Welcome!

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Agenda

- Overview of the MSc Innovation Management Program
- Excellence options
- Busting the IM-OML myths
- From IM to Funko 3PL manager
  Ir. Leroy Dumas
- Q&A
The need for Innovation Managers

- Innovation is essential for the competitive position of companies
  - win new customers
  - strengthen loyalty of existing ones
  - start-ups help address customer needs in entirely new ways
- However, many new products and businesses fail
- The competitive environment is dynamic and unstructured, which magnifies wrong managerial choices

The Innovation Management program teaches quantitative and qualitative theories, tools, and techniques to make businesses and entrepreneurs more innovative as well as more successful in their innovation activities.
THE COMPLEXITY AND DIVERSITY OF INNOVATION
Product and Service Innovation

- NPD: portfolio management and strategic decision-making
- HRM: selecting talent, matching skills and tasks, incentivizing, managing teams
- Entrepreneurship: idea generation and opportunity identification
- Entrepreneurship: finance and intellectual property rights
- Business strategy: Alliances, networks, eco-systems, open innovation
- Operations research: supply chain mgmt
- Marketing: launch tactics, sales strategies, after-sales service
- Marketing: market research, customer co-creation
- Information Systems: business intelligence, big data analytics
Innovation Management building blocks

Content
- New product development
- Strategic marketing
- Sales and after-sales service management
- Human resource management
- Business intelligence
- Open innovation
- Entrepreneurship

Methodologies and tools
- MatLab
- Neural & evolutionary computation
- Meta-heuristics for optimization of operational processes
- Econometric valuations
- Real option analysis
- Data Modeling (UML)
- Process Modeling (BPMN)
- Multivariate statistics
- Structural equation modeling
- Data mining
- Computational intelligence
- System dynamics modeling
- Design science methodology
- Calculus; differentiation & integration
## Program: Year 1

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>1ZM16</strong> Management of Product Development</td>
<td>Track Elective</td>
<td><strong>1ZM11</strong> Marketing and Innovation</td>
<td><strong>1ZM130 / 1ZM140</strong> Design Science Methodology and Project</td>
</tr>
<tr>
<td></td>
<td><strong>1JM06</strong> Human Aspects of Innovation</td>
<td>Track Elective</td>
<td><strong>1BM56</strong> Business Intelligence</td>
<td>Track Elective</td>
</tr>
<tr>
<td></td>
<td><strong>1ZM31</strong> Multivariate Statistics</td>
<td>Track Elective</td>
<td><strong>1ZM65</strong> System Dynamics</td>
<td>Track Elective</td>
</tr>
</tbody>
</table>

**Track =** Set of courses on same theme. Select at least 5 out of 9.
Two tracks

Business and Product Creation

Managing Innovation Processes
Two tracks

Three

Business and Product Creation

Dual Degree Or Excellence Track (Top 10%)

Managing Innovation Processes
Business and Product Creation Track

<table>
<thead>
<tr>
<th>Idea Development</th>
<th>Concept Development</th>
<th>Concept-to-Launch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Discovery</td>
<td>Build Business Case</td>
</tr>
<tr>
<td></td>
<td>Scoping</td>
<td>Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Testing &amp; Validation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Launch</td>
</tr>
</tbody>
</table>

Gate 0 | Gate 1 | Gate 2 | Gate 3 | Gate 4 | Gate 5
## Business and Product Creation Track

<table>
<thead>
<tr>
<th><strong>Focus</strong></th>
<th>Front-end of the innovation process, where individuals think about setting up their own business, and where established companies start the development of new and innovative products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key words</strong></td>
<td>Creative idea generation, opportunity identification, entrepreneurial actions, breakthrough projects, radically new products, exploration, new business models, start-ups</td>
</tr>
<tr>
<td><strong>Typical jobs</strong></td>
<td>Product developer, innovation strategist, innovation manager, strategy consultant, business developer, business engineer, entrepreneur (CEO), project manager</td>
</tr>
<tr>
<td><strong>Competencies</strong></td>
<td>Creativity, ability to cope with uncertainty, qualitative research skills</td>
</tr>
</tbody>
</table>
Business and Product Creation Track

**Q2 – 2018/2019**
- 1JM100  Management of organizational change and innovation
- 1ZM20  Technology entrepreneurship
- 1ZM120  Entrepreneurial marketing
- 0HM220  Network society
- 0EM160  Innovation and Intellectual Property Rights

**Q4 – 2018/2019**
- 1BM20  Software requirements management
- 1ZM60  Selling new products
- 1ZM70  Entrepreneurial finance
- 1ZM90  Open innovation

Choose 5 out of 9, you may replace one with a free elective
Business and Product Creation Track

Current students: Why did you pick this track?

