

For the Members of the Board

Executive Management
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Confidential Items are marked in grey and are only for the Board's own use. This applies to enclosures marked in grey as well.

The rest of this document and enclosures are Publicly Available Information.

Agenda for the IT University Board Meeting on Thursday, November 24, 2016, at 14:00 – 17:00, in Room 3A20/28, IT University of Copenhagen, Rued Langgaards Vej 7, 2300 Copenhagen S

Public items:

1. Approval of the Minutes from the Previous Meeting (decision)

2. Follow-up on Result Targets and Strategic Targets (briefing)

Enclosure 1: Follow-up on Development Contract Targets for 2016 (as of September 30, 2016)

Enclosure 2: Follow-up on the Strategic Targets for 2016 (as of September 30, 2016)

3. The Accounting of Third Quarter and the Prediction of the Result of the Year 2016 (briefing)

Enclosure 3: Accounts of IT University of Copenhagen, as of September 30, 2016

4. Plan of Actions/Targets 2017 (briefing)

Enclosure 4: Plan of Actions/Targets 2017

5. The Budget 2017 (decision)

Enclosure 5: Budget Proposal for 2017

6. The Games Programme (decision)

Enclosure 6: Games of Tomorrow – The New Master of Games at ITU

Confidential items:**7.****8.****9.****10.****Public items:****11. Institutional Accreditation (briefing)****12. Questions regarding mail delivered briefings (briefing)**

- E-mail 2016-11-09: Revised Articles of Association of the IT University of Copenhagen, signed by the minister
- E-mail 2016-10-28: ITU Strategy 2017-2021 with preamble – final version
- E-mail 2016-09-16: Accreditation Report Hearing

13 . Any Other Business**The Executive Management´s comments on the agenda****Public items:****Item 1: Approval of the minutes from the previous meeting (decision)**

No comments to the minutes from the meeting on September 15, 2016, have been received.

Recommendation:

The Executive Management recommend that the minutes be approved.

Item 2: Follow-up on Result Targets and Strategic Targets (briefing)

Enclosure 1: Follow-up on Development Contract Targets for 2016 (as of September 30, 2016)

Enclosure 2: Follow-up on the Strategic Targets for 2016 (as of September 30, 2016)

Comments on targets in status "red":

T2 The average delay in studies of 12.6 months for development contract year 2016 measures the delay in students who graduated in 2015. We have just received information that the average delay for students who graduated in 2016 will be 10.6 months. This is good news indeed, because, for the first time since the introduction of the progress reform, we now see a reduction in average delay of studies, compared to

2011, where the average delay of studies was 11.6 months. The development contract goal for the contract year 2017 is a reduction in average delays of 1.6 months compared to 2011, i.e., an average delay of $11.6 - 1.6 = 10.0$ months. So the reduction of average delays to 10.6 months corresponds to a goal achievement of $(11.6 - 10.6) / 1.6 = 63\%$, whereas the goal satisfaction for the development contract year 2016 will be 0%. Therefore, ITU expects a completion bonus from the Ministry concerning 2017, whereas there will be no completion bonus concerning 2016.

T3 The gross graduate unemployment rate of 14% is measured as the average of the unemployment rates in the 4th; 5th; 6th, and 7th quarters after graduation. The unemployment rate of 14% in 2016 is based on the graduates from ITU in 2013. The target was 13%. The gross unemployment rates for the four study programmes are as follows: SDT: 7%; DDK: 16%; Games: 27%; DIM: 9%. The high gross unemployment rate for Games confirms that it was a good decision to explore a redesign of the programme. We envisage a similar revision process concerning DDK to take place in 2017. It is conceivable that gross unemployment of graduates will affect the funding universities get already as from 2018.

T9 The spending of external research funding varies significantly across the three departments that will come into existence on January 1st, 2017. The growth initiatives that are part of the strategy are primarily in the Computer Science department, which currently accounts for around $\frac{3}{4}$ of the total external research funding spend. In addition, the Heads of Departments and Executive Management will make a special effort to give ten of the most talented researchers extra support.

T15 The future of the Master programmes is discussed separately under item 7.

T16 Some improvements of the administrative processes have been carried out, but others (e.g., fast billing) are delayed. Executive Management intends to stick to the goal of improving the administrative routines, even in the face of declining numbers of Master students, spending time on the improvements in 2017 as well.

Item 3: The Accounting of Third Quarter and the Prediction of the Result of the Year 2016 (briefing)

Enclosure 3: Accounts of IT University of Copenhagen, as of September 30, 2016

We refer to the enclosure itself.

Item 4: Plan of Actions/Targets 2017 (briefing)

Enclosure 4: Plan of Actions/Targets 2017

Executive Management and the Group of Managers are currently planning focus areas for 2017. Enclosure 4 shows the portfolio of high (or even top) priority actions currently under consideration.

Item 5: The Budget 2017 (decision)

Enclosure 5: Budget Proposal 2017

We refer to the recommendation contained in the Summary of the enclosure.

Item 6: The Games Programme (decision)

Enclosure 6: Games of Tomorrow – The New Master of Games at ITU

In the light of troubling unemployment numbers, an effort to propose a substantially changed Games programme was started at the beginning of 2016, headed by the new Head of Study Programme for Games, Associate Professor Martin Pichlmair.

Enclosure 6 describes the proposed changed version of the programme. At the Board Meeting Martin Pichlmair will give a brief overview of the design of the new programme and be able to answer questions.

Executive Management has followed the revision process closely. We note the following:

- The proposed Games programme is very different from the present one. That is, the changes are substantial.
- The revision is carefully thought through, as evidenced by Enclosure 6.
- The new design was developed in very close dialogue with the Employers' panel for the Games programme. In particular, the Head of Studies developed a new set of employment tickets and these have been approved by the Employers' Panel.
- Most of the new Games programme can be manned with faculty who are already employed at ITU and there seems to be widespread support, even enthusiasm, among these members of faculty for the new programme.

Recommendation

Based on the above, Executive Management recommends that admission on the Games programme continue (with 50 students per year) and that the new design be implemented as quickly as possible.

Confidential items:

Item 7:

Item 8:

Item 9:

Item 10:

Public items:

Item 11: Institutional Accreditation (briefing)

The final report is expected in December 2016. The report will be sent by e-mail to the members of the board.

Item 12: Questions regarding mail-delivered briefings (briefing)

- E-mail 2016-11-09: Revised Articles of Association of the IT University of Copenhagen signed by the minister
- E-mail 2016-10-28: ITU Strategy 2017-2021 with preamble – final version
- E-mail 2016-09-16: Accreditation Report Hearing

Item 13: Any Other Business

Yours sincerely,

Gitte Gramstrup
Assistant to the Executive Management

Follow-up on Development Contract Targets for 2016

The report stated in the chart below represents the results after the third quarter 2016.

Signature:

The time and activity schedule of the target has been kept.



The time and activity schedule of the target has not been kept. However, it is still estimated that the target can be reached within the period, as the delays are not critical.











The time and activity schedule of the target has not been kept, and if the present development continues, it will not be possible to reach the target within the time frame.





The time and activity schedule of the target has not yet launched, or data is not yet available.

| Target | Description | Comments | Status |
|--------|---|---|--------|
| T1 | The average response of students to the quantitative questions in the course evaluation must be at least 4.75 on a scale from 1 to 6. This goes for each year of the contract period. | The Spring 2016 course evaluation score is 4.70. The target can still be achieved if the Autumn 2016 course evaluation score is 4.80 or higher. | |
| T2 | The IT University will reduce the average excess of study time for its BSc and MSc graduates in 2015 with 0.5 month compared to 2011; 1 month in 2016 compared to 2011 and 1.6 months in 2017 compared to 2011. | The average excess of study time is calculated to be 12.6 months in 2016 for the BSc and MSc graduates combined. That is an increase of one month compared to 2011. The target will not be achieved in 2016. | |

| Target | Description | Comments | Status |
|--------|--|---|---|
| T3 | The unemployment rates of graduates graduating from the IT University 4-7 quarters earlier will in 2015 be at most 14 per cent, in 2016 at most 13 per cent and in 2017 at most 12 per cent. | The unemployment rate of graduates graduating from the IT University 4-7 quarters earlier is 14 per cent in 2016. The target will not be achieved in 2016. |  |
| T4 | The number of IT University graduates graduating from 0 to 10 years ago and working in the private sector must be at least 75 per cent of the employed graduates. This applies to every year of the contract period. | It´s too early to measure this target. There will be a follow-up after fourth quarter 2016. |  |
| T5 | The number of admitted MSc students, who qualified at a Danish educational institution other than the IT University must be at least 230. This applies to every year of the contract period. | The number of admitted students, who qualified at a Danish educational institution other than the IT University is 281 in 2016. |  |
| T6 | During 2015, the IT University will formulate a strategy of how the university consciously exploits the many different educational backgrounds from the MSc students. By the end of 2017, at the latest, the IT University will have formulated and carried out the actions, processes and procedures for the plans to implement the strategy. | The work is progressing as planned. |  |
| T7 | The profile of global competences and related activities of the BSc and MSc programmes are evaluated each year of the contract period and a plan of action is made for the following year. These plans must be approved by the Head of Studies. | It´s too early to measure this target. There will be a follow-up after fourth quarter 2016. |  |

| Target | Description | Comments | Status |
|--------|--|---|---|
| T8 | <p>At the end of 2016, there are Programme-specific Employers' Panels Reports from each of the Programme-specific Employers Panels.</p> <p>At the end of 2017, the Executive-level Employers' Panel expresses in the annual progress report, that the IT University to a satisfactory extent adjust its portfolio of study programmes to the customers' needs.</p> | <p>A report from each of the Programme-specific Employers Panels has been completed.</p> |  |
| T9 | <p>The total usage of external funding divided by the number of senior-faculty FTE must be at least 650,000 DKK in 2015, 800,000 DKK in 2016 and 1,000,000 DKK in 2017.</p> | <p>The target is to spend 800.000 DKK per senior-faculty FTE of which there are almost 55. The total spending after third quarter is 16.0 MDKK, corresponding to 291,385 DKK per senior-faculty FTE.</p> <p>Three quarter of 800,000 DKK is 600,000 DKK. Hence, after third quarter the target fulfilment is 291,385 DDK divided by 600,000 which corresponds to 48.6 per cent. Given a current target fulfilment of less than 50 per cent it is unlikely, that the target will be fulfilled.</p> |  |
| T10 | <p>The number of PhD students admitted during the year should be at least 14 in 2015, 18 in 2016 and 22 in 2017.</p> | <p>12 PhD students have been admitted.</p> <p>Five PhD positions have been or will be opened where employment is expected this year.</p> <p>Further two PhD students with a tuition fee free stipend are likely to be admitted this year.</p> |  |

| Target | Description | Comments | Status |
|--------|--|---|---|
| T11 | The number of people admitted as PhD students at the IT University in the year in question, without receiving an ordinary PhD scholarship, will be at least two in 2015, three in 2016 and four in 2017. | <p>Two PhD students with a tuition fee free stipend are likely to be admitted this year.</p> <p>Further three PhD students with a tuition fee free stipend may be candidates for being admitted, so it is likely that the target will be fulfilled.</p> |  |
| T12 | The number of bibliometric points divided by the number of faculty FTE reported to the Universities Denmark Statistics will be at least 1.85 in 2015, 1.96 in 2016 and 2.08 in 2017. | <p>It's too early to measure this target since the result will not be known until 2017.</p> <p>In 2015, the number of bibliometric points divided by the number of faculty FTE reported to the Universities Denmark Statistics was 2.34. The target was achieved in 2015.</p> |  |

Follow-up on the Strategic Targets for 2016

The report stated in the chart below represents the results after the third quarter 2016.

Signature:



The time and activity schedule of the target has been kept.





The time and activity schedule of the target has not been kept. However, it is still estimated that the target can be reached within the period, as the delays are not critical.



