S.HE GOES DIGITAL- GETTING WOMEN INTO IT BY DESIGN

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EPD Feedback Loop

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SUMMARY

In Belgium today, there is both a shortage of ICT professionals and a massive under-representation of women in the sector. The Vrije Universiteit Brussels (VUB) are attempting to address this issue through the creation of an Executive master's programme, a short 6-month programme targeted at women who are approaching the end of a non-STEM master's degree. The objective of the programme is to provide enough foundational knowledge of the IT subject area to support students' transition into the profession.
The programme is designed to build self-confidence, dispel misconceptions, and empower women to enter what may be perceived as a male-dominated IT sector. The programme certification provides sector hiring managers with the formal and certified proof of a student's capabilities. For this reason, it was decided to change the programme name to the gender-neutral "Executive Master in IT essentials".

CONTEXT

Women in IT-related professions in Belgium currently represent only 3% of the sector. Meanwhile, the increasing digitization and automation of society has created a growing need for trained ICT professionals. This lack of gender diversity not only creates problems within the IT sector, but more importantly, also means that many women cannot realize their dreams nor their potential. As the number of STEM students is static, increasing the size of the talent pool by including women, should solve at least part of this problem.

Our original objective in designing the "S.HE goes digital" was to boost the number of women with IT qualifications, an altruistic initiative started by three alumni of the VUB and ULB university. The approach that was taken was to create an "executive master" - a short 6-month programme of about 30 ECTS credits – which was targeted at women at the end of a non-STEM master's degree[1]. The objective of the programme is to give non-STEM students enough holistic IT culture to become so-called "bridge builders", who are professionals that link their field respective field of expertise (it could be accounting, operations, HR, …) to the domain of IT. There is a strong need for these kinds of profiles due to the strong drive to automation by means of algorithms and AI.

[1] The programme targets at least 50% women. In the first edition, the balance was closer to 90%

These professionals should have a conceptual understanding of IT and be able to translate between business requirements and IT.

The main reasons for choosing this programme format were threefold. First, it allowed any student finishing a non-STEM master's degree, and with an interest in IT, to get enough "IT culture" to apply for several roles within the IT sector, with minimal extra investment. Furthermore, it was designed to build self-confidence, dispel misconceptions, and empower women who may feel excluded from a perceived male-dominated IT sector. Thirdly, it provided confidence to IT hiring managers that these students had formal and certified proof of their capabilities.

Overview of the programme learning goals

The programme looks as follows, with technical modules indicated in blue, interdisciplinary ones in green, and methodological ones in yellow. The case studies are indicated in black, as bringing the students in contact with different views and people:

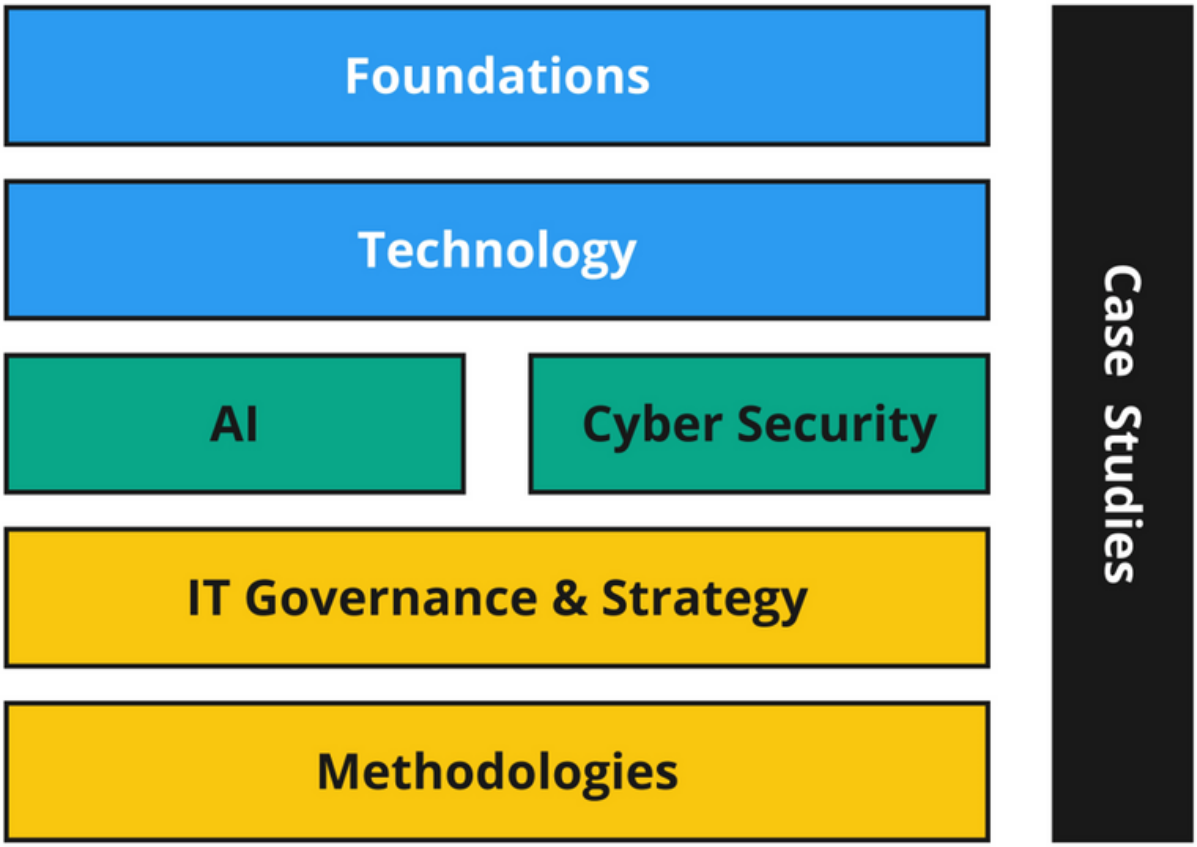
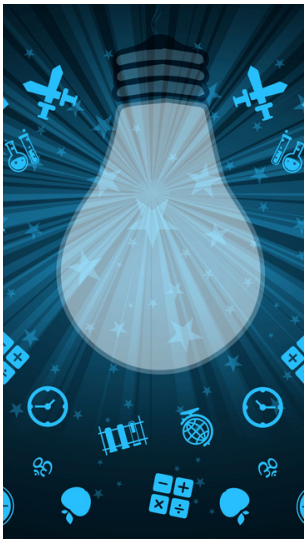