• “I am more interested in the creation of new products and businesses. I have already started multiple small businesses and I want to enhance myself in doing this.”
• “I am an entrepreneurial student. I'm always working on business. For example I am now starting a company called X. Another clear reason is because I am a creative person. I'm always looking for new things.”
• “I think that business and product creation will always be done almost entirely by people rather than software packages. So, in order to secure my future as much as possible, I think it is also the best choice to choose for a branch which will be mostly dependent on people.”
## Managing Innovation Processes Track

<table>
<thead>
<tr>
<th>Focus</th>
<th>Larger innovation projects (in terms of budget) and decisions that managers have to make to move new products through the development stages and finally launch it on the market, including the monitoring and continuous improvement of product/service performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key words</td>
<td>Marketing research, marketing strategy, process management, product lifecycle management, big data intelligence, sales and after-sales service management, product quality and reliability</td>
</tr>
<tr>
<td>Typical jobs</td>
<td>Business analyst, marketing manager/consultant, key account manager, sales manager, service manager, manager R&amp;D department, project manager, strategic buyer, purchasing and supply chain manager</td>
</tr>
<tr>
<td>Competencies</td>
<td>Planning and optimization, systematic, quantitative research skills</td>
</tr>
</tbody>
</table>
Managing Innovation Processes Track

Q2 – 2018/2019
- 1BM05 Business process management
- 1JM30 Managing team dynamics and team performance
- 1JM100 Management of organizational change and innovation
- 1ZM40 Strategy & technology management
- 1ZM55 Service engineering & marketing

Q4 – 2018/2019
- 1JM21 Designing effective performance management systems
- 1CM15 Project and process management
- 1ZM60 Selling new products
- 0EM190 Infonomics

Choose 5 out of 9, you may replace one with a free elective
Current students: Why did you pick this track?

- “The monitoring and improvement of a product sounds interesting to me. I also like that it still holds on more to the logistic side of the Industrial engineering bachelor.”
- “I am more motivated to launch products on the most optimal market, in the most optimal form, at the most optimal time, through the most optimal channels.”
- “I would like to work on large innovation projects in larger companies instead of starting my own entrepreneurial company. Besides that, I am more interested in quantitative research. Also in the future I hope to work as a manager or consultant and not as a developer.”
## Program: Year 2

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Elective (may be international)</td>
<td>Free Elective (may be international)</td>
<td>Master thesis</td>
<td></td>
</tr>
<tr>
<td>Free Elective (may be international)</td>
<td>Free Elective (may be international)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free Elective (may be international)</td>
<td>Free Elective (may be international)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
International Semester options