The time and activity schedule of the target has not been kept, and if the present development continues, it will not be possible to reach the target within the time frame.

| Target | Description | Comments | Status |
|--------|--|--|---|
| T13 | The IT University admits at least 140 students on the Study Programme Bachelor in Software Development in 2016. Quota 1 applicant´s grade points are at least 7.0. | The IT University has admitted 143 students on the Study Programme Bachelor in Software Development in 2016. Quota 1 applicant´s grade points were at least 7.3. |  |
| T14 | The IT University should become better at nourishing promising talents and will increase support in 2016 to talented junior faculty who are working towards becoming top researchers in their field. | A plan with the relevant Heads of Section has been agreed, where four young talented researchers are considered for support. Executive Management has approved a request for a budget extension for resources to carry out the plan, and the plan has been executed. |  |

| Target | Description | Comments | Status |
|--------|--|--|---|
| T15 | The IT University admits at least 155 students on its Master's Programmes in 2016. | <p>66 students of Master's Programmes have been admitted in 2016.</p> <p>The number of applicants for the Master in Interaction Design and the Master in Software Engineering was so low in summer 2016 that the Education Group and the Executive Management decided not to admit new students on these two study programmes.</p> |  |
| T16 | By the end of 2016, work processes, rules, IT systems and marketing of part-time teaching (especially those relating to single subject courses) have been relieved of constraints currently imposed by full-time study programmes, with the aim of restoring the number of single subject students to previous levels in 2017. | <p>Education Group will submit suggestions for a new strategy to the Executive Management in November 2016.</p> <p>The work is progressing and it is expected that the restructurings will be implemented in due time to be effectful in 2017.</p> |  |

Enclosure 3

Accounts of the IT University of Copenhagen, as per 30 September 2016

This report presents the third quarter actual accounts and the revised forecast of October 2016 including a cash flow forecast and revised assumptions and uncertainties.

Table 1 shows the development in income, costs and equity over a three year period.

Table 1: Overview of income, costs and equity

| Financial items | Actual 2014 DKK 1,000 | Actual 2015 DKK 1,000 | Budget 2016 DKK 1,000 | FCST August DKK 1,000 | Adjustment DKK 1,000 | FCST October DKK 1,000 |
|--|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------------------|
| Income | 259,866 | 281,452 | 261,023 | 263,394 | 1,160 | 264,553 |
| Ordinary operations costs | -262,031 | -262,707 | -271,937 | -265,199 | 4,284 | -260,914 |
| Profit from ordinary operations | -2,165 | 18,745 | -10,914 | -1,805 | 5,444 | 3,639 |
| Financial income and costs | 2,263 | 1,809 | 1,395 | 1,395 | 364 | 1,759 |
| Profit, year-end | 98 | 20,554 | -9,519 | -410 | 5,808 | 5,398 |
| Equity, end-year | 48,561 | 69,115 | 59,596 | 68,705 | 5,808 | 74,513 |

Compared to Budget 2016 the year-end result improves by DKK 14.9 M, which is caused by the sources listed in table 1a.

Table 1a: Break down of changes from Budget 2016 to forecast October

| Sources of change in profit | MDKK approx |
|--|----------------|
| Profit, budget 2016 | -9.5 |
| Government grants from increased MSc student activity | 6.5 |
| Faculty turnover realized at lesser expense | 4.5 |
| Vacant faculty positions and fewer part time lecturers | 2.5 |
| Decline in holiday obligations and other provisions | 1.4 |
| Positive effect on year-end result 2016 | 5.4 |

Executive Management expects the year-end result to improve from DKK -0.4 M to DKK 5.4 M compared to forecast August. Management will incorporate the expected surplus in 2016 into the multi-year management pool to sustain the strategic development towards 2021. We elaborate on the matter in Enclosure 5 about Budget Proposal 2017.

Table 2 shows a break down income and costs into budget items, which are elaborated in the following sections.

Table 2: Break down of income and costs

| Budget items | Budget Q3 DKK 1,000 | Actual Q3 DKK 1,000 | Diff Q3 DKK 1,000 | FCST August DKK 1,000 | Adjustment DKK 1,000 | FCST October DKK 1,000 |
|---|------------------------|------------------------|----------------------|--------------------------|-------------------------|---------------------------|
| Government grants | 168,778 | 169,677 | 899 | 225,037 | 1,199 | 226,236 |
| Tuition fees | 6,910 | 6,808 | -101 | 9,213 | -135 | 9,078 |
| External research funding | 17,853 | 16,022 | -1,831 | 23,804 | -704 | 23,100 |
| Facilities subleasing | 1,650 | 1,533 | -117 | 2,200 | -0 | 2,200 |
| Other income | 2,354 | 3,286 | 932 | 3,139 | 800 | 3,939 |
| Total Income | 197,545 | 197,327 | -218 | 263,394 | 1,160 | 264,553 |
| Executive Management | 2,843 | 2,777 | -65 | 3,790 | 0 | 3,790 |
| Communication Department | 4,688 | 4,717 | 29 | 6,250 | 35 | 6,285 |
| Department of Finance and Personnel | 11,732 | 11,404 | -328 | 15,643 | -300 | 15,343 |
| - Provisions for holidays, overtime etc | 1,507 | 697 | -810 | 2,009 | -888 | 1,121 |
| IT Department | 7,350 | 7,192 | -158 | 9,800 | 0 | 9,800 |
| Facilities Management | 4,261 | 4,050 | -210 | 5,681 | 0 | 5,681 |
| Student Affairs and Programmes | 11,586 | 11,926 | 340 | 15,448 | 0 | 15,448 |
| The Department | 71,393 | 67,225 | -4,168 | 95,191 | -3,189 | 92,002 |
| - Library | 208 | 208 | -0 | 277 | 0 | 277 |
| - Externally funded research | 10,992 | 9,948 | -1,044 | 14,656 | -597 | 14,059 |
| Total Personnel costs | 126,559 | 120,144 | -6,414 | 168,745 | -4,939 | 163,806 |
| Executive Management | 1,490 | 1,099 | -391 | 1,986 | 0 | 1,986 |
| - Management pools | 851 | 0 | -851 | 1,135 | -1,135 | -0 |
| Communication Department | 3,088 | 3,035 | -52 | 4,117 | 165 | 4,282 |
| Department of Finance and Personnel | 6,658 | 5,310 | -1,347 | 8,877 | 1,046 | 9,923 |
| - Rent, taxes and other provisions | 29,354 | 28,518 | -835 | 39,138 | -1,133 | 38,005 |
| IT Department | 3,840 | 3,625 | -215 | 5,120 | 1,250 | 6,370 |
| Facilities Management | 12,858 | 10,929 | -1,929 | 17,144 | 0 | 17,144 |
| Student Affairs and Programmes | 2,963 | 2,624 | -339 | 3,951 | 125 | 4,076 |
| - E-Business programme | 618 | 618 | 0 | 824 | 0 | 824 |
| The Department | 6,368 | 5,543 | -825 | 8,490 | 252 | 8,742 |
| - Library | 1,586 | 1,568 | -17 | 2,114 | 0 | 2,114 |
| - Externally funded research | 2,668 | 2,351 | -317 | 3,557 | 85 | 3,642 |
| Total Other operating costs | 72,340 | 65,221 | -7,119 | 96,454 | 655 | 97,108 |
| Total Ordinary operating costs | 198,899 | 185,366 | -13,533 | 265,199 | -4,284 | 260,914 |
| Profit from ordinary operations | -1,354 | 11,962 | 13,316 | -1,805 | 5,444 | 3,639 |
| Financial income and costs | 1,046 | 1,759 | 712 | 1,395 | 364 | 1,759 |
| Profit | -307 | 13,720 | 14,028 | -410 | 5,808 | 5,398 |

Third quarter actual accounts

In Table 2, we show actual income is slightly below the budget by DKK 0.2 M. Income shows an increase in government grant from increased MSc student activity and other income such as Master qualification course, summer school fees and catering during weekend Master courses. However, less income from external research funding counters these.

Personnel costs are below the budget by DKK 6.4 M. Most importantly, the Department has vacant full-time and part-time faculty positions equivalent to DKK 4.2 M, which will remain unoccupied this year. In order to comply with the Quality Policy VIP/DVIP ratio, the Department no longer substitutes vacant faculty positions with part-time lecturers. Furthermore, the vacancies reduce provisions for holiday pay by DKK 0.8 M. In administrative departments, changes in personnel costs is mainly due to short-time vacancies and maternity leave substitutes.

Other operating costs are below the budget by DKK 7.1 M. Firstly, this is due to a lesser need for funding of new activities than expected. Secondly, the administrative departments plan to catch up their lesser spending by the end of the year. Thirdly, ITU has no need to draw on provisions for project losses and such, resulting in a lesser spending of DKK 0.8 M. Finally, the Department expects to catch up on the lesser spending of DKK 0.8 M, for example research stays abroad usually take place late in the year.

Financial income is above the expectations at this point by DKK 0.7 M, though capital gain on investments has fluctuated some during the first three quarters.

Forecast 2016 October

In table 2, we showed the forecast adjustments to budget items, and we elaborate budget items below.

Break down of income

Government Grants and Tuition Fees

Government grants and tuition fees are expected to increase by DKK 1.2 M. As we show in table 3, student activity increases by DKK 1.1 M. In general, this is considered to be a short-term effect of the Student Progress Reform, not expected to be repeated in upcoming years (and leaving strategic targets for education out of account).

Table 3: Student activity forecast

| Student Activity | Budget 2016 | | Forecast 2017 | | Forecast 2018 | | Forecast 2019 | |
|-------------------------------------|--------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|
| | units | DKK 1,000 | units | DKK 1,000 | units | DKK 1,000 | units | DKK 1,000 |
| Students, BSc | 521 | 48,505 | 540 | 49,895 | 601 | 54,242 | 675 | 57,490 |
| Students, MSc | 733 | 68,219 | 737 | 68,109 | 722 | 65,130 | 719 | 61,251 |
| Guests and scholarships | 44 | 3,960 | 36 | 4,433 | 36 | 4,355 | 36 | 4,171 |
| Students, full-time (FTE) | 1,298 | 120,684 | 1,313 | 122,437 | 1,359 | 123,728 | 1,431 | 122,912 |
| Students, part-time (FTE) | 108 | 13,339 | 64 | 7,677 | 52 | 6,117 | 46 | 5,314 |
| Students, total (FTE) | 1,406 | 134,023 | 1,377 | 130,114 | 1,411 | 129,845 | 1,476 | 128,227 |
| Completion, BSc + MSc | 249 | 7,918 | 333 | 10,735 | 350 | 4,365 | 362 | 6,118 |
| Other student activity | | 1,174 | | 1,069 | | 1,055 | | 1,024 |
| Income from student activity | | 143,116 | | 141,918 | | 135,266 | | 135,369 |

External Research Funding

The most recent external research funding forecast from the Department shows a small decline of DKK 0.7 M in external research funding. In 2016, external research funding is well below the official target for the IT University as stated in the Development Contract.

Personnel costs and other operating costs for research projects decline by DKK 0.6 M in all concurrent with the increase in external research funding.

Other Income

Other income is increased by DKK 0.8 M concurrent with additional income from the third quarter accounts.

Break down of operating costs

Personnel costs

Personnel costs are reduced by DKK 4.9 M. Primarily, this is due to full-time and part-time faculty vacancies in the Department, which will remain unoccupied in 2016, despite a committed effort to recruit talented full-time scientific staff. Furthermore, in order to comply with the Quality Policy VIP/DVIP ratio the Department has not hired substitute external lecturers as in previous years. Also, provision for holiday pay is downsized accordingly.

Other operating costs

Other operating costs are expected to increase by DKK 0.6 M. Management has transferred DKK 0.2 to the Communication Department for marketing of the Data Science Bachelor Study Programme in 2016, and has downsized the pools by DKK 0.9 M.

The Department of Finance and Personnel expects to spend an additional DKK 1.1 M on taking out patents, start-up counselling for promising student-driven companies and preparing the finance payroll systems for the new organizing as per 1 January 2017. Provisions to unexpected losses are reduced by DKK 1.1 M.

