Hogeschool Rotterdam Business School & the Future of Dutch Business Education

Industry Horizons

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I. Preface

This report is based on a research project conducted by students of the (English-taught) Rotterdam University of Applied Sciences' International Management & Consultancy programme for Hogeschool Rotterdam Business School (HRBS) that was completed in 2019. As part of this programme, six groups of four to five students have studied historical and current trends and forecasts about their future to develop (1) scenarios of the HRBS' business environment in 2025 and (2) a strategic roadmap to prepare the HRBS for each of these environments. The contents of this reports provides a critical summary and elaboration (on some points) of their best work.

As this report was being finalized, higher education was disrupted by the COVID-19 measures in a way that no one could have foreseen or even fathom when the students completed their research in the first half of 2019. To the sceptic, this unforeseen disaster may seem like a perfect argument against the practical value of using scenarios for long-term strategic planning – for if they fail to incorporate such an incredibly disruptive event, how useful and reliable does that make them!? In response we readily admit that neither the students nor the authors did not see COVID-19 coming or thought about this as an important possibility. Yet we would also stress that the approach of scenario-based strategy formation that we have followed neither pretends to forecast the future nor to capture all the potential factors that could come to play (such) a decisive role at some point in future (as COVID-19).

Scenario-based strategy formation focuses on factors and trends that can already be discerned as (potentially) having a significant strategic impact in the future, but are still uncertain in terms of how they will play out. In that sense, the future potential impact of much of the factors, trends and developments that have been studied by the students and did make their way in this report are either unaltered by COVID-19 or affected in ways that still fit the bandwidths of possibility within which the scenario's in chapter four have been defined. COVID-19 has presented higher education with a crisis that was unprecedented in terms of its impact at the operational and tactical level and the suddenness with which it struck. The factors, trends and developments that have been studied here could – in some of the scenarios that we have developed – pose unprecedented strategic challenges for the HRBS. And although the good news is that these challenges will, in all likelihood, not force themselves upon us as quickly as COVID did, ignoring them for too long could result in a strategic crisis that cannot be survived by hard work and decentralized adaption of individual organizational members alone.

We would like to thank all the students in the programme for their contributions to the research reports that we have used as a foundation for this report. And we would be remiss if we did not give special thanks to Wesley Kruijthof, who – after participating in and completing the programme as a student – has stayed on to help us write this report as a co-author. Without his work on the section about the impact of automation, digitalization and artificial intelligence on the general skills profile that the labour will demand from business graduates in the future, this report would not be.

Daan Gijsbertse, Wesley Kruijthof & Arjen van Klink

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Table of Contents

II. Managementsamenvatting (Dutch)

Studenten van het minorprogramma International Management & Consultancy hebben in het studiejaar 2018-2019 toekomstscenario's voor de HR Business School opgesteld. Aanleiding was de vorming van de Hogeschool Rotterdam Business School (HRBS) vanuit drie onderwijsinstituten van Hogeschool Rotterdam en de gevoelde noodzaak na te denken over het onderwijsconcept in het licht van recente en toekomstige ontwikkelingen in de externe omgeving.

Het onderzoek is uitgevoerd met behulp van de scenario-gebaseerde strategieontwikkelingsmethode van De Ruijter (2016). Eerst zijn trends en ontwikkelingen die relevant zijn voor de HR Business School geïdentificeerd en geclusterd naar impact en onzekerheid. Vervolgens zijn vanuit deze trends en ontwikkelingen vier toekomstscenario's voor het hoger beroepsonderwijs binnen het Economisch Domein in 2025 geschetst. Daarna is via stresstests bepaald wat het effect van elk van deze toekomstscenario's op de strategische positie en de huidige plannen van de HR Business School zou zijn. Tenslotte is een strategische roadmap opgesteld waarmee de business school zich beter op elk van de verschillende scenario's kan voorbereiden.

Vanuit een brede inventarisatie hebben de studenten ruim twintig clusters met trends en ontwikkelingen rondom strategische sleutelvariabelen opgesteld. Twee van deze clusters scoren het hoogst op impact en onzekerheid en vormen de basis van dit rapport:

1. De *inhoud* van het onderwijs: welk effect hebben automatisering, digitalisering en artificiële intelligentie op de set aan vaardigheden die de arbeidsmarkt van afgestudeerde bedrijfskundigen vraagt?
2. De *vorm* van het onderwijs: wat wordt het toekomstige marktaandeel van verschillende (nieuwe) onderwijsmodellen als gevolg van veranderingen in wet & regelgeving, innovatie van hogescholen en nieuwe toetreders en mogelijk veranderende eisen die werkgevers in hun wervingsbeleid aan startkwalificaties stellen.

Voor beide sleutelvariabelen zijn eerst de belangrijkste determinanten (de drijvende krachten die deze sleutelvariabelen beïnvloeden) bepaald. Vervolgens is de historische ontwikkeling van de sleutelvariabelen en deze determinanten op basis van historische data beschreven. Tot slot zijn de mogelijke uitkomsten van toekomstige ontwikkelingen in deze determinanten in kaart gebracht op basis van de plannen van relevante stakeholders uit de transactionele omgeving en voorspellingen van experts met betrekking tot dominante factoren uit de contextuele omgeving van de HRBS. Deze mogelijke uitkomsten zijn per sleutelvariabele samengevat binnen een bandbreedte van twee mogelijke extremen.