- Technische Universität Darmstadt, Germany
- Karlsruhe Institute for Technology, Germany
- Technische Universität München, Germany
- Hamburg University of Technology, Germany
- Universität Duisburg-Essen, Germany
- University of Augsburg, Germany
- University of Passau, Germany
- Université Catholique de Louvain, Belgium
- KU Leuven, Belgium
- Universiteit Gent, Belgium
- Royal Institute of Technology Stockholm, Sweden
- Chalmers University of Technology, Sweden
- Linköping Institute of Technology, Sweden
- Aalto University, Helsinki, Finland
- Lappeenranta University of Technology, Finland
- Norwegian Institute of Technology, Trondheim, Norway
- Danmarks Tekniske Universitet, Kopenhagen
- Seeburg Castle University, Salzburg, Austria
- Politecnico di Torino, Italy
- Politecnico di Milano, Italy
- Roma Tor Vergata, Italy
- UCP Barcelona, Spain
- Universidad Politécnica de Madrid, Spain
- Universidad Politecnica de Valencia, Spain
- Universidade de Lisboa, Portugal
- Institut National Polytechnique de Grenoble, France
- Ecole Nationale Supérieure des Mines de Saint Etienne, France
- Lodz University of Technology, Poland
- University of Ljubljana, Slovenia
- Universida de Porto, Portugal
- Polytechnique de Montreal, Canada
- University of Manitoba, Canada
- Bogazici University, Istanbul, Turkey
- Koc University, Istanbul, Turkey
- Ankara Bilkent University, Turkey
- Istanbul Technical University, Turkey
- Beijing Institute of Technology, China
- Zhejiang University, China
- Bandung, Indonesia
- National University of Singapore
- Korea Advanced Institute of Sc and Tech, Daejon, South Korea
- Ulsan National Institute of Science and Technology, South Korea
- National Taiwan University of Science and Technology
- National Tsing Hua University, Hinchu, Taiwan
- American University in Cairo, Egypt
- University of Pretoria, South Africa
- University of Johannesburg, South Africa
- Instituto Tecnologico de Buenos Aires, Argentina
- Tecnológico de Monterrey, Mexico
- Universidad de Los Andes, Bogota, Colombia
- Universidade de Sao Paolo, Brasil
- Unicamp, Brasil
- Federal University of São, Brasil
- Instituto Tecnologico de Buenos Aires, Argentina
Options:
1. Dual degree
2. Excellence track
3. Honors academy
1. Dual Degree

- Allows you to complete two masters
- Currently popular combinations:
  - Innovation Management – Innovation Sciences
  - Innovation Management – Operations Management and Logistics
- Other “logical” combinations:
  - Innovation Management – Human Technology Interaction
  - Innovation Management – Industrial Design
  - Innovation Management – Mechanical Engineering
  - Innovation Management – Medical Engineering
  - Innovation Management – Computer Science and Engineering
1. Dual Degree

- Program suggested by student and validated by two program managers
- Program consists of minimum 165 ECTS, maximum 195 ECTS
- Satisfies minimum demands of two Master programs, for IM
  - 6 core courses 30 ECTS
  - 4 track elective courses 20 ECTS
  - 1 track design project 5 ECTS
- Thesis
  - 45 ECTS
  - Features topic on intersection of the two Master programs
  - Two mentors, one from every Master program in the dual degree
2. What is an excellence track?

- A special program integrated with a M.Sc. Program for selected excellent and ambitious students
- To develop advanced capabilities for
  - Research in Industrial Engineering
  - Design in Industrial Engineering / Data Science
- To facilitate better entrance into
  - The PhD Program for researchers
  - The PDEng Program for designers
What does an excellence track contain?

- A number of special courses
  - with a total load of 30 ECTS
  - 10 ECTS within the standard 120 ECTS
  - 20 ECTS on top of the standard 120 ECTS

- Two options
  - Track in research
  - Track in design
IE Excellence Track in Research

- Consists of:
  - Two mini-research projects to discover two different research fields, in first year (5 ECTS per project)
  - PhD courses, in second year (10 ECTS)
- Master thesis project:
  - Is preceded by the writing of a PhD research proposal (instead of literature study and formulation thesis assignment)
  - Proposal can be used to compete for grants (at e.g. NWO)
  - Master thesis is first part of the PhD research
- Additional PhD courses can be followed in second year of master, as part of the electives
IE Excellence Track in Research: Advantages

• Development of extra research skills
• Ideal preparation for continuation as PhD student after completion of the master program
• Priority for positions within the PhD program of Industrial Engineering (but, we give no guarantee)
• PhD program can be completed in 3 instead of 4 years
• Equivalent to research (Mphil) masters, as seen at Tilburg University and Erasmus University
IE Excellence Track in Design

• 30 ECTS choice from PDEng courses:
  • Program currently in transition
    – from Industrial Engineering (IE, TU/e)
    – to Data Science for IE (JADS, Den Bosch)
  • Programmatic details under elaboration
IE Excellence Track in Design