Finally, the IT Department expects to replace outdated IT equipment for DKK 1.0 M and procure development support for DKK 0.3 M regarding the new BI system, Qlik Sense.

Breakdown of financial income and costs

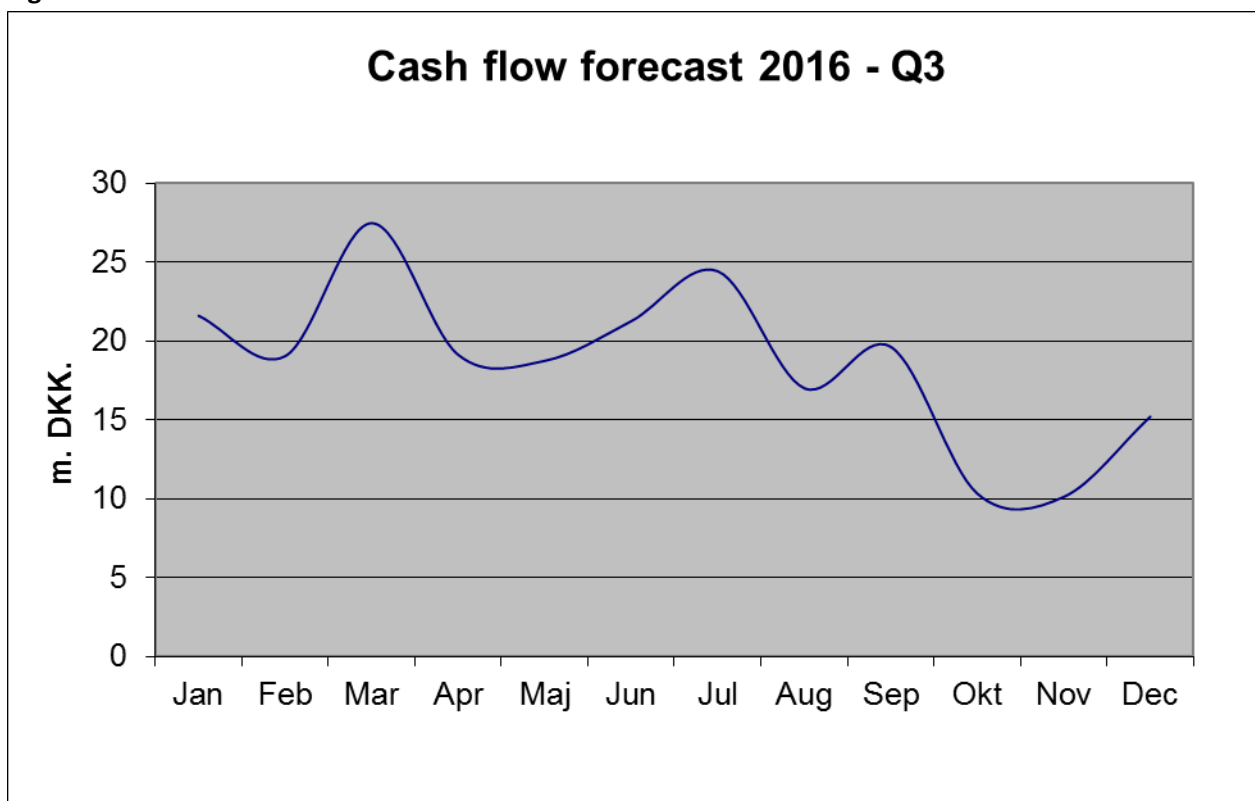
Expected capital gain is increased to DKK 1.8 M based on the latest report from Danske Capital.

Cash flow forecast

The cash flow forecast below shows a positive cash flow throughout the year. The decline from January to December in cash holdings is due to less prepayment of externals funds for research, and a high number of invoices regarding accounts 2015, which are paid in 2016.

The cash flow peaks high in March and September due to prepayment of research awards from government funds. Furthermore, the cash flow peaks low in April, August and October due to the quarterly payments of rent. By the end of the year, cash holdings rise due the final installment of government grants.

Figure 1: Cash flow forecast



Assumptions and uncertainties

The student activity forecast shows a significant rise in MSc student activity and completions in 2016 due to the Study Progress Reform. At other universities, student activity and completions are significantly higher than expected as well. This sector wide rise is likely to result in a reduction of the Government Finance Act rates of 2016. Partly, because the completion bonus pool is a fixed amount, and partly because the Minister

of Higher Education and Research must comply with the National Budget for Education regardless of higher student activity. We have made a provision of DKK 2.0 M for reduced rates.

The external research funding forecast from October assumes that the Department carries out project activities as planned without any delays. Any further grants awarded this year are not expected to start spending until next year.

Expected capital gain on investments is estimated at DKK 1.8 M for now. However, the capital markets are somewhat volatile, and the actual bond prices at the end of the year might significantly influence the year-end result.

Enclosure 4

Tentative List of Actions for 2017 to Support ITU's Strategy 2017-2021

Executive Management 2016-11-05

Executive Management and the Group of Managers are currently planning actions for 2017 to support ITU's new strategy 2017-2021. Here are the items of the list that currently have high (some even top) priority.

Education

- Revision of DDK, to improve employability of DDK graduates
- Continue the intake of 140 Bachelor Software students in 2016, but with a higher percentage of women among the students.
- Start a new Bachelor Programme in Data Science, with the first students to start in August 2017.
- Implementation of new Games programme, if the Board so decides (cf. Item 6)
- Revision of ITU's MSc programmes generally, in order to improve the handling of student diversity issues. This may involve a strengthening of admission requirements, thus replacing introductory courses on the MSc programmes with more advanced courses. It may also involve the separation of the SDT programme into two: a Computer Science MSc degree building on top of Bachelor Computer Science degrees and a broader programme, similar to the design track of SDT today. This split has been advocated by the Executive-Level Employers' Panel and by external reviewers alike.
- Improve students' opportunities to get involved in research projects. Perhaps through some university-wide mechanism for matching students and researchers. Perhaps such a mechanism could be extended to include companies and public organisations who are interested in working with students.
- Change internal work processes to speed up examination of MSc theses, as part of the effort to reduce average completion times.

Research

- Provide ten (or so) talented researchers with extra, ad-hoc support, in order to further their likelihood of them with research activities that are strong enough to secure external research funding.
- Pro-active recruitment of faculty with exceptionally strong research track records.
- Recruitment of 22 PhD excellent students in areas that support the overall strategy of the university.

Other

- Organisational implementation of the PP-model in the three new departments, in order to state expectations explicitly and share work load fairly.
- Recruitment of more female faculty in senior positions.
- Speeding up the employment process to avoid losing such candidates to competing universities.
- Secure funding for the continued growth of the university.
- Accommodate the increase in number of bachelor students in the current building in 2017 and try to figure out how much more ITU can grow before hitting the maximum capacity of the current building.

Enclosure 5

Budget Proposal 2017

This presentation concerns the Budget Proposal 2017 for the IT-university of Copenhagen.

Summary

Based on the approved Framework Budget 2017-2019, Executive Management has allocated funds from the management pools to the departments and other functions. Furthermore, we have incorporated updated forecasts on income from education and external research funding into the budget proposal.

The expected result of budget proposal 2017 is a deficit of DKK -10.0 M. The budget proposal includes management pools of DKK 6.8 M to sustain the strategic development towards 2021.

Executive Management recommends that the Board approves Budget Proposal 2017.

Management assumptions

In general, we assume the Budget Proposal Act for 2017 (FFL 2017), as presented by the Government in August 2017, is passed by the Parliament, without substantial changes regarding the IT University.

Specifically, the Budget Proposal 2017 is based on the following management assumptions:

- The Minister of Higher Education and Research approves the new BSc programme in time for admission of students in August 2017.
- Admission of students and student activity follow new forecasts from October 2017 as shown in table 3 and table 4, signifying the decline in admissions of part time students stabilizes in 2017 near the 2016 level.
- The IT University fulfills the target of the Study Progress Reform by 63 per cent in the study year 2015/2016. The target fulfillment is used to adjust government grants downwards in 2017, and we assume no other subsequent Government reduction in completion bonus rates.
- Spending of external research funding follows a new forecast from October 2017, signifying a decline compared to previous years.
- Income from subleasing on the fifth floor is DKK 2.2 M as in 2016, which signifies no vacancies, and signifies that the growth in BSc programmes does not limit subleasing activities in 2017 as well.
- Income from ITU Professional Courses is set to DKK 2.0 M in 2017.
- Recruiting of personnel proceeds as planned and in compliance with the Quality Policy VIP/DVIP ratios.
- The investment portfolio provides a return of DKK 1.4 M.

Finally, Executive Management is committed to ensure increased base research funding from the Government to sustain growth.

Income, costs and equity

Budget Proposal 2017 is based on equity at the end of 2016 as expected in the accounts as per 30 September 2016. Government grants are regulated with a +1.1 per cent average price/wage inflator in 2017, as stated in the Government's initiative. Personnel costs and other operating costs are regulated with +0.8 per cent and +0.6 per cent in 2017, respectively.

In table 1, the income, costs and equity of Budget Proposal 2017 are compared with Framework Budget 2017, and the table includes Budget 2016 as well.

Table 1: Budget Proposal 2017

| Budget items (KDKK) | Budget 2016 | Framework 2017 | Adjustment | Proposal 2017 |
|---|----------------|-------------------|---------------|------------------|
| Government grants | 220,700 | 222,070 | 2,347 | 224,417 |
| Tuition fees | 9,884 | 7,098 | -1,023 | 6,075 |
| External research funding | 26,500 | 27,999 | -3,496 | 24,503 |
| Facilities subleasing | 2,200 | 2,213 | -0 | 2,213 |
| Other income | 2,739 | 4,043 | 505 | 4,548 |
| Income | 262,023 | 263,423 | -1,667 | 261,756 |
| Personnel costs | 86,533 | 88,507 | 1,187 | 89,694 |
| Other operating costs | 8,888 | 9,141 | 131 | 9,272 |
| Departments | 95,421 | 97,648 | 1,318 | 98,966 |
| Personnel costs | 16,165 | 16,519 | -2,063 | 14,457 |
| Other operating costs | 3,710 | 4,760 | -594 | 4,166 |
| External research | 19,875 | 21,279 | -2,657 | 18,622 |
| Personnel costs | 66,975 | 65,136 | 3,194 | 68,330 |
| Scholarships | 1,000 | 1,000 | 0 | 1,000 |
| E-business programme | 824 | 0 | 0 | 0 |
| Other operating costs | 27,579 | 26,493 | 1,247 | 27,741 |
| Technical and administrative departments | 96,378 | 92,629 | 4,442 | 97,071 |
| Building | 49,497 | 50,415 | 1,207 | 51,622 |
| Management pools | 11,766 | 11,000 | -4,177 | 6,823 |
| Ordinary operating costs | 272,937 | 272,971 | 133 | 273,103 |
| Profit from ordinary operations | -10,914 | -9,548 | -1,800 | -11,348 |
| Financial income and costs | 1,395 | 1,395 | -0 | 1,395 |
| Profit | -9,519 | -8,153 | -1,800 | -9,953 |
| Equity year-end* | 74,513 | 66,360 | -1,800 | 64,560 |
| Equity/income ratio | 0.28 | 0.25 | -0.01 | 0.25 |

*Equity year-end is adjusted according to financial follow-up in October 2016

Departments consist of the three new departments Data Science, Digital Design, IT Business, the Study Board, the PhD School and the Library. Technical and administrative departments consist of Student Affairs and Programmes, Research and Learning Support, the Communication Department, the IT Department, Facilities Management, the Department of Finance and Personnel, Executive Management and finally provisions for holiday pay and other matters.

Income shows a modest increase in government grants and a decline in tuition compared to the Framework Budget 2017, which is elaborated in the section on Education. Furthermore, external research funding is adjusted downwards based on the updated forecast from the Department. Finally, other income is adjusted upwards due to income from qualification courses, summer schools and other minor activities.