Met betrekking tot de inhoud van het onderwijs bestaat de eerste extreme erin dat er geen significante doorbraken op het gebied van kunstmatige intelligentie. Daardoor zetten trends op het gebied van de automatisering en digitalisering van werk die er anno 2019/20 zichtbaar zijn wel door, maar vinden er geen disruptieve substitutie van menselijke werkzaamheden plaats. Digitale vaardigheden worden belangrijker en bedrijfskundigen werken in toenemende mate met en aan het op maat maken van domein-specifieke systemen. Technologische skills (met name de digitale vaardigheden die nodig zijn om met domein-specifieke systemen te werken) zijn hierdoor het belangrijkst.

De andere extreme met betrekking tot de inhoud van het onderwijs is dat een grote doorbraak op het gebied van kunstmatige intelligentie aan het begin van de jaren '20 en de adoptie daarvan op een veel ingrijpendere wijze het werk verandert. Systemen voeren niet alleen veel van het werk uit, maar leren grotendeels zonder supervisie om bij te sturen en zelf tactische beslissingen te maken. Bedrijfskundigen die met deze systemen werken monitoren hen op basis van *management by exception*. De aard van het werk verschuift van operationele uitvoering en tactische besluitvorming van deelgebieden naar cross-disciplinair beheer op strategisch niveau en innovaties op het gebied van beleving en betekenisgeving op sociaal

niveau. Hierdoor worden hogere orde cognitieve, creatieve en sociale vaardigheden belangrijker dan technologische vaardigheden.

Ten aanzien van de vorm van het hoger beroepsonderwijs bestaat de eerste extreme erin dat het marktaandeel van 'blended learning' is toegenomen ten koste van het traditionele model, maar dat het traditionele onderwijsmodel van een vier jarige discipline-specifieke bacheloropleiding die nominaal doorlopen wordt nog steeds. Het deeltijdonderwijs is wel flexibeler geworden in termen van tijd & tempo waarmee deeltijdstudenten hun programma (mogen) volgen. Havisten en mbo'ers die doorstuderen op het hbo kiezen echter nog steeds grotendeels voor voltijd opleidingen en het speelveld bestaat nagenoeg nog steeds uit dezelfde bekostigde en onbekostigde instellingen als in 2019/20.

De andere extreme is dat het hoger (beroeps)onderwijs qua vorm in veel verdere mate is geflexibiliseerd en zelfs tot op zekere hoogte (voor een deel van de totale studentenpopulatie) gefragmenteerd is geraakt. Wet- en regelgeving maken een flexibeler onderwijsaanbod en flexibelere deelname van studenten mogelijk. Microcredentials zorgen ervoor dat kortere onderwijstrajecten ook erkend en door werknemers gewaardeerd worden. Dit maakt dat deeltijdstudenten vaker kortere onderwijstrajecten naast hun werk volgen die al dan niet opstapelen tot een traditioneel bachelor diploma. Maar het zorgt er ook voor dat voortvarende voltijdstudenten (met name in tekortberoepen en -sectoren) sneller een baan zullen aannemen tijdens hun studie om deze vervolgens in deeltijd af te ronden.

Op basis van de twee sleutelvariabelen en hun mogelijke, extreme uitkomsten zijn vier scenario's ontwikkeld ten aanzien van de omgeving van de HRBS in 2025:

1. Scenario 1 – relatief vaste leerroutes naar carrières die domein-specifieke systemen gebruiken en ontwikkelen
2. Scenario 2 – relatief vaste leerroutes naar carrières die door algemene intelligente systemen worden ondersteund
3. Scenario 3 – flexibelere leerroutes naar carrières die domein-specifieke systemen gebruiken en ontwikkelen
4. Scenario 4 – flexibelere leerroutes naar carrières die door algemene intelligente systemen worden ondersteund

Om de HRBS op elk van deze vier scenario's voor te bereiden worden verschillende strategische acties geadviseerd.

Ten eerste wordt geadviseerd om een aantal randvoorwaarden te realiseren die het aanpassingsvermogen en de strategische positie van de HRBS in elk van de vier scenario's zou verbeteren.

- Doorontwikkeling, versterking en verbreding van een structuur die voor studenten mogelijk maak om interdisciplinaire cross-over projecten te participeren. Het beoogde beleid voor minors (meer fieldlabs en meer samenwerking met andere domeinen) is een essentiële randvoorwaarde voor elk van de vier toekomstbeelden. Maar ook in de majors moeten interdisciplinaire onderdelen worden aangeboden.
- Ontwikkeling van een adequate structuur voor samenwerking met het werkveld. De behoeften van de beroepspraktijk moeten sneller, beter en vaker vertaald kunnen worden naar het onderwijs, opdat dit beter aan kan sluiten bij actuele vraagstukken en beroepsrollen.
- Ontwikkeling van een onderwijsaanbod dat zich toespits op life-long learning (LLL). Het vraagt om de ontwikkeling van nieuwe onderwijsformats, deels geënt op bestaande fulltime en parttime programma's maar ook deels nieuw ontwikkeld.
- Professionalisering over digitalisering en automatisering in het algemeen en kunstmatige intelligentie (AI) in het bijzonder. De HR Business School – en Hogeschool Rotterdam als geheel – moet investeren in (a) deskundigheid over en onderzoek naar het effect van AI op sectoren en beroepen, (b) vakinhoudelijke, didactische en pedagogische kennis en (c) onderwijsprogramma's die daarop voorbereiden.

