Enrolment Planning

**Development of an Enrolment Planning
Model for South African Higher Education
Institutions: A Cautionary Tale**

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Objectives

- **To reflect on the development of an Enrolment
  Planning Model for South African Universities**
  - Brief history of enrolment planning
  - Context of CPUT and IDSC
  - Location of project within academic analytics
  - Main stages of development and deployment
  - Massaging of data
  - Lessons learnt

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Enrolment Planning in SA

- **Enrolment planning at a national level is a relatively recent phenomenon**
- **Since 1994, the Education Department (later DHET) has required the submission of three plans**
- **The most recent process was initiated towards the end of 2012, for the period 2014 – 2019**

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Context of Development

- **DHET requires Universities to populate about 40 tables in Excel spreadsheets**
- **The tables do not match the Faculty and Department structure of the University**
- **CPUT had been successful in predicting its headcount enrolments, by assuming that the future would be much like the past**
- **But the tables submitted to DHET were of no use to a Head of Department in managing enrolments**

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Context of Development

- **IDSC is a small software development company, based in Potchefstroom**
- **Its HEDA management information system aims at providing a holistic, data-driven planning and monitoring solution for University managements**
    - HEDA: Higher Education Data Analyzer
- **IDSC raised the option of developing an Enrolment Planning Model at the HEDA User Group Meeting in November 2012**
- **The DHET's request for the 2014-2019 enrolment plans was issued days later**

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Location in Academic Analytics

- **In terms of technology platform:**
    - **Level 1 – Transaction system only**
    - **Level 2a – Operational data store or single mart; no ETL**
    - **Level 2 – Operational data store or single mart used in conjunction with ETL and reporting tools**
    - **Level 3a – Warehouse or multiple data marts; no ETL, OLAP, or dashboards**
    - **Level 3b – Warehouse or multiple data marts with ETL; no OLAP, or dashboards**
    - **Level 3 – An enterprise-wide data warehouse or multiple data marts used in conjunction with ETL tools, reporting tools, executive dashboards, or alerts**

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Location in Academic Analytics

- **In terms of application:**
  - Stage 1 – Extraction and reporting of transaction-level data
  - Stage 2 – Analysis and monitoring of operational performance
  - Stage 3 – What-if decision support (such as scenario building)
  - Stage 4 – Predictive modeling and simulation
  - Stage 5 – Automatic triggers of business processes (such as alerts)

  - Philip J Goldstein, "Academic Analytics: The Uses of Management Information and Technology in Higher Education", 2005

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Location in Academic Analytics

- **The model does involve predictive modeling based on the University's historical data.**
- **It projects the retention and progression of students in particular qualifications through their years of study, and the number of graduates, based on the history of students in the qualifications concerned.**
- **For new qualifications, without any history, its default projections are based on the overall pattern for the University.**

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Development

- **Timeline**
  - **DHET letter dated 12 November 2012**
  - **Submission required mid-February 2013 (extended to end February)**
  - **Development began in early January 2013**
  - **Discussions with DHET in May**
  - **Second submission required in August**
- **CPUT Requirements:**
  - **The envisaged end-user was the academic Head of Department (HoD)**
  - **The model should be as simple as possible for the HoD**
  - **Only question: How many new enrolments can be admitted to a qualification in a particular year?**

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Development

- **What should the planning unit be?**
  - **Qualification?**
  - **Subject?**
  - **Approved Qualification ID Description**
- **How should the new student cohort be defined?**
  - **First-year students?**
  - **First-time entering students?**
  - **IDSC planning unit: First-Time Cluster Enrolments (FCEs): that group (or "cluster") of students in an institution who *enrol for a particular qualification for the first time in a particular year*.**

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Development

- **What about part-time enrolments?**
  - Part-time students will not have the same progression pattern as full-time students
- **What about different campus enrolments?**
  - The same qualification might be offered on different campuses, with different progression patterns
- **These issues led to the inclusion of the Offering Type in the model**
  - The Offering Type (on the ITS system) can specify a combination of campus and full-time/part-time offering

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Model Interface

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Deployment

- **At CPUT, a different approach was taken for this enrolment plan, compared to the previous iterations**
- **As in the past, the Deans' Meeting set overall parameters for growth per Faculty**
  - **These values were captured in the Model and formed the basis of the projections**
- **The Model's projections were exported to Excel and E-mailed to the HoDs**
  - **They were given an opportunity to amend the FCE figures**
  - **The amendments were captured centrally, between CPUT and IDSC**

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Planning Parameters

FACULTY	Default FCE Growth Rate				
	UG	PG < M	Masters	Doctoral	Occ
INFORMATICS & DESIGN	1,015	1,015	1,015	1,015	1,015
EDUCATION & SOCIAL SCIENCES	1,015	1,015	1,015	1,015	1,015
HEALTH & WELLNESS SCIENCES	1,020	1,020	1,020	1,020	1,020
APPLIED SCIENCES	1,025	1,025	1,025	1,025	1,025
BUSINESS	1,000	1,000	1,000	1,000	1,000
ENGINEERING	1,025	1,025	1,025	1,025	1,025