Departments show an increase in personnel costs due to external research projects co-financing fewer scientific staff salaries than expected, compared to Framework Budget 2017. Thus, personnel costs in the departments may increase without any change in scientific staff FTEs. The scientific staff development is elaborated below in the section on Personnel.

External research spending shows a decline in both personnel cost and other operating costs equivalent to the drop in external research funding.

Technical and administrative departments show an increase in personnel costs due to growth in BSc programmes and transfer censor planning and booking from Departments to Student Affairs and Programmes. Furthermore, both personnel cost and other operating costs increase due to further develop the management information system, i.e. Qlik Sense and a data warehouse. Finally, building maintenance is turned back to the level of Budget 2016.

The drop in management pools reflects Executive Management approval of budget requests regarding growth in BSc Programmes and other initiatives as specified above. Executive Management has added one third of the expected year-end profit from 2016 to the management pools, i.e. DKK 1.8 M as described in enclosure 3. Executive Management maintains a multi-year pool for support of action plans and other projects towards 2021. The multi-year management pools functions as a flexible instrument to support strategic action towards 2021 and reaching long-term goals. Management revises the size of the pool every quarter, taking into account both the actual result of the previous year and the opportunity to transfer funds from or to future years depending on planned strategic action.

Personnel

In table 2, is shown the development in scientific and technical and administrative staff.

The downwards adjustment of scientific staff reflects the reduced external research funding forecast, reduced study activity forecast and the updated performance model on education (sector average per teaching FTE). The increase in scientific staff to sustain the planned growth in BSc programmes only somewhat counters these in 2017.

Table 2: Staff forecast

| Staff (FTE) | Forecast 2016 | Budget 2016 | Framework 2017 | Adjustment | Proposal 2017 |
|---|--------------------------|------------------------|---------------------------|-------------------|--------------------------|
| Full-time scientific, seniors | 56.13 | 60.00 | 65.00 | -3.94 | 61.06 |
| Full-time scientific, others | 81.79 | 82.46 | 75.55 | -1.84 | 73.71 |
| Part-time scientific, lecturers | 11.98 | 15.00 | 15.00 | -0.08 | 14.92 |
| Part-time scientific, others | 31.48 | 30.00 | 30.00 | 0.47 | 30.47 |
| Scientific staff | 181.38 | 187.46 | 185.55 | -5.39 | 180.16 |
| Technical and administrative staff | 131.71 | 129.71 | 131.36 | 4.57 | 135.93 |
| All Staff | 313.09 | 317.17 | 316.91 | -0.82 | 316.09 |

The number of scientific staff FTEs is based on a detailed three-year planning of faculty staff composition from the Department. The planning supports an average VIP/DVIP ratio of 75 per cent, and the department heads are charged with allocating scientific staff to courses in compliance with the Quality Policy VIP/DVIP ratio for each study programme.

Finally, the departments are unlikely to fulfill the Development Contract target regarding external research consumption of DKK 1.0 M per senior-faculty FTE in 2017. Based on the latest external research funding forecast of DKK 24.5 M, the departments will reach DKK 0.4 M per senior-faculty FTE.

The upwards adjustment of technical and administrative staff regards investment in a management information system, growth in BSc programmes and a transfer of tasks from scientific staff to administrative staff as described in the section above.

Education

Table 3 shows the student activity forecast of the number of admitted students and income of FTE and completion, which is based on the admission forecast in table 4 and rates from the Budget Proposal Act in table 5.

Table 3: Student activity forecast

| Student activity | Budget 2016 | | Framework 2017 | | Adjustment | | Proposal 2017 | |
|-------------------------------------|--------------------|----------------|-----------------------|----------------|-------------------|---------------|----------------------|----------------|
| | units | DKK | units | DKK | units | DKK | units | DKK |
| Students, BSc | 521 | 48,505 | 571 | 52,723 | -31 | -2,828 | 540 | 49,895 |
| Students, MSc | 733 | 68,219 | 713 | 65,919 | 24 | 2,190 | 737 | 68,109 |
| Guests and scholarships | 44 | 3,960 | 37 | 4,534 | -1 | -101 | 36 | 4,433 |
| Students, full-time (FTE) | 1,298 | 120,684 | 1,321 | 123,176 | -8 | -738 | 1,313 | 122,437 |
| Students, part-time (FTE) | 108 | 13,339 | 76 | 9,205 | -12 | -1,528 | 64 | 7,677 |
| Students, total (FTE) | 1,406 | 134,023 | 1,397 | 132,381 | -20 | -2,266 | 1,377 | 130,114 |
| Completion, BSc + MSc | 249 | 7,918 | 290 | 7,164 | 43 | 3,570 | 333 | 10,735 |
| Other student activity | | 1,174 | | 1,049 | | 19 | | 1,069 |
| Income from student activity | | 143,116 | | 140,594 | | 1,324 | | 141,918 |

Most notable, the total number of student FTEs declines from 1,406 in 2016 to 1,377 in 2017, because the decline in Master's programmes counters the growth in BSc programmes. It appears from table 4, that planned admission numbers also are in decline in 2017 as two Master's programmes are unlikely to admit students from 2017.

Furthermore, income from education declines slightly from 2016 to 2017. This is due to a steady reduction in MSc and BSc student activity rates per student FTE as shown in table 5.

In 2017, the completion bonuses partly depend on the study progress in the academic year 2015/2016 as shown in table 5. The IT University achieved an average excess study time of 10.6 months. Compared to the starting point of 11.6 months and target of 10.0 months, this is a target achievement of 63 per cent. A major improvement compared to the prudent expectation of 30 per cent from Framework Budget 2017 in August. The forecast on completion bonuses equivalently increases by DKK 3.6 M correspondingly.

Table 4: Student admission forecast

| Admission forecast (students) | Actual 2016 | Forecast 2017 | Forecast 2018 | Forecast 2019 |
|--|------------------------|--------------------------|--------------------------|--------------------------|
| SWU | 143 | 140 | 140 | 140 |
| DMD | 64 | 63 | 59 | 59 |
| GBI | 66 | 60 | 60 | 60 |
| Data Science | | 50 | 66 | 83 |
| BSc | 273 | 313 | 325 | 342 |
| DDK/DKM | 136 | 143 | 139 | 134 |
| DIM (EBUSS) | 154 | 130 | 130 | 130 |
| SDT/INT | 131 | 110 | 110 | 110 |
| GAMES/MTG/MMT | 58 | 50 | 50 | 50 |
| MSc | 479 | 433 | 429 | 424 |
| ILM | 55 | 40 | 40 | 40 |
| IND | 7 | 0 | 0 | 0 |
| SEN | 4 | 0 | 0 | 0 |
| Masters | 66 | 40 | 40 | 40 |
| Total | 818 | 786 | 794 | 806 |

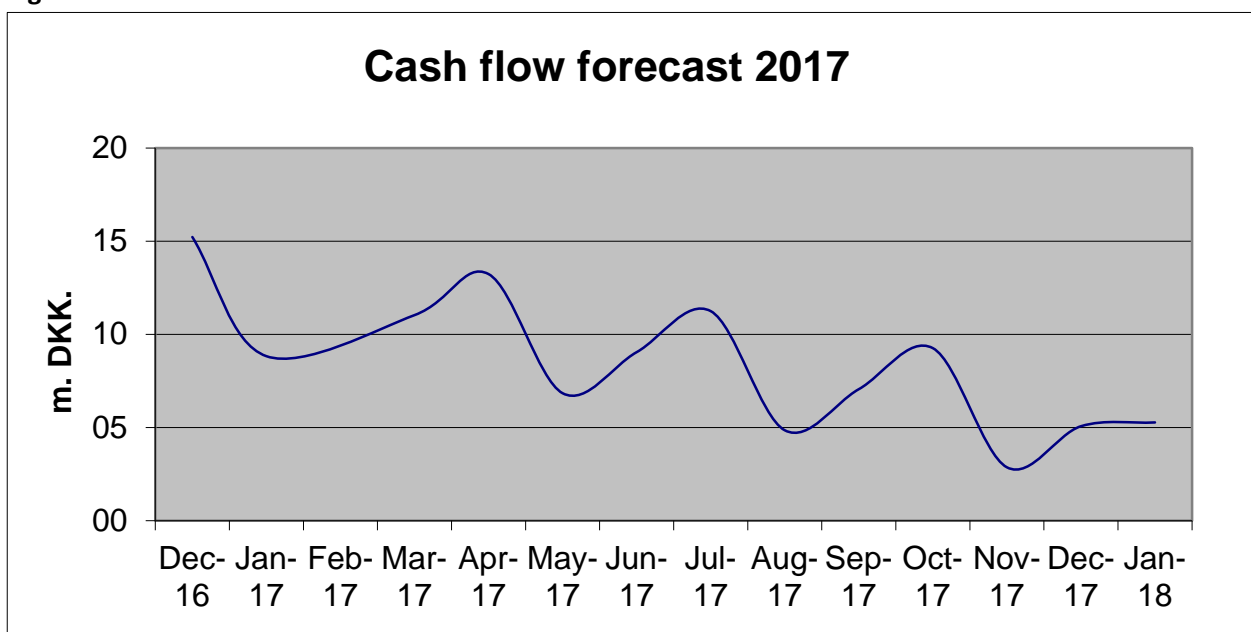
Table 5: Student activity rates

| Student activities rates (DKK) | 2016 | 2017 | 2018 | 2019 |
|--|--------|--------|--------|--------|
| Government grant, BSc (FTE) | 93,100 | 92,400 | 90,228 | 85,154 |
| Government grant, MSc (FTE) | 93,100 | 92,400 | 90,228 | 85,154 |
| Government grant, Guest students (FTE) | 93,100 | 92,400 | 90,228 | 85,154 |
| Completion bonus, BSc | 51,024 | 49,854 | 50,173 | 66,387 |
| Completion bonus, MSc | 34,016 | 33,236 | 33,449 | 44,258 |
| Stydy progress dependent part | 26.8% | 61.6% | 100.0% | 100.0% |
| Government grant, part-time SEN (FTE) | 43,000 | 41,700 | 39,982 | 38,380 |
| Government grant, part-time IND (FTE) | 43,000 | 41,700 | 39,982 | 38,380 |
| Government grant, part-time ILM (FTE) | 31,000 | 30,100 | 29,016 | 27,904 |
| Tuition fee, part-time students | 85,000 | 85,000 | 85,000 | 85,000 |

Cash flow

The cash flow forecast in figure 1 shows cash holdings to be positive throughout the year 2017. Mainly, this is due to the monthly instalments of government grants and tuition.

At the beginning of the year, cash holdings are high and gradually decline due to the planned deficit of DKK 10.0 M. The cash flow peaks low in January, May, August and November due to the quarterly payments of rent. Late in the end of the year cash holdings are below DKK 5.0 M. The Finance section is charged with monitoring the cash flow throughout the year, and will transfer funds from capital investments to cash holdings to avoid overdraft during the year, if necessary.

Figure 1: Cash flow forecast 2017

Uncertainties regarding Budget Proposal 2017

Budget Proposal 2017 is based on the Government's Budget Proposal Act from August 2016, which has not yet been passed by Parliament. However, significant changes are not expected concerning ITU.

In any case, income from education is still subject to the over-all inherent uncertainty of year-end adjustments of government grants according to the Supplementary Act, which the Government bases on the actual student activity and completion at Danish universities altogether.

The ordinary operating uncertainties, which could affect the Budget Proposal 2017, includes the number of full-time and part-time student FTE, number of MSc and BSc students that trigger completion bonuses, external research funding, self-insurance and financial income. Appendix A recaps the simulation of uncertainties regarding the Framework Budget 2017-2019 presented to the Board in September 2016. The simulation indicates that the probability of the actual result 2017 being at least DKK 4.0 M less than the budgeted result is approximately 20 per cent. Equally, the probability of the actual result 2016 being at least DKK 4.0 M more than the budgeted result is approximately 20 per cent.