- If completed successfully, access to the PDEng program
  - Currently being repositioned from IE to JADS
- On a contract to prepare for and execute a design project for a specific company
- Supervised by design mentor
Contact

- Further information research track
  - Research Director IE, Prof.dr.ir. Paul Grefen
  - Applications: contact research director or a full professor (who will be your mentor)
  - Criteria for selection: top 10% of the IE students, research attitude

- Further information design track
  - Director PDEng Program IE, Prof.dr. Tom van Woensel
  - Applications: contact director
  - Criteria for selection: top 30% IE students, design attitude
3. Honors Academy

• IE Excellence Track can be combined with enrollment in TU/e Honors Academy
• HA offers a program for development personal skills – with a load of 5-20 ECTS
• If combined with IE-ET, we advise 5 ECTS HA + 15 ECTS HT on top of regular program
• Enrollment for excellent students, via Research Director (prof.dr.ir. Paul Grefen)
Myth 1: IM is “soft” and “fuzzy”

- 1ZM31 Multivariate Statistics is full core course in IM, only part of 1JM110 Research Methods in OML
- 1BM56 Business Intelligence is core course in IM, elective in OML
- 1ZM65 System dynamics is core course in IM, elective in OML
- OML has two core courses by HPM, IM has one

IE&IS Alumnimonitor 2015:

<table>
<thead>
<tr>
<th></th>
<th>IM (n = 40)</th>
<th>OML (n = 51)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory / practice ratio</td>
<td>2.58 (sd = 0.59)</td>
<td>2.55 (sd = 0.73)</td>
</tr>
<tr>
<td>Depth and detail</td>
<td>3.00 (sd = 0.55)</td>
<td>3.06 (sd = 0.68)</td>
</tr>
<tr>
<td>Apply skills to solve engineering problems</td>
<td>3.75 (sd = 0.95)</td>
<td>3.94 (sd = 0.73)</td>
</tr>
</tbody>
</table>
Myth 1: IM is “soft” and “fuzzy”

- Some course evidence: Black-Scholes formula

\[ c = SN(d_1) - Xe^{-rT}N(d_2) \]

where

\[ d_1 = \frac{\ln(S/X) + (r + \sigma^2/2)T}{\sigma \sqrt{T}} \]
\[ d_2 = \frac{\ln(S/X) + (r - \sigma^2/2)T}{\sigma \sqrt{T}} = d_1 - \sigma \sqrt{T} \]

S = Current stock (or “underlying asset” price)
X = Exercise (or “strike”) price
T = Time to expiration (in years)
R = Annualized riskfree rate (continuously compounded = log)
\( \sigma \) = Volatility (annualized standard deviation of log returns)
N(d) = Cumulative normal distribution evaluated at d
Myth 1: IM is “soft” and “fuzzy”

- Some course evidence: 1ZM65 System Dynamics logistic growth model

Net Birth Rate = \( g^* \left( 1 - \frac{P}{C} \right) P = \frac{dP}{dt} \)

\[
\int \frac{dP}{(1 - \frac{P}{C})P} = \int g^* dt
\]

\[
\ln\left( \frac{P}{C} \right) - \ln\left( \frac{P_0}{C} \right) = g^* + \ln(4) - \frac{1}{C} \cdot P_0
\]

\[
P(t) = \frac{P_0}{1 + \left( \frac{P_0}{C} - 1 \right) \exp(-g^* t)}
\]
Myth 2: IM is easier than OML

• Passing rates (2015/2016):

<table>
<thead>
<tr>
<th>Course Type</th>
<th>IM</th>
<th>OML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core courses</td>
<td>87.8%</td>
<td>91.8%</td>
</tr>
<tr>
<td>Electives</td>
<td>91.5%</td>
<td>87.7%</td>
</tr>
</tbody>
</table>

• IE&IS Alumnimonitor 2015:

<table>
<thead>
<tr>
<th>Course Type</th>
<th>IM (n = 40)</th>
<th>OML (n = 51)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty of curriculum</td>
<td>2.95 (sd = 0.55)</td>
<td>2.96 (sd = 0.63)</td>
</tr>
</tbody>
</table>

• IM expert needs theoretical insight, modeling skills, and analytical skills. Bringing these together is a challenge!
Myth 2: IM is easier than OML

But what about courses that both IM and OML students follow? Do OML students do better?