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What the Model Does

- **Audited HEMIS data for the past 9 years is imported from the HEDA server**
  - **Enrolments and graduates**
  - **By Tracking Cluster and Offering Type combinations**
- **Percentages/ratios are calculated for cohort and tracking years**
  - **Percentage of retained students**
  - **Percentage of students fulfilling the requirements (graduating)**
  - **Headcount percentage of total enrolments**
  - **First-time Entering enrolments as a percentage of FCEs**

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What the Model Does

- **The trends are used for generating the behaviour of future cohorts and for transforming the Model's predictions to fit the DHET enrolment tables**
- **The University has three options regarding the historical patterns to be applied to the projections:**
  - **The past eight years**
  - **The last three years**
  - **The last year only**
- **In the case of CPUT, the last three years were applied**

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What the Model Does

- **The Model re-calculates the projections based on any overrides by the HoDs or planning office**
- **Projections for nine years are calculated, based on the University's default growth parameters and the historical patterns**
  - **As the 2012 year was the latest year of audited HEMIS data at the time, the Model projected for 2013 – 2019**
- **Excel reports are generated**
  - **Pivot table view of the data**
  - **DHET enrolment tables in the required format**
  - **DHET scarce skills tables**

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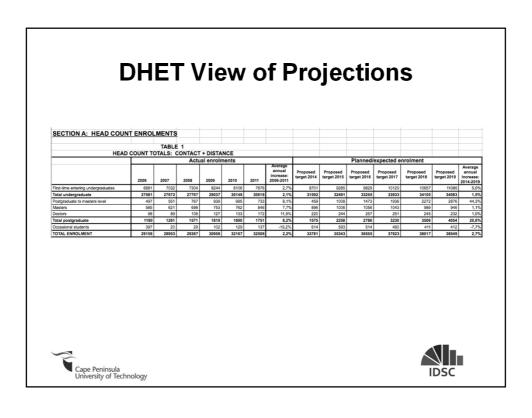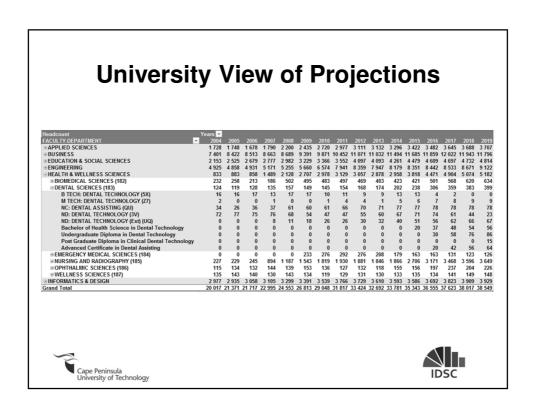University of Technology

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What the Model Does

- **The final enrolment dataset is uploaded to the HEDA server for monitoring purposes**
- **A separate, formula-free version of the Excel document is generated, including all the enrolment and scarce skills tables for submission to DHET**

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DHET View of Projections

SECTION A: HEAD COUNT ENROLMENTS

TABLE 1
HEAD COUNT TOTALS: CONTACT + DISTANCE

	Actual enrolments							Planned/expected enrolment						
	2006	2007	2008	2009	2010	2011	Average annual increase: 2006-2011	Proposed target 2014	Proposed target 2015	Proposed target 2016	Proposed target 2017	Proposed target 2018	Proposed target 2019	Average annual increase: 2014-2019
First-time entering undergraduates	6881	7032	7304	8244	8106	7876	2,7%	8701	9285	9829	10120	10657	11085	5,0%
Total undergraduate	27581	27672	27767	29037	30148	30618	2,1%	31592	32491	33255	33933	34100	34083	1,5%
Postgraduate to masters level	497	551	767	939	995	733	8,1%	459	1008	1473	1936	2272	2876	44,3%
Masters	585	621	698	753	762	846	7,7%	896	1006	1056	1043	989	946	1,1%
Doctors	98	89	106	127	133	172	11,9%	220	244	257	251	245	232	1,0%
Total postgraduate	1180	1261	1571	1819	1890	1751	8,2%	1575	2258	2786	3230	3506	4054	20,8%
Occasional students	397	20	29	102	129	137	-19,2%	614	593	514	460	411	412	-7,7%
TOTAL ENROLMENT	29158	28953	29367	30958	32167	32506	2,2%	33781	35343	36555	37623	38017	38549	2,7%

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University View of Projections