The simulation in Appendix A does not include the specific operating risk of the Study Progress Reform. Firstly, completion bonuses are dependent on achieving the targets of the Study Progress Reform, where the Government calculates completion bonuses based on the sector wide target achievement, not just the target achievement of the IT University. Secondly, the ongoing reform affects student behavior and positively affected student activity FTE in 2016. A positive and somewhat unpredictable effect that might reoccur to some degree in 2017 as well.

Games of Tomorrow – The New Master of Games at IT University Copenhagen

Version 1.0, 23.10.2016

Martin Pichlmair, Head of Programme

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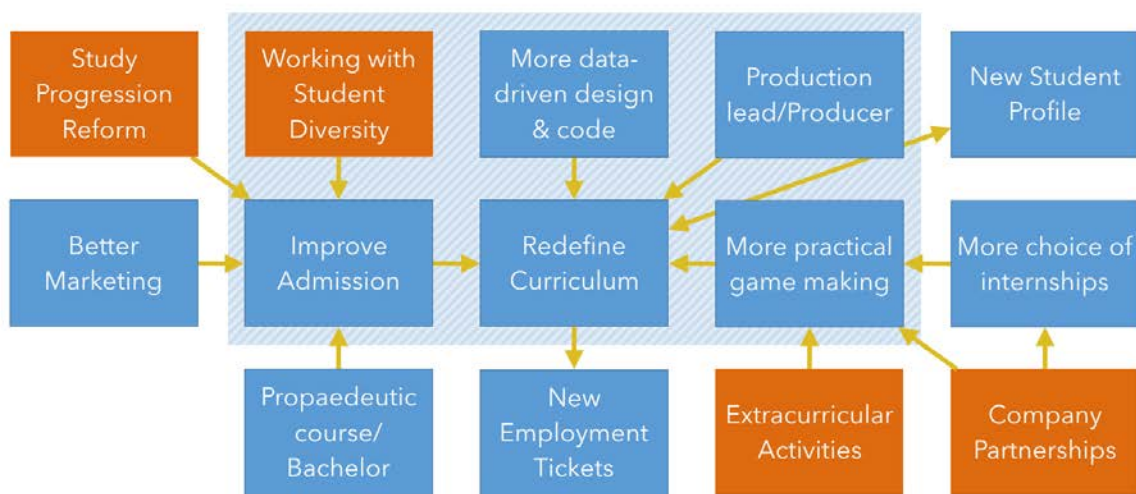
Motivation and Outline

The motivation for reforming the Games Programme originates primarily from occasionally exceedingly high unemployment numbers of recent graduates as pointed out by several statistics over the last years. Additionally, the Employers' Panel report [1], the external review report [2] as well as the internal review report [3] point at the need to reform the programme. In these reports, the main points of critique are that the programme lacks relevance for the industry, that the humanities-style theory aspect is insufficiently connected to the rest of the curriculum and that the curriculum generally tries to achieve too many different things. Further points of criticism were raised in all reports and addressed in detail by the Games Programme in a letter to the management [4]. Despite the criticism, the games programme remains outstanding as one of the leading academic games programmes worldwide.

The main vision for the reformed games programme is to create a modern games education that brings together the visions and needs of all stakeholders – from the university to future employers, from students to teachers. It does so by sharpening the profile of graduates, focussing on essential and relevant topics that are important in the games industry as well as valuable in related software development areas.

Overview of the Reform Process

The following diagram gives an overview of all areas covered by the reform process. Blue indicates that the activity was requested by the Employers' Panel. Red means that the activity has its origin in ITU, either with the head of studies or the head of the study programme. The light blue background signifies the parts that have an influence on the new curriculum. In summary, the goal of the reform process is to align the programme more closely with the



currently preferred development methods of the games industry as well as the IT industry in

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general. In accordance with the Education Strategy and the Quality Policy this is achieved by research-based teaching in areas relevant for the development of skills expressed in the employment tickets. An important aspect of the existing programme is the integration of the three pillars of design, technology, and theory. Based on this, Games graduates set themselves apart from graduates of other games-related educations by their ability to formulate, communicate and solve complex problems. These skills enables them to work in positions where communication skills, managerial skills, or self-determined problem-solving are important, e.g. project management, client communication and innovation.

The necessary actions by the programme together with various groups at ITU are to:

- Strengthen the focus on data-driven design & development as well as current labour market demands in general
- Assure that theory courses contribute to more than only the academic aspect of education
- Strengthen the marketing of the games programme
- Reform the admission process in order to attract and accept more and better qualified students
- Expand the internship program

These actions result in:

- New employment tickets
- A newly structured admission process
- A new curriculum
- Additional actions like internships and extracurricular activities
- A marketing plan for the games programme

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The New Games Programme

A programme for students who want to change the future by creating innovative new games and other engaging products and services using cutting-edge technologies.

A Head Start in the World of Games of Tomorrow

The new Master in Games gives students a head start in the world of games of tomorrow. We teach students to be innovators, creating new experiences based on cutting-edge technologies. In game development, a world characterised by constant change, this requires a solid technical and conceptual foundation and the careful selection of key areas as well as the agility to swap those if new interesting fields emerge.

Virtual and Augmented Reality, Data Analytics, and Machine Learning are contemporary trends that characterise shifts in the way games and other interactive systems are created and consumed. Virtual Reality (VR), Augmented Reality (AR), and similar technologies bring the physical world closer to the digital, leading to innovative new applications. Machine Learning is data-driven and so is the development and long-term maintenance of games-as-services, the financially most lucrative new area of games. All of these trends have a technical as well as a design dimension. All of them require a robust user-centred design approach and agile development methods. Conclusively, user-driven development has become paradigm in game development and other innovative areas. With data analysis, user testing has been expanded to govern the whole lifetime of digital products. At the same time, agile development in small multidisciplinary teams has become the new norm for producing innovative products. Even large companies mimic this setup by isolating task forces that work autonomously and undistracted by the bigger organisation. To summarise, a modern Games Programme has to teach contemporary production practices for cutting-edge technology.

It follows that

Design Track graduates of the new Games Programme will

- be masters of user-centred design methods, from user testing to data-analysis and
- have the ability to design innovative engaging playful products,
- based on a deep scientific and practical understanding of play and design,
- in multidisciplinary international small teams.

Technology Track graduates will

- have the ability to innovate with technology,
- by developing new complex games & entertainment technologies,
- in data- and design-driven processes,
- based on a deep scientific and practical understanding of game technology,
- in multidisciplinary international small teams.

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The New Objectives for Learning Output¹

In a workshop with the Employers' Panel on May 24th, Employment Tickets² have been developed as a starting point for the new Games Programme. They have been formally approved on September 12th and can be found in Appendix G. Based on these Tickets, new Objectives for Learning Output have been developed:

The graduate will develop knowledge and understanding of:

- Tools, methods and techniques applicable to the design, development, production, and understanding of games and other playful and engaging experiences, as well as their technological foundations, based on highest international research
- The scientific basis and scientific methods for reflecting on the design, development, production, and understanding of games and other playful and engaging experiences, as well as their technological foundations.

The graduate will develop the skills to:

- Design and develop innovative and creative technologies, products and concepts within games, based on scientific analysis and established design methods
- Research, communicate and develop concepts, theories, methods, models and solutions based on scientific analysis of games, their design and development process, and their technological foundations
- Analyse, communicate, evaluate and select scientific methods, tools and theories supporting the creation of games and other playful and engaging experiences

The graduate will develop the competences to:

- Initiate, manage, plan and participate in the complex and unpredictable production process of games within local and global multidisciplinary environments
- Employ data-based and user research methods to evaluate, refine, assess and make decisions about prototypes and products
- Reconcile the limitlessness of creative ideas with the limitations of system requirements based on established design, production and development practices
- Further the graduate's skills, knowledge and competences concerning the graduate's specialization in the field of games and other playful and engaging experiences independently and self-determinedly.

Additional track specific competences for graduates are:

Design track:

- The graduate can employ, select and adapt a range of design methods and processes to create innovative games and other playful and engaging experiences
- The graduate can apply programming and computational thinking competences to solve design-related technical challenges

¹ A mapping of the programme's objectives can be found in Appendix E.

² Defined as "something difficult and in demand in the labour market that all graduates of that study programme master" [6]

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Technology track:

- The graduate can select, evaluate, discuss, apply, adapt and develop complex algorithmic and technological solutions in the field of games and game technologies

The New Curriculum

It has always been a strength of the Games Programme that there are two tracks with a large overlap, one Design Track and one Technology Track. This basic structure will be maintained, but the theory aspects of the former Design & Theory track are isolated and selectively integrated into the new curriculum without a dedicated specialisation.

The New Games Programme is characterised by the following changes to the programme:

- The new mandatory backbone teaches the basis of game design and development based on principles of user testing and data analysis.
- There is a clearer focus on producing games individually and in groups.
- All Design Track students will learn programming. All Technology Track students will learn prototyping.
- The New Programme will stop to offer art-related courses and will stop admitting students that want to focus on art production (artists, animators, sound engineers).

Following the advice by the External Review Report to “pick certain future-oriented key areas” that “should be of a type, which also provides employment opportunities outside the world of games” [2], and after talking to industry representatives, visiting industry conferences, discussing with the Focus Group, students and faculty, the areas that are the best candidates for this are:

- Data-based Design and Development, which is the basis of many modern games but also relevant for general service and product development, e.g. in the health and fitness area.
- Machine Learning and related AI techniques, which is based on the analysis of data and is a growing field with applications in games, robotics and all other areas of big data. Combined with mathematics and computer graphics, this also establishes a strong grounding in simulation.
- Play Design, a method of how to approach technology and design from the perspective of play, in order to create experiences that engage users across a wide range of media expressions, from games to services, physical locations, and products.
- Augmented and Virtual Reality, which means that games are increasingly taking over physical spaces, making the screen just one aspect of the experience. From locative games to augmented reality, from virtual reality to toys-to-life, a great deal of innovative new game ideas operate on the boundary between the physical world and the virtual.

Data-based design and development methods become part of the mandatory backbone. Machine Learning and Play Design become specialisations. Augmented and Virtual Reality are targeted as topics of the Play Design specialisation and in electives.

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Programme outline

Students from the two tracks share 75% of their first year and more than 50% of the whole programme. This setup allows the students to learn to work in teams very similar to those they will have to work with in their professional lives. Both tracks aim for creating so-called T-shaped competence profiles, a solid wide knowledge and competence base coupled with in-depth understanding of a specific topic.

The Technology Track builds on a computer science bachelor. It requires solid computer science and programming skills and competences. These are amended with game-specific technical competences and skills required for working in multidisciplinary teams that work on innovative products. Half of the first semester (in the courses Data-Driven Production and Game Programming) is spent with learning these technical competences. The other half (Game Prototyping and Games & Culture) has the goal of teaching skills necessary to innovate in a team. Game Prototyping eases the student into a dynamic design process and Games & Culture provides a vocabulary and knowledge base to be shared between programmers and designers, thus also contributing to successful teamwork. The role in a team is further developed in the interdisciplinary project. The specialisation gives the Technology Track student a hard topic with concrete applications inside and outside game development. Electives focus on specific contemporary technologies and additional skills and competences.

The new Design Track builds on a user-driven design process. Students that have learned the basics of such a process are preferred. In the first semester, students learn to apply those design skills in various situations, autonomously and in teams, by creating prototypes and learning rudimentary programming skills (in Game Prototyping and Programming for Designers). Games & Culture teaches them the wider context they are working in. Date-Driven Production amends their user-driven practice with data-driven methods to give them a more complete toolset for their job. In the second semester, they further develop their role in the interdisciplinary project. In their specialisation they first learn a more fundamental view of play to make their skills more generally applicable, for example in user experience design or gamification, and then move on to go deep into a contemporary design space in the Play Lab. Electives will primarily give them additional design experience or provide industry-specific contexts to work in.