Figure 1: programme learning goals chart

Course 1: The **Foundations** course covers computational thinking, teaching the fundamental principles of computing, programming languages, the structure of information, and abstraction. It also introduces students to the pioneers in the field and the history of computer science. Lastly, the topic of problem solving is discussed, alongside fundamental algorithmic paradigms such as data structures, trees, graphs, and algorithms.



Course 2: A second course covers the **technological** aspects of IT, including hardware, cloud computing, sensors, IoT, databases, encryption, networking and services.

Course 3 & 4: The master's program has a special focus on emerging technologies - namely **Artificial Intelligence** and **Cyber Security** – taught in two dedicated modules that provide a comprehensive overview of these fields.

Course 5: A fifth course looks at IT from an **organisational, societal and sectoral** perspective: how are IT departments structured? How is the ecosystem organised? What does the Open Source Movement encompass? What regulation exists? What are the ethical and societal implications of IT? As a core part of this course, industry practitioners are invited to give a diversity of perspectives.

Course 6: Course 6 pays paricular attention to **methodology**. What methodologies exist? What is design thinking and how can it help? How can we organise interdisciplinary collaboration? How are processes managed such as product management, software development, software documentation, and user experience?

Course 7: A final course explores how IT/digital can **solve real-world issues**. This course pays particular attention to the role of digital, the role of women in IT, and the existence of issues like bias, diversity, gender and equality in IT.

As the industry expressed a strong interest in internships, an optional internship was included – either within the company that the student works, or an external one.

Labour-market information was employed, both explicitly and implicitly, to identify and develop the learning goals. They are broadly divided into vertical, content-specific goals, and horizontal/cultural goals.

The horizontal learning goals are:

1.Feel comfortable in IT environments

a.Understand the vocabulary, the lingo, the roles & jobs the culture

b.Know who to talk to in an IT company (roles), who does what

c.Understand executive summaries of documents across IT organisations

2.Translate and bridge business to technology

a.Talk to business owners, collect their needs and translate for software architects

b.Translate a technical issue in layman's terms and vice versa

c.Understand the impact of a requirement/user need, being able to estimate the feasibility - Assess how difficult a change request is, how much time it will take

d.Understand the limits of technology and the impact on requirements / functionality

3.Manage and communicate on your projects in the digital era

a.Explain a blog, understand a job description - interview a candidate for a role

b.Apply or understand the lean start-up & other methodologies (XP, agile, ...)

c. Identify where things can go wrong

Pedagogical approach

There was a shared enthusiasm and identification of the need for interactive learning experiences that are adapted to IT culture but that also focus on the development of soft and interdisciplinary skills. For this reason, preference is given to active learning formats, including:

·'War Stories'– real stories of IT implementations, experienced by the lecturer or speaker, with a post-mortem analysis of what went wrong, what went well, and lessons learnt.