<table>
<thead>
<tr>
<th>Course</th>
<th>IM</th>
<th>OML</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM56 Business Intelligence (2016/2017)</td>
<td>89%</td>
<td>95%</td>
</tr>
<tr>
<td>1BM11 Marketing and Innovation (2015/2016)</td>
<td>90%</td>
<td>83%</td>
</tr>
</tbody>
</table>

However, in the above examples, the passing rates for IM and OML students are not consistently higher for one group over the other.
Myth 3: IM provides a poorer career perspective than OML

Profit = Revenue - Cost

To increase this...
... increase this...
... or decrease this
Myth 3: IM provides a poorer career perspective than OML

- IE&IS Alumnimonitor 2015:

<table>
<thead>
<tr>
<th></th>
<th>IM (n = 40)</th>
<th>OML (n = 51)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start salary</td>
<td>2531</td>
<td>2750</td>
</tr>
<tr>
<td>(average, gross in Euro’s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First job search duration</td>
<td>1.23</td>
<td>1.58</td>
</tr>
<tr>
<td>(average, in months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fit between education and first job</td>
<td>3.47 (sd = 1.28)</td>
<td>3.85 (sd = 0.88)</td>
</tr>
<tr>
<td>Current contract hours</td>
<td>39.76</td>
<td>39.60</td>
</tr>
<tr>
<td>(average)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction in current job</td>
<td>4.28 (sd = 0.86)</td>
<td>4.02 (sd = 1.02)</td>
</tr>
<tr>
<td>(5 point scale)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Career perspectives of current job</td>
<td>3.44 (sd = 0.68)</td>
<td>3.15 (sd = 0.82)</td>
</tr>
<tr>
<td>(4 point scale)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Myth 3: IM provides a poorer career perspective than OML

Nuttig advies
Met hun studietijd nog vers in het geheugen, hebben Leanne en Joost als afsluiting bruikbaar advies voor de huidige generatie studenten. Leanne: “Het meest waardevolle advies dat ik ooit heb gekregen is dat je altijd naar jezelf moet luisteren. Doe dingen die je leuk vindt. Niet alleen qua nevenactiviteiten maar vooral ook qua vakken en de masterrichting die je kiest. Zoals je hebt gezien hebben Joost en ik een andere master gevolgd met totaal andere keuzevakken en toch vervullen we dezelfde functie. We kiezen weliswaar andere projecten, gezien onze interesses, maar we zijn allebei opgeleid met dezelfde analytische, oplossingsgerichte vaardigheden.”
Myth 3: IM provides a poorer career perspective than OML

- Some IM graduates of the past couple of years...
Myth 4: OML has a better reputation than IM

Beste studies (2017)
Yearly evaluation of masters by students

<table>
<thead>
<tr>
<th></th>
<th>IM</th>
<th>OML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
<td>55</td>
<td>61</td>
</tr>
<tr>
<td>Education</td>
<td>76</td>
<td>73</td>
</tr>
<tr>
<td>Structure of program</td>
<td>81</td>
<td>79</td>
</tr>
<tr>
<td>Lecturers</td>
<td>74</td>
<td>72</td>
</tr>
<tr>
<td>Assessment</td>
<td>82</td>
<td>81</td>
</tr>
<tr>
<td>Organisation and communication</td>
<td>58</td>
<td>66</td>
</tr>
<tr>
<td><strong>FINAL VERDICT</strong></td>
<td><strong>71</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>

Scores: 0 - 100
Myth 4: OML has a better reputation than IM

Yearly evaluation of masters by experts and students

<table>
<thead>
<tr>
<th></th>
<th>IM</th>
<th>OML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact hours</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Content</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Lecturers</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Academic profile</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Practice oriented</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Study load</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Communication</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Facilities</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ambition</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Examination policy and final level of students</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>FINAL VERDICT</strong></td>
<td>70</td>
<td>64</td>
</tr>
</tbody>
</table>
RECAP OF TODAY’S INFORMATION
http://www.im-master.nl