Course Structure

The following tables illustrate the two tracks of the programme. Electives can be taken by students in both tracks by default. Red indicates a mandatory course, yellow is a specialisation and electives are coloured green.

| | | | | |
|--------------------------|------------------|-----------------|---------------------------|---------------------------------|
| Semester 1 Foundation | Game Prototyping | Games & Culture | Data-Driven Production | D: Programming for Designers |
| | | | | T: Game Programming |

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| | | | | |
|---------------------------------|---|---|----------------------------------|---|
| Semester 2 Specialization | Interdisciplinary Project Lecture | Interdisciplinary Project Group Project | Specialization D: Play Design | Electives Game World Design, Computer Graphics, Artificial Life |
| | | | T: Data Mining | |
| Semester 3 Individualization | Specialization D: Play Lab | | Thesis Preparation | Electives Game Studies, Virtual Reality, Experimental Interfaces |
| | Specialization T: Modern Artificial Intelligence | | | |
| Semester 4 Innovation | Master Thesis | | | |

Course Descriptions

Mandatory Courses

| | |
|------------------------------------|--|
| Game Prototyping | A course that gives students the experience of having produced a number of games individually as well as in teams. They will learn fundamental design methods and their practical application as well as develop their own design practices and technical skills. <i>New course not offered in the current programme.</i> |
| Games & Culture | A course that builds on scientific theories of how games and play are constituents of human culture. By opening up the definition of what play is, the student is enabled to design a great number of social, communicative, educative and other cultural processes playfully. At the same time, the course teaches the foundations for the scientific analysis of games. <i>New course not offered in the current programme, based on Foundations of Play and Games.</i> |
| Programming for Designers | A course that teaches how to formulate a problem so that it can be solved by a machine. After the course, designers are expected to be familiar with principles of programming and able to solve design-related technical challenges individually. <i>This course exists as an elective that has to be adapted to be suitable for a higher number of students. This course could be offered across all non-Computer Science master programmes.</i> |
| Game Programming | This course teaches programming concepts that are specific to games. After completing the course, students are able to write core parts of a game from scratch. Students are expected to be able to program in an object-oriented language before attending this class. <i>New course not offered in the current programme, based on Game Engines course.</i> |
| Data-Driven Design and Development | Design and technology students have similar general learning goals in this course but the first group focuses on applying data analysis as a design tool whereas the second group learns data-oriented programming, the leading programming paradigm when it comes to engine and framework development. The course could be offered in collaboration with a company that provides real-world data. <i>New course not offered in the current programme.</i> |

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| Interdisciplinary Project: Game Studio | <p>The Game Studio is a project-based class where students create a game in an interdisciplinary team. It is of high importance that each student is aware of her role in the development of a joint project by that point. If the general master programme reform process leads to the “interdisciplinary project”, the game studio will be replaced by that, as long as this substitution leads to comparable learning outcomes.</p> <p>The course that forms half of the project teaches the business and production aspects of game development. Students learn competencies in project management, team roles, leadership, business plans, and marketing & communication.</p> <p><i>New course not offered in the current programme.</i></p> |
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All Specializations

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| Thesis Preparation | <p>The Thesis Preparation course makes sure that every student has a supervisor, a well-formed research question, an overview over relevant literature as well as knowledge about the research method before the actual thesis is started.</p> <p><i>An existing course of the programme.</i></p> |
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Technology Track Specialization: Data Engineering

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| Data Mining | <p>Teaches students to analyse data mining problems and reason about the most appropriate methods to apply to a given dataset and knowledge extraction need. Students also learn to implement basic pre-processing, association mining, classification and clustering algorithms. They work in groups and evaluate the algorithms on real-world problems.</p> <p><i>An existing course of the programme that has 2/3 students from other programmes, especially Software Development.</i></p> |
| Modern Artificial Intelligence | <p>After completing this course, students are able to implement the most common algorithms from game AI. The same algorithms play a role in general simulation and are applicable to a wide range of problems.</p> <p><i>An existing course of the programme. This course could be offered in the Software Development Programme, too, and/or become a double-offered course where one half of the course is offered to Software Development/Data Science bachelor students.</i></p> |

Design Track Specialization: Play Design

| | |
|-------------|---|
| Play Lab | <p>Play Lab is a production-based course that explores the possible futures of playful entertainment technologies. Each semester, students will be challenged to create playful experiences using cutting edge technology, addressing the possible futures of the entertainment and communication industries. The course combines prototype development with research work on UX, Design Theory, Interaction Design and Philosophy.</p> <p><i>A newly developed course that can easily be offered to Digital Design and Communication students.</i></p> |
| Play Design | <p>Play Design is an introductory course focused on the teaching of a solid theoretical and practical basis for the conceptualization, prototyping, development and testing of playful interactive experiences, beyond the conventional formats of digital games. In the course students explore the ways in which play, as a form of human expression and technological creativity, can be used to create new experiences beyond games.</p> <p><i>This course exists as an elective that has to be adapted to be suitable for a higher number of students.</i></p> |

Electives (which will only be conducted if they are interesting to more than one programme)

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| Virtual Reality | <p>Building on computer graphics and prototyping, this course teaches how to work with this new technology. This course should not strictly be limited to creating games but be open to exploring the full potential of virtual reality, from architecture visualisation to simulation. It should be highly interesting to students from other master programmes.</p> <p><i>New course not offered in the current programme. Should be offered in the Software Development programme, too. If the course is structured so that non-programmers can take it, the course would be interesting for Digital Design and Communication students as well.</i></p> |
| Computer Graphics | <p>This course teaches mathematical concepts, especially 3D mathematics and their application in computer graphics. As such, the content is highly relevant for creating simulations and later classes like Virtual Reality. It also directly supports one of the employment tickets.</p> <p><i>An existing course of the programme. Traditionally visited by many Software Development students.</i></p> |
| Advanced Topics in Game Studies | <p>This course teaches advanced topics in the study of games and players, advancing the understanding of the role of play and games in contemporary socio-cultural developments. The course deepens and diversifies the content and methods of the first semester course Games & Culture.</p> <p><i>Newly developed course based on Digital Game Theory that will be integrated into the Meaning and Games ERC project. Could be offered in Digital Design and Communication.</i></p> |
| Experimental Interfaces | <p>This course focusses on the intersection between the physical and the digital world. Mobile phones, the internet of things, virtual and augmented reality, toys-to-life products, but also health- and fitness-related products, have led to an increasing amount of overlap between the physical and the digital world. This course provides a solid basis for working at this intersection. It should be highly interesting to students from other master programmes and could be offered in those too.</p> <p><i>An existing course of the programme visited by lots of Digital Design and Communication students.</i></p> |
| Game World Design | <p>As a follow-up to Game Prototyping, students learn to design game worlds from a conceptual as well as a practical perspective. The course is hands-on and provides a solid base for content production outside the visual domain.</p> <p><i>An existing course on the programme.</i></p> |
| Artificial Life | <p>This course, mainly visited by students from other programmes (65.5% in spring 2016), sits between robotics, artificial intelligence and artificial life.</p> <p><i>An existing course of the programme, mostly with students from outside the games programme.</i></p> |

New Employment Profiles

The games industry needs competent employees that have the ability to learn quickly and adapt to constantly changing circumstances. A solid foundation in methods, techniques and processes is therefore fundamental to make our students' abilities future proof. All students are expected to learn fundamentals of programming and the ability to contribute to design-driven development processes. The concrete technologies they work with have to be re-evaluated continuously and the foundations upon which they are built are more important than the concrete applications.

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Graduates can be expected to work in small multidisciplinary teams. The diversity in the games programme ideally trains them to productively work in a heterogeneous environment. The Employers' Panel insisted several times that each individual has to have experience with group work as well as in individually solving design and technical challenges. Both skills are needed in today's working environments.

Finally, our research into the labour market taught us about a lack of producers/project managers. The competencies required for this position are distributed over a number of classes in the proposed course structure. It is important to note that students' rhetoric abilities and their skills in writing long, complex and well-structured arguments make graduates of a master programme well suited for this role.

Given the above focuses, the following employment profiles emerge:

- Technology Track graduates are competent in creating new forms of digital products, from games to services, using domain-specific development methods. These are applicable to the following jobs in the games industry and related companies:
 - Engine Programmer
 - Gameplay Programmer
 - Analytics Engineer
 - Data Analyst
 - AI Programmer
 - Front-end Developer
 - System Architect
 - Software Engineer
 - QA Engineer
 - General Programmer
- Design Track graduates are competent in creating user-centred innovative solutions to design problems and have a basic understanding of their implementation. Depending on their specialisation they can apply their skills as entrepreneurs or in the following positions:
 - Game/Play/Simulation Designer
 - Interaction Designer
 - Project Manager
 - QA Manager
 - Service Designer
 - Data Analyst

The New Admission Process

Students from ITU's Global Business Informatics and Digital Media and Design are directly admitted to the Design Track. Students from ITU's Software Development bachelor are directly admitted to the Technology Track. We are currently developing a portfolio of national and international bachelor educations that would be similarly suited for direct admission. At the same time, the diversity of the admission in the Games Programme has always been an asset.

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This third tier of admission will be specified at a later point. A structured letter of recommendation and work samples in the form of a portfolio are possible ingredients.

Admission Projection

Recently acquired statistics show greatly employable Technology Track graduates but employment problems with Design Track graduates. While the programme reform aims to mitigate this issue, it is still advisable to raise the number of Technology Track students as soon as possible. Depending on the number and qualifications of participants, between $\frac{1}{3}$ and $\frac{1}{2}$ of all accepted students should be accepted to the Design Track. The following projection assumes the best possible applicants in the Technology Track.

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-------------------------|------|------|------|------|------|------|
| Design Track | 30 | 20 | 20 | 25 | 30 | 30 |
| Technology Track | 20 | 30 | 30 | 35 | 40 | 40 |
| SUM | 50 | 50 | 50 | 60 | 70 | 70 |

Necessary Hirings

In order to teach the new courses, new faculty has to be hired. The Technology Track is in more need than the Design Track, and people with a solid foundation in one of the new areas – VR & computer graphics or data analysis – should be prioritised. In general, more people with industry background or a history of releasing games would be a great addition to the faculty. When the above programme is accepted, the two positions offered in the mandate [Appendix A] will be filled with two computer scientists. One of them with a background in computer graphics, game technology or engine architecture and one of them with a background in data science. If the upcoming data science bachelor attracts people that can teach courses in the Games Programme, the second hiring could be an established game maker with technical as well as design skills or an expert in data-driven architectures. There should be efforts to increase the diversity of the staff.

Auxiliary Activities

Additionally to the above restructuring process, a number of initiatives have been proposed and/or started in order to bring our education closer to the industry. Some of them are extra-curricular and others form a part of the curriculum.

Internships

As one of many means to reduce the number of unemployed games students, internships have been proposed for many years. Internships solve two problems: they demonstrate the relevance

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of the program to the industry, and they are a practice-driven contribution to the education within the program. The best suited point in time for an internship is the third semester. During this semester, some students already learn very practice-relevant aspects of their craft, e.g. at DADIU. The full description of the internship process can be found in Appendix C.

Workshops, Game Jams and Hackathons

In order to offer a stimulating environment for students and to foster the connections of our students with the local game and toy development industry, there are a couple of initiatives run by the faculty and students of the Games Programme:

- A recent workshop with Lego, focussed on Play Design, yielded more than 10 innovative design proposals by nearly 30 students.
- BreakIT, a recurring workshop facilitated by Daniel Cermak-Sassenrath, regularly invites students to experiment with hardware, sensors and prototyping tools.
- The yearly Alternate Controller Jam, run by Martin Pichlmair, invites students to invent new game controllers and expand their understanding on how to interact with software.
- A hackathon together with PET and SKAT takes place in late October and is the start of our “play is more than games” initiative aiming at pushing games students out of their comfort zone, demonstrating that their skills can be used in all kinds of contexts.
- Global Game Jam, with its local event run by PlayIT, a student group, occurs every year and invites students to develop games in 48 hours.

