



Analytics@TP

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Agenda

Our Analytics Journey

Capability Development

Challenges

Sample of Data Products

Student Analytics Learning Analytics Graduate Analytics Procurement Analytics

Text Analytics

IoT Analytics

Summary







Our Analytics Journey





Gartner Analytics Ascendancy Model





What can we analyse ?







TP Analytics Roadmap





Early Learning Analytics Project

- Developed and launched in 2014
- A front-end self-service analytics tool for School Directors and Course Manager to gain academic insights – on course and subject performance

Min No. Of Students Senior Actual Gr Image: Students taking subject > = 20 Freshmen Projected Grad. Rate by Intake Image: Students taking subject > = 20 100% 86.8% 97.3% 98.1% 2009-intake 2011-intake 2011-intake 2011-intake 100% 86.8% 97.3% 98.1% 2009-intake 2011-intake 2011-intake 2011-intake 100% 86.8% 97.3% 98.1% 2009-intake 2011-intake 2010-intake 2011-intake 2010-intake 2011-intake 80% 6 80% 6 80% 6 97.3% 98.1% 2010-intake 2010-intake 2010-intake 200-intake	Toggle for A or Z Top/Bottom
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Capability Development





Capability Development

- Start from basic : Awareness
- Classroom learning
- eLearning
- On-the-job-training
- Certification
- Community of Practice (CoP)
- Knowledge Sharing



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Challenges





Challenges

Data sources and Quality

- Structured vs unstructured data
- Data consistency
- Data quality is important in producing meaningful results



Competency Building

- Steep Learning Curve
- Lack of skilled personnel in business analytics
- Collaboration with domain experts and IT application teams



Familiarisation with tools

- New analytical tools and systems
- Different tools for different roles Backend, frontend, Administration



Challenges



Change Management

- Different mindset data-driven decision making
- Strategic vs operation
- Descriptive to Predictive analytics



System Performance

- Reasonable loading and response time
- Drill down, drill through
- Data size does matter



Access Control

- Different from transaction system
- Aggregated data
- Open for self-service



Sample of Data Products

Student Analytics





Conceptual Architecture





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Student Analytics

- Student Academic Performance
- Reports for BOE (Board of Examiners)
- Graduation & Attrition
- Comparison by Admission Category / Entry Qualification
- 5-year Trend
- Comparison by Predictive Analytics Top Performer / At Risks



School BOE Report





Graduation/Attrition Report





Admission Category

							Intake Year 2016/2017	School	Course
							2010/2017		
Intake Number and Percer	ntage	Intake No	Intake %			ISAE	•	JPSAE	•
DAF		25	9.2%						
DRA		23	1 50/			CGPA Distribution		CGPA Dist	tribution
DFA		4	1.3%					0.001	
ISAE		3	1.1%			20%		20%	
JAE		199	73.2%						
JPAE		25	9.2%			0%		0%	
JPSAE		16	5.9%				2016/2017		2016/2017
Admission Academic Warning and Removal for this Semester Withdrawal (Cumulative)									
Category Code			0.0%		4.0%	Adm Cat Cod	de 🔺 Withdrawal No	o. Withdrawal %	
DAE			0.07	, 	4.0 /0	DAE		0 0.0%	
DPA DPA	_		0.0%	0.0%		DPA		0 0.0%	
EAE						ISAE		0 0.0%	
ISAE EAE						JAE		0 0.0%	
			0.0%	0.0%		JPAE		1 4.0%	
JPAE			0.0 /6	0.0 %				0 0.000	
JPSAE JAE	_		1.5%	0.0%		Removal (Cumula	ative)		
						Adm Cat Co	de 🔺 Removal No.	Removal %	
IPAF	-		0.0%	0.0%		DAF		1 4.0%	



Entry Qualification

							I	Intake Year 2015/2016	School	Course	•
							~				
Intake Number a Entry O	ind Percenta	ige	Intake No	Intako %		GCC	JL	•	IIE	¥	
GCOL		-	488	85.9%							
ITE			20	6.0%		CGP	A Distribution		CGPA D	Istribution	
			37	0.770		209	6		20%		
PFP			35	6.2%		207			100/		
SSSB			2	0.4%					10%		
Foreign			4	0.7%		0%	6		0%		
Total			568	100.0%			2	015/2016		2015/2016	
Admission Academic Warning and Removal for this Semester Withdrawal (Cumulative)											
Category Code			, 				Entry Qual Code	 Withdrawal No. 	Withdrawal %		
GCAL	GCOL			1.0%	0.0%	G	COL	14	2.9%		
GCOL						IT	E	4	10.3%		
	ITE	5.1%			0.0%	PF	:P	4	11.4%		
PFP						55	SR	0	0.0%		
SSSB			0.00/		0.001	55		0	0.0%		
Foreign	PFP		2.9%		0.0%	FO	breign	0	0.0%		
lorengin						Re	moval (Cumulative))			
	SSSB			0.0	% 0.0%		Entry Qual Code	 Removal No. 	Removal %		
						G	COL	5	1.0%		
	Foreign			0.0	% 0.0%	IT	E	0	0.0%		



Predictive Analytics

Predictive models were built for students' performance to enable proactive actions on semester basis for individual schools/diplomas

Predict Students' Performance

At the end of a student's academic career with TP, will he/she become 1. top performer (top 25%) 2.at-risk (bottom 25%) 3. graduate within normal duration?