Headcount — FACULTY-DEPARTMENT	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
APPLIED SCIENCES	1 728	1 748	1 678	1 790	2 200	2 435	2 720	2 977	3 111	3 132	3 296	3 422	3 482	3 645	3 688	3 707
BUSINESS	7 401	8 422	8 513	8 663	8 689	9 391	9 871	10 452	11 071	11 032	11 494	11 685	11 859	12 022	11 943	11 796
EDUCATION & SOCIAL SCIENCES	2 153	2 525	2 679	2 777	2 982	3 229	3 366	3 552	4 097	4 093	4 261	4 479	4 609	4 697	4 732	4 814
ENGINEERING	4 925	4 858	4 931	5 171	5 255	5 660	6 574	7 941	8 359	7 947	8 179	8 351	8 442	8 533	8 671	9 122
HEALTH & WELLNESS SCIENCES	833	883	858	1 489	2 128	2 707	2 978	3 129	3 057	2 878	2 958	3 818	4 471	4 904	5 074	5 182
BIOMEDICAL SCIENCES (182)	232	258	213	186	502	495	483	497	469	403	423	421	501	568	620	634
DENTAL SCIENCES (183)	124	119	128	135	157	149	145	154	168	174	202	238	306	359	383	399
B TECH: DENTAL TECHNOLOGY (5X)	16	16	17	13	17	17	10	11	9	9	13	13	4	2	0	0
M TECH: DENTAL TECHNOLOGY (Z7)	2	0	0	1	0	0	1	4	4	1	5	6	7	8	9	9
NC: DENTAL ASSISTING (QU)	34	26	36	37	61	60	61	66	70	71	77	77	78	78	78	78
ND: DENTAL TECHNOLOGY (3V)	72	77	75	76	68	54	47	47	55	60	67	71	74	61	44	23
ND: DENTAL TECHNOLOGY (Ext) (UQ)	0	0	0	8	11	18	26	26	30	32	40	51	56	62	66	67
Bachelor of Health Science in Dental Technology	0	0	0	0	0	0	0	0	0	0	0	20	37	48	54	56
Undergraduate Diploma in Dental Technology	0	0	0	0	0	0	0	0	0	0	0	0	30	58	76	86
Post Graduate Diploma in Clinical Dental Technology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Advanced Certificate in Dental Assisting	0	0	0	0	0	0	0	0	0	0	0	0	20	42	55	64
EMERGENCY MEDICAL SCIENCES (184)	0	0	0	0	0	233	276	292	276	208	179	163	163	131	123	126
NURSING AND RADIOGRAPHY (185)	227	229	245	894	1 187	1 543	1 819	1 930	1 881	1 846	1 866	2 706	3 171	3 468	3 596	3 649
OPHTHALMIC SCIENCES (186)	115	134	132	144	139	153	136	127	132	118	155	156	197	237	204	226
WELLNESS SCIENCES (187)	135	143	140	130	143	134	119	129	131	130	133	135	134	141	149	148
INFORMATICS & DESIGN	2 977	2 935	3 058	3 105	3 299	3 391	3 539	3 766	3 729	3 610	3 593	3 586	3 692	3 823	3 909	3 929
Grand Total	20 017	21 371	21 717	22 995	24 553	26 813	29 048	31 817	33 424	32 692	33 781	35 343	36 555	37 623	38 017	38 549

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Massaging the Data

- **The output of the Model was submitted to DHET and discussed at a meeting in May**
- **A second iteration of the planning process was undertaken**
- **New HEQSF qualifications were included in the projections**
  - **As there was no history for such qualifications, the Model used institutional averages for the projections**

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Massaging the Data

- **The various interventions and additions as the process unfolded put the Model under pressure**
  - **The capturing of HoD amendments was slow**
  - **The addition of new HEQSF qualifications was not initially foreseen and an additional screen to capture them was developed**
  - **The initial reporting did not include the DHET Scarce Skills tables. The Model was designed to work at the level of broad CESM groupings (or Major Areas).**
    A table had to be developed to map the proportions of enrolments and graduates for each Approved Qualification ID in terms of third-order CESMs, with this split applied to future enrolments and graduates.

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Monitoring the Enrolments

Faculty ▶ Department ▶ Approved Qualification ▶ Offering Type	2014 Planned	2014	
APPLIED SCIENCES	1,282	1,360	○
AGRICULTURAL & FOOD SCIENCES (2)	316	267	●
BIODIVERSITY& CONSERV. MGNT (3)	125	96	●
CHEMISTRY (4)	216	187	●
ENVIRON. & OCCUPATIONAL STUD (5)	201	214	○
FOOD TECHNOLOGY (6)	166	151	○
HORTICULTURAL SCIENCES (7)	178	367	●
MATHEMATICS & PHYSICS (8)	80	78	●
Total	**1,282**	**1,360**	○

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Lessons Learnt

- **The Model enables the University to move from compliance to active enrolment management**
- **Involvement of HoDs in the planning process does not guarantee their continued commitment to the numbers**
- **Major applications are not best developed in haste**
- **Final specifications are needed before development begins**
- **Excel is a good modelling tool but has its limitations**
- **No model can eliminate human error**

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