Future game jams and workshops with industry partners as well as about special topics, have been planned. Thus, we will continually offer opportunities for students to establish industry ties while adding projects to their portfolio.

Industry Relations

In order to stay on top of current developments in the games industry and to offer students a wide range of industry contacts, we are actively working on establishing stable relationships with the local games industry – as can be seen in the above list of partners for events.

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References

- [1] Employers' Panel Report, 15 January 2016
- [2] External review of the MSc Games programme at ITU, 30 October 2015
- [3] Internal Review Report, August 2015
- [4] Letter to Management, 27 January 2016
- [5] Quality Policy For 2016, Version 6, 27 November 2015

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Appendices

Appendix A: The Mandate

The task is to redesign the Games programme taking the relevant criticism raised by the internal review report, the external review panel, and the employers panel into account; in particular the relevance of the programme must be improved. Relevance should here be understood as *the relevance criteria* described as one of the three principles for an ideal study programme at ITU.

The Studie Board and the relevant SAT must be involved as far as their approval is concerned.

All ideas how to redesign the programme are welcome as long as they fit the legal framing of a study programme, thus changes must fit acceptable changes of the current curriculum ("studieordning"). Whatever redesign proposed it will be an option to ask for allocation of up to two new hires for teaching on the revised programme.

Organization

As part of carrying out the task a project must be established along the lines of a project in the ITU Project Organization; but it will not per se be a PPG project, i.e. it may be a project under the auspices of the Department if so wished. The steering group of the project will be Laura Beloff and Lene Pries-Heje. The role of the steering group is to approve the progress of the project. The project manager will be a project manager from the project organization, say Gustaf Gimm. The project team will consist of Martin Pichlmair and Sebastian Risi. SAP should be part of the group to help with legal and study administrative aspects. The project may have affiliated one or more reference groups with researchers and students from ITU. The project must make sure to consult the Employers Panel for advice and approval of the proposed changes. The Learning Unit may also be obvious to consult. The first step of the organization will be to hand in a project brief (a project description, see template from our Project Organization) to the Education Group.

Timeline

The timeline must be defined such that the recommendation for a redesign can be presented for the Board of Directors at their November 24, 2016 meeting. This means that the Education Group must have a final proposal for the revised programme no later than end of September 2016.

Appendix B: Timetable for the Reform Process

Version 0.6.: Authors: Martin + Eva

Updated: July 8 2016, June 30 2016, April 25 2016, May 2 2016, May 9 2016, June 13 2016

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March 2016: Kick off meeting with the project group. Analysis of the most significant points of conflict between ITUs policies/interests and needs by employers.

April 21 2016: Employers' Panel meeting, agreement over a process that allows the Employers' Panel to influence, discuss and give feedback on the proposal.

From April 21 - Mid May 2016: Workshop with Focus Group to evaluate branching out into new areas with the Games programme.

May 24th: Employment Ticket workshop with Employers' Panel (proposed by Karsten)

June 2016: First outline of the core changes to be implemented. Formulation of processes how to implement the changes and of a time plan.

July 2016: First complete draft of the revised programme consisting of a new curriculum and a new competence profile.

August 8th 2016: Proposal for circulation in SAT Games, Software, Communication and Business. Also sent to Employers' Panel, Project Group and Study Board.

August 17th 2016: Discuss proposal in SAT group Games

August 22nd 2016: Proposal for Study Board

August 22nd 2016: Draft is presented to the Employers' Panel in an irregular meeting. If that meeting cannot be conducted the Employers' Panel is invited to discuss and give feedback on the draft by email.

Until end of September: Incorporate remarks, requests and changes from Employers' Panel & SAT group and flesh out all the details.

Mid September 2016: Presentation in Education Group > Contact Lene Reder (SAP)

Mid September 2016: Send report to Executive Management

Rest of September: incorporate changes etc. from Education Group

November 24 2016: Final proposal for the Board of Directors.

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Appendix C: Internship Factsheet

Internships Fact Sheet

April 11, Version 0.1, Martin Pichlmair

April 12, Version 0.2, Martin Pichlmair/Hajo Backe

April 14, Version 0.3, Small corrections after project group meeting

The key symptom of the challenges faced by the Games MSc lies in the comparatively high unemployment numbers. The employers' panel report indicates that these numbers are, among other things, the result of a perceived lack of relevance of the program for the industry.

Internships solve two problems at once: they demonstrate the relevance of the program to the industry and they are a practice-driven contribution to the education within the program. The best suited point in time for an internship is the third semester. During this semester, some students already learn very practice-relevant aspects of their craft, e.g. at DADIU.

When looking at the Studieordning of the MSc in Games, the following learning outcomes can be partially or completely reached by taking an internship:

- The graduate can manage the complex and unpredictable processes of game development within local and global production requirements
- The graduate will develop knowledge and understanding of tools, methods and techniques applicable to the development of innovative and creative media and games technologies
- The graduate will develop knowledge and understanding of tools, applications and theories applicable to the development and programming of complex media and games technologies
- The graduate can bring about products, prototypes and theories which make appropriate use and analysis of media and games technologies
- The graduate can collaborate with others in interdisciplinary and varied local and global teams in a game design and development process
- The graduate can develop innovative technologies applied to the fields of digital leisure

A number of these learning outcomes are easier to achieve within an internship than within the rest of the curriculum. These include truly global production requirements, interdisciplinary and potentially global teams, and actually applying innovative technology in the field of digital leisure.

In order to ensure that internships are in accordance to the Studieordning and that interns are not a replacement of paid labour, a structured process has to be designed. This process ensures that interns produce results that support them in achieving the above learning goals, that companies are only supplied with interns if they consistently support the learning process of the student and that faculty observes the usefulness of the internships in all cases.

The cornerstones of the existing process are:

- Internships are treated as individual projects
- Every intern has a faculty supervisor
- Learning goals are agreed upon before the internships starts
- A research question gets formulated within the first 2 weeks of the new semester
- There is a whitelist of companies
- Internships can be either 7.5 or 15 ECTS
- The grade for the internship is based on the written report and an oral exam. Both are concerned with demonstrating that the student has the ability to contextualise the practical work done in the internship with the scientific knowledge accumulated during her prior studies and/or during the internship. The reports answer a research question that was formulated based on the work the student is supposed to carry out in the internship. The student demonstrates the ability to identify, analyse and solve practical problems and thereby achieves some or all of the above learning outcomes (see also Andersen & Toftskov 2008).

To achieve even more learning effect from internships, the possibility to have 30 ECTS internships should be explored. Maybe the framework has to be as fleshed out as DADIU in this case. Alternatively having them take a 22.5 ECTS internship + Thesis Prep would be advisable, especially if they want to work abroad. In this case, Thesis Prep might have to be taught as a remove course. In general, internships at companies outside Copenhagen, e.g. Lego or King.com, should be possible.

To-dos in order to ensure the quality of the internships and the curriculum:

- It should be evaluated if it is necessary to draft a legal agreement between the company and ITU that regulates what the student is supposed to do in her internship in order to ensure that the work is on an appropriate level of sophistication. It has to be decided if this is an individual agreement or if there is a general one for all companies.
- We have to regulate the communication between companies and supervisor in order to ensure that the supervisor is aware of the actual work done by the intern. This could take the form of a report or questionnaire at the end of the internship. For this, there has to be a contact person at each company.

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- Faculty has to communicate the availability of internships to companies as well as students.
- Learning outcomes have to be agreed upon as early as possible. All three parties are involved in this. There have to be implications if the company fails to support students in achieving these learning outcomes.
- We have to offer Thesis Prep, or at least the matchmaking part, for all students, possibly remotely. This ensures the student's smooth progression towards the master thesis.

Appendix A: Relevant mentions of Internships in reports

From the Employers' Panel report, page 4: "All Games students employment ticket: Industry experience through internships"

Mail from Mads Tofte from 18. June 2014 summarizing the results of a working group about how to reform key parts of the Games program: "5. The internship experiment looks extremely promising" and "Stine [Due Hansen] will draft a description of the internship process and discuss it with Miguel. Stine: please come to me thereafter, if it is unclear how to get the process embedded in day-to-day operations, once it is created."

From the Graduate Survey 2015:

"Internships are a valuable source of knowledge and practical experience

Internships are not ECTS rewarded as a part of the study programmes at the IT University. However, 12% of the graduates have responded that they decided to engage in an internship during their studies. These graduates have a very clear idea of their perceived outcome of their internship experience. 88.9% felt that they gained competencies, which they could not otherwise have attained through their study programme. They also experienced that they gained valuable knowledge on the expectations and required skills in a real-life scenario. More than 50% of the students doing an internship used their network from this experience in their following job-seeking activities."

Also in the comments (p. 56): "The program should include mandatory internships".

"Main Recommendations" from the external review report (p. 7): "More emphasis should be put on the business side of games. This should be stressed more when advertising the studies, admitting students, establishing courses and specializations. Also, a functioning internship program will support awareness of the business side." The report goes on to observe (p.3): "So far no proper internship program has been implemented"

Appendix B: Quick overview of internships at relevant other programs

At CBS, 16 out of 36 offered master programs (44%) officially offer internships. Nearly all other courses offer ways of writing and exam paper in the 3rd semester about a self-chosen topic that could be produced in collaboration with a company.

CBS requires a fixed structure for internship reports, consisting of (Andersen & Tofteskov 2008):

1. Introduction
2. Problem formulation
3. Method
4. Theoretical reflection
5. Analysis
6. Synthesis

References

Andersen, Hanne Leth & Tofteskov, Jens: *Eksamen og eksamensformer - betydning og bedømmelse*. Samfundslitteratur, 2008.

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Appendix D: All Recommendations by All Reviews

| Item | Comment | Status |
|---|--|---------------|
| External Reviewers Panel | | |
| The panel recommends that ITU strives at establishing both games degree programme tracks as type A, a “Game Industry Expert School” - Education based on world class research in areas with a high demand for expertise in game development and other game industry positions - with research base in areas where competences and knowledge are in high demand in the games industry, but also have applicability in its own right as a skill outside the games industry. | It’s important to note that the panel recommends to keep both tracks | New Programme |
| ITU should pick certain future-oriented key areas, for Design that can be e.g. monetization and big data analysis in game design | | New Programme |
| A shift of emphasis that would augment the humanities style analysis and theorization of games with data-oriented, quantitative skills and methods. | | New Programme |
| More emphasis should be put on the business side of games. | Adding a business-oriented teacher & basic business content to Game Development already helped. Students are hard to convince, though. | New Programme |
| A functioning internship program will support awareness of the business side. | | Implemented |
| Offer a mixed game design/project management role due to labour market demand. | Partially already implemented in Game Development class | New Programme |
| Attract teachers from industry to partner up in the development of a business course and as visitors in other courses. | Many industry speakers in e.g. Game Development class. Many part-time teachers are from the industry | Implemented |
| Have the most important courses be taught by core faculty. | | Implemented |

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| Extent the supply of electives, possibly with visiting, external experts. | We would greatly appreciate this but given the size of the games programme our abilities to do so are limited. Instead we will try to offer more varied electives in the new programme. | New Programme |
| Prune the courses for repetitions. | | New Programme |
| Establish physical space for non-screen games, experimentation playtesting in a proper game lab setting. | This has been an ongoing demand from our students that is hard to meet due to requirements of ITU that student labs are classrooms | Ongoing |
| Improve the information procedures. | Needs more clarification | Ongoing |
| Be conscious about presupposed knowledge of classical games and game features. | | New Programme |
| Be conscious about the degree programme's emphasis on types of games (indie/AAA, PC/console/mobile, digital/analogue platforms). | | New Programme |
| Tech: Analyze the mathematical prerequisites and be consistent when admitting students. | See New Intake Process | New Programme |
| Tech: Establish a specialization option for students with programming interests rather than mathematically based algorithms. | Due to the size of the programme, offering additional specializations is close to impossible. The new programme should offer more ways to tailor the curriculum to individual students' needs. | New Programme |
| Tech: Establish a course in graphics programming. | | Implemented |
| Design: It should be considered to place in the first semester a course on (rapid) digital prototyping of game ideas. | | New Programme |
| Internal Report | | |
| Consider leadership skills as elements in the study programme | Leadership is a skill that is very hard to teach. We offer projects where students can learn the fundamentals but a thorough leadership education is beyond the scope of the games programme. | Partially implemented |