Performance **On-Time Graduation Top Performer** At - Risk



Sample of Data Products

Learning Analytics





Learning Analytics

• Support Learning Intervention and Enculturate Reflective Practice





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- How long did students engage with online content?
- What is the level of student engagement in the online discussion forum?



LMS Content Access

AY/AS	Course	Practical Group	
2017 Apr	Enter Course	Enter Practical Group	
2017 Oct			
✓ 2018 Apr	СЕР	✓ PE01	
Acad Week	🗹 DIP 3D IMT	2 PE02	
□ 0	DIP AEROSPACE ELN	PE04	
☑ 1	DIP AEROSPACE ENG	PE05	
☑ 2	DIP AV MGT & SVCS	PE07	
⊻ 3	DIP BIOMED ENGG	PE08	
Acad Day	DIP BUS & SYS ENGG	PE11	
✓ 06May2018	DIP CLEAN ENERGY	Lecture Group	
☑ 05May2018	DIP COMP ENG	Enter Lecture Group	
✓ 04May2018			
☑ 03May2018	DIP GRN BLDG & SUS	🗆 L01	
02May2018	DIP INFO & NET ENG	LE01	
☑ 01May2018	Subject	LE02	
30Apr2018	Enter Subject	LE03	
29Apr2018		LE04	
28Apr2018	Advanced Digital Animation and Special	□ LE21	
27Apr2018	ASP.NET Web Programming	□ LZ01	
26Apr2018	Basics of e-Entrepreneurship	Tutorial Group	
25.42010	Basics of Nutrition	Enter Tutorial Group	
School	Career Communication		
ASC	Computer Programming for Problem Solv	□ PE01	
BUS			

Filters



Students' Access Patterns

Student Workload Distribution







Sample of Data Products

Graduate Analytics





Graduate Analytics

To distil key drivers for graduates' outlook to enable personalised interventions

Predict



Will the graduate be

- economically active?
- working in field related to studies?
- engaged in further study?
- etc.



Distil underlying Key Drivers

- Demographic
- **Entry Qualification**
- Academic Performance
- **Financial**
- etc.

Enable Intervention (every semester or as needed)



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Generate propensity of students at the end of each semester for 'personalised' interventions

Input Considerations



Utilise data in **TP** source systems to study students' behaviour comprehensively

Demographics	Entry Qualification	Academic Performance	Financial	Non-academic	Disciplinary / Attendance
 Age Citizenship Gender etc. 	 Admission Category Group Choice Order Entry Qualification etc. 	 Core / Elective / CDS Subjects passed / failed GPA Subject Marks etc. 	 Award / Bursary PCI Range etc. 	• CCA points	 Disciplinary Record Exam MC Leave Days etc.

Model Building





- Historical data •
- Drop ٠ unnecessary variables

- Configure the % • of training and validation data
- Determine model(s) with the best balanced outcome
- Run the model with the validation data
- Deployment of code

Key Modelling Methodology



Decision Tree

widely used by organisations for its intuitiveness and business interpretability





Sample of Data Products

Procurement Analytics





Procurement Analytics



- No response or single response ? Specification too stringent or geared towards a particular brand of item?
- Frequency of purchase for specific item ? Spending patterns ?



Procurement Analytics – Alerts & Audit



 Alert functionality - prompt relevant stakeholders to review the data so that necessary intervention can be considered at different stages of the procurement process.



• Apart from intervention, information gathered can also be used for audit function.

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Text Analytics



Text Analytics - Project Background



- Teaching Effectiveness, Subject Review, Course Review
- Extensive analysis of quantitative data
- Eyeball qualitative data
 - E.g. Online Student Evaluation of Teaching (OnSET) collects about 100,000 free-text comments annually

Iemasek

Objective

Leverage on technology to analyse free-text comments, so as to gain insights on themes and sentiments



Key Advantage: Categorization

UTTESDORSIE keep as is not engaging disrespectful/rude poor delivery approachable must change well delivered enthusiastic / dedicated kind / personable neutral not worthwhile important / relevant responsive unclear frustrating clear helpful / supportive unfair fair engaging interesting boring funny / entertaining high quality enjoyable difficult instructive / informative available organized knowledgeable unhelpful comprehensive unavailable superficial repetitive unkind/unpleasant disorganized lacking knowledge unapproachable bad quality



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Benefits of Text Analytics

- Convert open-ended comments into meaningful themes and quantifiable results
- Automate comment processing, saving time and resources
- Leverage on the purpose-built 'Teaching and Learning Dictionary'
- Obtain a more complete picture of what students are saying



Text Analytics

- Cross-tabulation: Qualitative & Quantitative
- Provide better insights

Q11: Write down something that your lecturer has done especially well

Female students reflect more positively on the learning experience. Key insights for further research:

- Are there more female faculty?
- Are there more female students?
- What is the graduation rate for females?
- What is the employability rate for females?





IoT Analytics





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Video Analytics



Video Analytics





Very Crowded



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Analytics with IoT Sensors

- Environment Temperature, CO2, PMI sensors
- Carpark Occupation/Utilisation carpark sensors
- Energy Management Smart Distribution Box
- etc



Summary





Summary



Our journey continues...

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Thank you !