·'Games & Demonstrators' – one of the key expertise of the AI lab of the VUB is the creation of games & demonstrators, to explain about AI and its impact as well as to showcase the newest research trends.

·Microprojects and situated learning workshops – situated learning experiences to deepen the understanding of the learning material and make teaching more adapted to the application at work.

·Interaction w/ professionals - anthropological sessions in companies, e.g. walk along with an expert in the company as well as roleplay with people from industry.

·A coding project to apply the concepts that were taught.

Recruitment of students

A final note on the recruitment of students. Originally, direct marketing and more traditional methods of open recruitment were planned. However, as we progressed through the programme development stages, it emerged that “two-tiered” recruitment, with sectorial organisations (like FINBEL, Agoria, …) and unemployment offices (Actiris in the case of Brussels) buying seats for the programme, was a more effective solution. In this case, they are responsible for recruitment within their respective organisations. In the first year, we started off with 30 students, of which 6 men.

METHODOLOGY AND IMPLEMENTATION

Process

The process for launching the "S.HE goes digital" programme can be divided into three phases:

Phase 1: Initiation. The idea for the programme was conceived by 3 (female) alumni from the two Free Universities of Brussels, VUB and ULB, currently at work in industry. As such there was a direct connection between the academic world and private sector. At this stage, value alignment was central to the efforts, as well as creating a small but committed group of ambassadors within the university, as the programme was to be legally organised by the university. These ambassadors had an affinity with industry and understood the challenges that the programme wished to solve, as well as the "lifelong learning" context. We will address this latter issue in the "Challenges section".

Phase 2: Definition. Next, a "charter" was designed at a high-level to protect the values shared by the group. Three light working groups were created: one on programme development, one on marketing and one on finance. This intermediate level of detailing the curriculum was crucial because it served as a mediator between the academic world taking care of implementation, and the needs of the business.

Phase 3: Implementation. Finally, a wider group of stakeholders was involved, and the detail of the programme content was mapped out by those responsible for the academic coordination of the programme at the university level (ie. lecturers, deans etc.). This phase also involved creating the necessary legal documents required by the university and government and guiding the programme's development and approval through both universities' administration procedures. This was quite an arduous process with buy-in required from both bottom-up and top-down levels from departmental level, educational programme, and faculty to university-wide strategic level).

Success factors

I would identify the following key factors in the programme's ultimate success:

1. External drivers. The programme was initiated, and the case made, by people in industry who were confronted daily with the problem we wanted to solve and who were, therefore, extremely motivated to solve it.

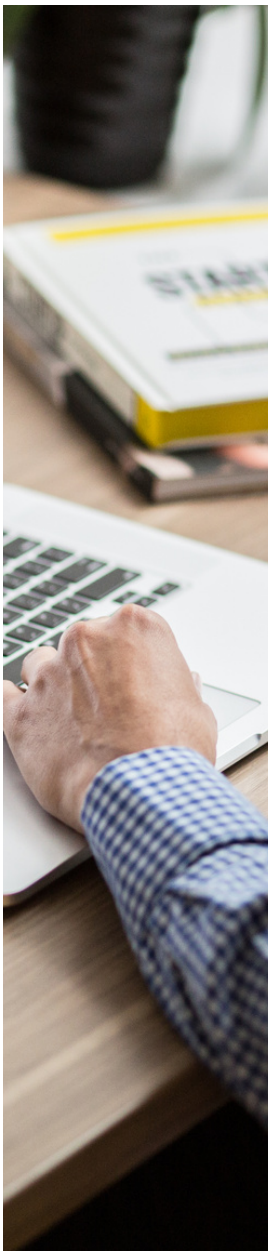
2. High-level support. The rectors of both universities were strong supporters of the idea, backing the development of the programme, but without intervening within university governance processes or strongarming decisions.

3. Allocation of administrative resources. This allocation of significant administrative resources from the earliest stages of the project was key to fulfilling all the relevant governance and approval requirements and to coordinate the many stakeholders involved.

4. Freedom in programme development. From the earliest stages of the project, there was a complete freedom to define the programme, which allowed us to develop a programme that met a real need from the labour market.

5. Stakeholder involvement. The awareness and articulation of the most relevant needs for the programme was present because of intense stakeholder involvement and relationships with the IT sector. As part of this stakeholder engagement, surveys were administered among IT professionals to better understand their needs. An HR roundtable was also organised to discuss potential solutions. The standards and ontologies of key sector organisations were also kept in mind throughout the process. Also, at a personal level, the people responsible for defining or elaborating the program had all worked both in academia and industry.