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| Investigate if the more academic job market (PhDs and beyond) is appropriate as a new area of expansion | Numbers that should give more information about our graduates jobs have been requested at the statistics department in June 2016. | Ongoing |
| Focus on long term planning for electives to enable actual choice and progression for every student | | New Programme |
| Keep up the ambitious take on co between students and staff | | Implemented |
| Clear up the communication paths for better coordination | There are regular “townhall meetings” and many other information meetings about specific topics (e.g. internships). | Ongoing |
| Make Student Affairs & Programmes more visible to students | The HoP continuously refers students to SAP. | Implemented |
| Better communicate the study structure to the students to make it easier to plan individual learning processes | Will be implemented with the study plan. Also there should be an additional meeting along the lines of the “townhall meeting” that informs students e.g. about electives in the next semester. | New Programme |
| Ensure systematic structures for ongoing quality assurance | All requirements of the Quality Policy have been implemented. | Implemented |
| Broaden out the scope of quality assurance, from courses to programmes | All requirements of the Quality Policy have been implemented. Further requirements will be fulfilled on request. The report fails to point at any programme-specific issues in this area. | Implemented |
| Employers' Panel | | |
| More practical experience & data driven design and code | | New Programme |
| Root analysis and theory in design and technology | | New Programme |
| Distribute weight from introductory courses to “deeper” courses | | New Programme |
| Improve marketing | | Ongoing |
| Improve funnel, e.g. new admission process for 2017 | | Ongoing |
| Revise introductory courses | | New Programme |

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| Deeper specialization courses | | New Programme |
| Statistical models | Already implemented in Data Mining course | Done |
| More games for the portfolio | Prototyping course in first semester. | New Programme |
| Designers should learn how to code | Already implemented (in the Programming for Designers course) & emphasized in new programme | Done |
| Coders should learn how to design | Already implemented (Game Design course) | Done |
| Establishment of an internship programme | | Done |
| Realign employment tickets | Done in employment tickets workshop (May 24 2016) | Done |

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Appendix E: Qualification Framework Mapping

Excel sheet available as separate document on request. This mapping just covers the mandatory courses in the programme.

| | Game Prototyping | Games & Culture | Data-Driven Production | Interdisciplinary Project | Master Thesis | D: Programming for Designers | T: Game Programming |
|--|------------------|-----------------|------------------------|---------------------------|---------------|------------------------------|---------------------|
| Programme Objectives | | | | | | | |
| Identify complex problems related to information technology | x | x | X | X | X | x | x |
| Formulate complex problems related to information technology | x | x | X | X | X | x | x |
| Solve complex problems related to information technology | x | | X | X | X | x | x |
| Reflect on complex problems related to information technology | x | X | X | | X | | |
| Assess the underlying technology upon which it is based | x | | | x | X | x | x |
| Apply the underlying technology upon which it is based | X | | x | X | X | X | X |
| Develop the underlying technology upon which it is based | | | x | X | X | | x |
| Assess the scientific theories, methods and tools upon which it is based | x | X | X | x | X | | |
| Apply the scientific theories, methods and tools upon which it is based | X | X | X | x | X | x | X |
| Develop the scientific theories, methods and tools upon which it is based | x | X | x | | X | | |
| Independently initiate and carry out collaborative work in professional and multidisciplinary settings | X | X | X | X | x | x | x |
| Independently engage in global and distributed interaction drawing on research-based perspectives | X | X | X | X | X | X | X |

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| | Game Prototyping | Games & Culture | Data-Driven Production | Interdisciplinary Project | Master Thesis | D: Programming for Designers | T: Game Programming |
|---|------------------|-----------------|------------------------|---------------------------|---------------|------------------------------|---------------------|
| Take independent responsibility for his or her own professional development and specialisation | X | X | x | X | X | X | X |
| Knowledge and understanding | | | | | | | |
| Tools, methods and techniques applicable to the design, development, production, and understanding of games and other playful and engaging experiences, as well as their technological foundations, based on highest international research | X | X | X | x | x | X | X |
| The scientific basis and scientific methods for reflecting on the design, development, production, and understanding of games and other playful and engaging experiences, as well as their technological foundations | x | X | X | x | x | x | x |
| Skills | | | | | | | |
| Design and develop innovative and creative technologies, products and concepts within games, based on scientific analysis and established design methods | X | X | X | x | x | x | X |
| Research, communicate and develop concepts, theories, methods, models and solutions based on scientific analysis of games, their design and development process, and their technological foundations | X | X | X | x | x | | |
| Analyse, communicate, evaluate and select scientific methods, tools and theories supporting the creation of games and other playful and engaging experiences | X | X | x | x | X | | x |
| Competences | | | | | | | |
| Initiate, manage, plan and participate in the complex and unpredictable production process of games within local and global multidisciplinary environments | X | | X | x | x | x | X |

Enclosure 6

| | Game Prototyping | Games & Culture | Data-Driven Production | Interdisciplinary Project | Master Thesis | D: Programming for Designers | T: Game Programming |
|---|------------------|-----------------|------------------------|---------------------------|---------------|------------------------------|---------------------|
| Employ data-based and user research methods to evaluate, refine, assess and make decisions about prototypes and products | x | | X | | x | | |
| Reconcile the limitlessness of creative ideas with the limitations of system requirements based on established design, production and development practices | X | | X | x | x | x | x |
| Further the graduate's skills, knowledge and competences concerning the graduate's specialization in the field of games and other playful and engaging experiences independently and self-determinedly. | X | x | X | X | X | x | x |
| Design Track-specific competences | | | | | | | |
| The graduate can employ, select and adapt a range of design methods and processes to create innovative games and other playful and engaging experiences | X | x | X | x | x | | |
| The graduate can apply programming and computational thinking competences to solve design-related technical challenges | X | | x | x | | X | |
| Technology Track-specific competences | | | | | | | |
| The graduate can select, evaluate, discuss, apply, adapt and develop complex algorithmic and technological solutions in the field of games and game technologies | | | x | x | x | | X |

Programme Objectives

a) Section 1. The purpose of the Master of Science Programme in Information Technology is to provide students with the scientific qualifications to identify, formulate, solve and reflect on complex problems relating to information technology.

QF 1.2

b) Subsection 2. The programme prioritises the student's ability to assess, apply and develop the underlying technology as well as the scientific theories, methods and tools upon which it is based.

QF 2.1 + 2.2

Enclosure 6

- | | |
|---|----------------|
| c) Subsection 3. The student must have the ability to independently initiate and carry out collaborative work in professional and multidisciplinary settings. Furthermore, the student must have the ability to engage in global and distributed interaction, drawing on research-based perspectives. | QF 3.2 |
| d) Subsection 4. On the background of the student's preceding bachelor's programme, the programme provides the student with the qualifications to define his or her own academic profile within the field of information technology and to take independent responsibility for his or her own professional development and specialisation. | QF 3.3 |
| e) Subsection 5. Within the framework of the programme, the student can acquire the requisite individual qualifications for specialised posts in business and industry as well as for research training programmes (PhD programme) in information technology, cf. section 2, subsection 1 of Consolidation Act on Universities (the Danish Universities Act) from the Ministry of Science, Technology and Innovation (consolidation act no. 367 of 25 March 2013) and section 3, subsection 3 of the Order on Study Programmes. | Does not apply |

Programme specific Objectives for Learning Output

Knowledge and understanding

- | | |
|--|-----------------|
| f) Tools, methods and techniques applicable to the design, development, production, and understanding of games and other playful and engaging experiences, as well as their technological foundations, based on highest international research | QF 1.1 + QF 2.2 |
| g) The scientific basis and scientific methods for reflecting on the design, development, production, and understanding of games and other playful and engaging experiences, as well as their technological foundations. | QF 1.1 + QF 1.2 |

Skills

- | | |
|---|--------------------------|
| h) Design and develop innovative and creative technologies, products and concepts within games, based on scientific analysis and established design methods | QF 2.1 + QF 3.1 |
| i) Research, communicate and develop concepts, theories, methods, models and solutions based on scientific analysis of games, their design and development process, and their technological foundations | QF 2.1 + QF 2.2 + QF 2.3 |
| j) Analyse, communicate, evaluate and select scientific methods, tools and theories supporting the creation of games and other playful and engaging experiences | QF 2.1 + QF 2.2 + QF 2.3 |

Competences

- | | |
|--|-----------------|
| k) Initiate, manage, plan and participate in the complex and unpredictable production process of games within local and global multidisciplinary environments | QF 3.1 + QF 3.2 |
| l) Employ data-based and user research methods to evaluate, refine, assess and make decisions about prototypes and products | QF 3.1 |
| m) Reconcile the limitlessness of creative ideas with the limitations of system requirements based on established design, production and development practices | QF 3.1 |
| n) Further her skills, knowledge and competences concerning her specialization in the field of games and other playful and engaging experiences independently and self-determinedly. | QF 3.3 |

Enclosure 6

Technology Track-specific competences

o) The graduate can select, evaluate, discuss, apply, adapt and develop complex algorithmic and technological solutions in the field of games and game technologies QF 3.1

Design Track-specific competences

p) The graduate can employ, select and adapt a range of design methods and processes to create innovative games and other playful and engaging experiences QF 3.1

q) The graduate can apply programming and computational thinking competences to solve design-related technical challenges QF 3.1

| KANDIDATGRADEN_ENGLISH | | | | | |
|---|--|--|--|---|---|
| Knowledge and understanding | | Skills | | | Action s |
| Knowledge field | Understanding and reflection level | Type of skills | Evaluation and decision-making | Communication | Action s |
| Must possess knowledge of one or more subject areas which, in selected fields, is based on the highest international research within a subject area. | Must be able to understand and, on a scientific basis, reflect on the knowledge of the subject area(s) as well as be able to identify scientific issues. | Must master the scientific methodologies and tools of the subject area(s) as well as master general skills related to work within the subject area(s). | Must be able to evaluate and select among the scientific theories, methodologies, tools and general skills of the subject area(s), and set up, on a scientific basis, new analysis and solution models. | Must be able to communicate researchbased knowledge and discuss professional and scientific issues with both peers and nonspecialists. | Must be able to manage work situations and development complex, unpredictable and require n solution mod |
| 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 3.1 |
| New Programme | | | | | |
| f+g | a+g | b+h+i+j | b+f+i+j | i+j | h+k+l+m+o+p |

Enclosure 6

Appendix F: Employment Tickets

The following new employment tickets have been developed with the Employers' Panel in a workshop on May 24th and approved on September 12th. Employment tickets are defined as "something difficult and in demand in the labour market that all graduates of that study programme master" [5]. This means that they form the baseline for an education. Students are expected to go far beyond them, but every single student has to feature the abilities mirrored in the employment tickets.

All graduates will have the ability to:

- Design and implement prototypes of playful and engaging experiences, individually and in teams
- Evaluate, refine, assess and make decisions about prototypes and products through user research, user testing and data-based methods
- Use scientific theories and methods to research, communicate and reflect on complex problems related to games

Additionally, Design graduates will have the ability to:

- Apply, select, discuss and adapt a range of design methods, development processes, and scientific methods, to create games and other playful and engaging experiences
- Excel in computational thinking and apply basic programming
- Develop design innovations in the field of games and playful experiences, based on scientific methods

All Technology graduates will have the ability to:

- Apply, discuss, evaluate, adapt and develop technical concepts, technical solutions, complex algorithms, system architectures and development methods of games and other playful and engaging experiences
- Develop technical innovations in the field of games and playful experiences, based on scientific methods