BPMN. Would it have made a difference if a different modelling formalism was used? Which constructs would be impossible to model?

4. Derive process modelling guidelines that can be applied across UoB for all the upcoming process improvements efforts at UXBPM. This should cater for both the experienced process modelers (i.e. the members of the UXBPM team), and the novel process modelers from the business-areas. The resulting modelling guidelines should be presented as completed professional artefacts that can be immediately put to use at UoB.

5. Model the current student enrolment process (see a detailed description of the current state of the process under "*The as-is Student Enrolment Process*" section of the Teaching Case), applying the proposed modelling guidelines (and making further enhancements, as/if needed).

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[8]   See latest version available at: https://www.omg.org/spec/BPMN/

6. (a) What role does a Process Architecture play when modelling business processes?
    (b) Using an environmental scan of university processes and existing process architectures that are designed for the Education Sector, derive a detailed Process Architecture for UB. The Process Architecture should consist of a process landscape diagram, details of the set process hierarchy levels, and a decomposition of all processes to (at least) one further level beyond what is depicted in the process landscape document.
    (c) What information should you capture within the process architecture to support process prioritization?
    (d) Given individual processes can be modelled, analyzed and redesigned without a process architecture, at what stage should an organization consider having a process architecture? What is in your opinion the 'right' time for UoB to invest in deriving a Process Architecture, and would it make a difference at their current state?

7. How would you evaluate the quality of process models created at UoB?

8. UXBPM will commence modelling selected core processes and have sought your input to design a Stakeholder Engagement plan to elicit process information and also collect process issues early on. What advice would you provide for the design of such a Stakeholder Engagement plan?

9. UXBPM seeks your input to develop awareness of common process modeling pitfalls and develop means to avoid them in their process modelling efforts. Provide evidence-based advice on what to be aware of and how to avoid such.

Acknowledgments

Appendix I: high-level Organizational chart of UoB
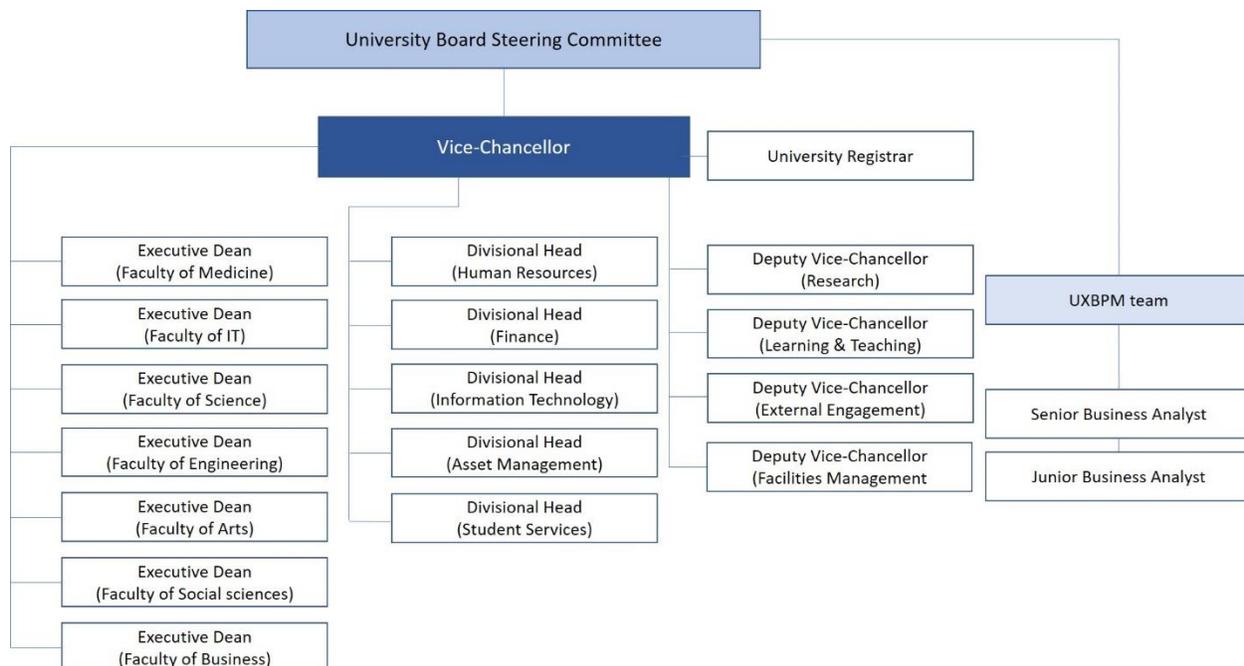
Appendix II: Sample Correspondence from UoB VC to University Staff

From: *Peter Smart*
Sent: *Thursday, 10 January 2020 10:32 AM*
To: *staff@UoB.org*
Subject: *Federal Budget and Business Transformation Update*

Dear Colleagues

I write to provide an update on the recently announced National Budget Measures affecting higher education, and to update on you on additional arrangements for the coordination and support of the Business Transformation Program.

Given the on-going challenge of responding to the National Higher Education Budget cuts, it remains critical that the business transformation (BT) program continues to progress if we are to ensure UoB's continuing success and long-term financial sustainability.

As you will recall, the BT Program commenced in 2019 with the leadership of the UXBPM Director Mr Harrison Ford and involves projects across a number of streams that improve the way in which we provide services for both students and staff. Fundamentally, this involves a new enterprise model of service delivery, which means that we are designing services from a user's point of view and adopting a whole-of-University perspective in the delivery of those services.

It is fundamental that we understand our underlying business processes at UoB and that we each see clearly what our individual roles are and contribute to our fullest capacity to create the efficiency and effectiveness UoB strives for. This is now a critical necessity.

Staff have worked very hard to date, which is reflected in what has already been achieved within a relatively short period of time. I acknowledge that this work has inevitably resulted in some disruption experienced by all staff, and I thank you all for your patience and commitment to the initiative. In time, tangible benefits and improvements accruing from these changes will be evident, which will allow UoB to increase its investment in and focus on education and research initiatives.

To further support the program, UoB Registrar Professor Jules Adminton, will be co-chairing with UXBPM Director Mr Harrison Ford a new governance group. Additional support in the form of a change manager and an officer responsible for coordination and communication will underpin the work of this group. Further details about the BT Program of activities, as well as the status of the individual streams, are available on the staff UoB intranet page.

I am committed to working together with everyone on the transformation activities to ensure UoB is in the best position to thrive in an environment of increased competition, funding constraints and disruptive innovation. Regular updates on the BT Program will be provided by Professor Adminton. I will also provide more details of the progress of the program in my campus-wide briefings in the coming months.

Regards,

Professor Peter Smart
Vice-Chancellor- UoB

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