Challenges



I would argue that the main challenges in our case were organisational, and related to the new needs that lifelong learning poses. These challenges include:

1. Alignment with the university KPIs. How to create enthusiasm among university staff when teaching or organising the programme does not align with KPIs from the institution, and thus introduces a potential opportunity cost.

2. Finding teachers. The existing lecturers were already fully occupied, but the university rules require them to be responsible for the programme to ensure quality control and approval. This is even more problematic in other situations where a course does not carry ECTS credits, often the case for lifelong learning activities.

3. Schedules do not align. Most university processes are aligned with semester schedules (for example rostering, or setting up learning management systems).

4. Agility. Traditional university courses run over longer periods of time like a semester and content changes slowly. Our courses were much shorter - 5 to 10 weeks long – and needed to remain responsive to industry demands.

5. Balancing meeting industry demand and providing solid foundations that last for decades. The question how to divide the learning that happens within universities and at work, remains a difficult problem. A healthy symbiotic relationship is preferred, but not often easy to find.

The other main challenges we faced related to the different pedagogical context of lifelong learning – some that still need a satisfying answer:

1. Teaching to lifelong learners. Many teachers are not used to teaching adults, but rather to younger students that have followed a common school-level curriculum and thus share a common background. Also, the learning goals are imposed by the institution, which is absolutely not the case with lifelong learners. Lastly, while traditional students are expected to spend most of their learning time at home and on their own initiative, in corporate training, students expect to learn everything during the training.

2. Content. Often, teaching to lifelong learners requires a different pedagogical approach, and new content. This makes the quality-centred university organs feel uncomfortable: as the content is not covered by existing courses (taught in the regular university curriculum), how can we trust the quality? Does it mean our current programs are incomplete?

3. Examination and quality control. Traditional exams do not always make sense when students come from a different background and have different learning goals. The traditional model with fixed learning goals and fixed examination per student to verify the learning comes under pressure. How will universities then guarantee the quality of the learning outcomes for their students if they differ for each student? Is it acceptable to measure learning goal, regardless of the learning goals?

ANALYSIS AND EVALUATION

The following criteria will be used to evaluate the effectiveness of the program:

1. Feedback from graduates, gauging usefulness, relevance and effectiveness for their job.
2. Referrals.
3. Mutations of graduates to IT-roles within the company.
4. Hiring of graduates in IT-roles.
5. Public mentions of the programme.

REFLECTION AND NEXT STEPS

The lessons learnt from the development and delivery of our new Executive Master in IT essential scan be summarised in three parts:

Lesson 1. Still a large distance between academia and industry

First, when coping with the problem of defining a curriculum adapted to labour market needs, it is important to realize that the work has often already been done. Sectorial organisations (like ACM, IEEE in IT and engineering), standardization bodies and consultancies (like Gartner), typically have working groups and publications explaining the needs and trends of the labour market, and often even summarizing possible initiatives and solutions. Often, this literature is even known by academics.

The problem lies typically with a disagreement on the solution. There is not a common view on whether it is the role of academia to fill this gap, or whether an academic programme is the correct solution.

Which brings us to a lack of mutual affinity and discoverability. The issue is not that there is an unwillingness to work together towards a solution, and even less that the necessary knowledge is available. Rather, there is an unawareness of the problem. The academic categories are inexistent, and similarly, industry professionals are unaware of the fact that some problems have already been solved in academia.

Lesson 2: Need for high-level and administrative support to facilitate change management

Moving into lifelong learning or, takes time and a change in mindset for academic personnel that are used to regular semester programmes with homogeneous groups of students and fixed learning outcomes. Support from the highest levels of the university, as well as from people who are aware of the politics and sensitivities within the organisation, is essential to overcome the friction that may occur. According administrative and legal support is therefore often lacking and should be provided.

Lesson 3: Curriculum, positioning and marketing interact

Implementing a new programme, introduces two kinds of friction. First, fears of cannibalisation of existing degrees and their potential students (and thus impacting established power relations); and secondly, fears of a lack of market interest and financial sustainability.

In the case of “S.HE goes digital”, these fears were mitigated or avoided by:

- targeting an audience that is currently not yet served by the University (teaching IT to non-STEM students)
- collaborating with an intermediary sector and unemployment organisations to attract students rather than targeting the students directly. Similarly, time schedules, pricing, examination formats and many more details were defined after “contact” with the target audience, rather than being imposed from the outset by the curriculum designer.

HYPERLINKS & SUPPORTING DOCUMENTS

https://www.ulb.be/en/programme/fc-831

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