Naast deze vier randvoorwaarden worden ook de volgende contingente strategische acties aanbevolen (welke elk alleen in het geval dat bepaalde scenario's werkelijkheid worden dienen te worden uitgevoerd).

- Scenario's 1 en 3 vragen om een toespitsing van het onderwijs dat met partners uit de beroepspraktijk ontwikkeld zal worden (zie boven) op het gebruik van domein-specifieke intelligente systemen.
- Scenario's 2 en 4 vragen om onderwijs dat hogere orde cognitieve vaardigheden, creativiteit en sociale vaardigheden ontwikkelt, opdat afgestudeerden waarde kunnen toevoegen in een werkveld dat operationeel en tactisch in belangrijke mate op een volgende generatie algemene intelligente systemen draait.
- Naast kwalitatieve veranderingen vragen scenario's 2 en 4 ook om portfoliostrategie die de HRBS voorbereid op de kwantitatieve verschuivingen in bepaalde beroepsgroepen als gevolg van deze intelligente automatisering en digitalisering.
- Scenario's 3 en 4 vragen om de vertaling van de voornoemde inhoudelijke verschuivingen naar een flexibeler onderwijsaanbod en onderwijsorganisatie voor de op-, om- of bijscholing van reeds werkzame professionals.

1. Introduction

Like many other business schools Hogeschool Rotterdam Business School (HRBS) has enjoyed a long period of relative stability in its external environment. The labour market has long needed business graduates in the professions for which its portfolio of full degree programmes prepared them. The majority of high school graduates (havo) continued to choose for a bachelor degrees at universities of applied science. And the institutional framework for higher education within which it operated has not drastically changed in terms of government funding and legislation.

There are, however, several trends & developments that could potentially change or even disrupt this relative stability. Automation, digitalization and artificial intelligence are bringing about quantitative and qualitative changes in labour market demand. Potential changes in the government funding mechanism and regulatory framework could engender new competitive dynamics between incumbents as well as new entrants in higher education. New learning technologies could require a significantly different skill set from teachers and other personnel at universities of applied sciences.

These trends & developments urge the HRBS to explore what kind of changes are possible in its future business environment and what it can do to prepare for them. To that end, this study will answer the following question:

> *How should the HRBS prepare for the business environment of 2025?*

This research question fall apart in two questions:

1. *What could the external environment of the HRBS look like in 2025?*
2. *How should the HRBS prepare for that environment?*

The main research question and both sub questions are answered using the method of scenario-based strategy formation (De Ruijter, 2016). There are many methods, frameworks and tools that could be used and can indeed be helpful when developing business strategies that prepare firms for the future. Yet scenario-based strategy formation has the unique quality that it does not assume away, but factors in key uncertainties about what that future may look like. As such, it provides a much more cautious and comprehensive approach to developing strategies that make firms future proof than other methods of strategy formation.

The following chapters follow the steps of scenario-based strategy formation. After the organizational context of TLN/AVZ and the industry profile of the Dutch container trucking firms have been discussed in chapter 2, chapter 3 presents the clusters of trends & developments with the highest potential impact on the strategic position of container trucking firms and uncertainty about their outcome. Chapter 4 presents six scenarios of the future business environment for Dutch container trucking firms. After that, chapter 5 stress-tests to what extent the typical smaller and larger container trucking firm is currently prepared for each of these futures. Chapter 6 then presents two strategic roadmaps (one for smaller and one for larger firms) that help these firms to better prepare. This is followed by a conclusion and recommendations for further research in chapter 7.

2. Organisation Profile

This section of the report solely scrutinizes the strategic levers, building up towards the eventual stress-testing in which the current strategic plans are contrasted to the opportunities and threats brought forward by the scenarios resulting from uncertainty and criticality of external developments.

2.1. Organisation profile

The Rotterdam University of Applied Sciences (hereafter to be named RUAS) aims to educate students on their paths to becoming professionals that make valuable contributions to society in the international environment and metropolitan environment of Rotterdam. RUAS emphasizes the focus on equality as a shared goal through all its facilities. To accomplish this, RUAS is creating a learning environment between lecturers, researchers and field professionals to create an up-to-date curriculum which challenges students *'to exceed themselves.'* This vision is summarized succinctly as: *"With a diploma of Rotterdam University of Applied Sciences in hand, every student is ready for the world of tomorrow."*[1]

2.1.1. Organisational structure

The organisational structure of RUAS before the formation of the Hogeschool Rotterdam Business School (HRBS) is depicted in Figure 1.

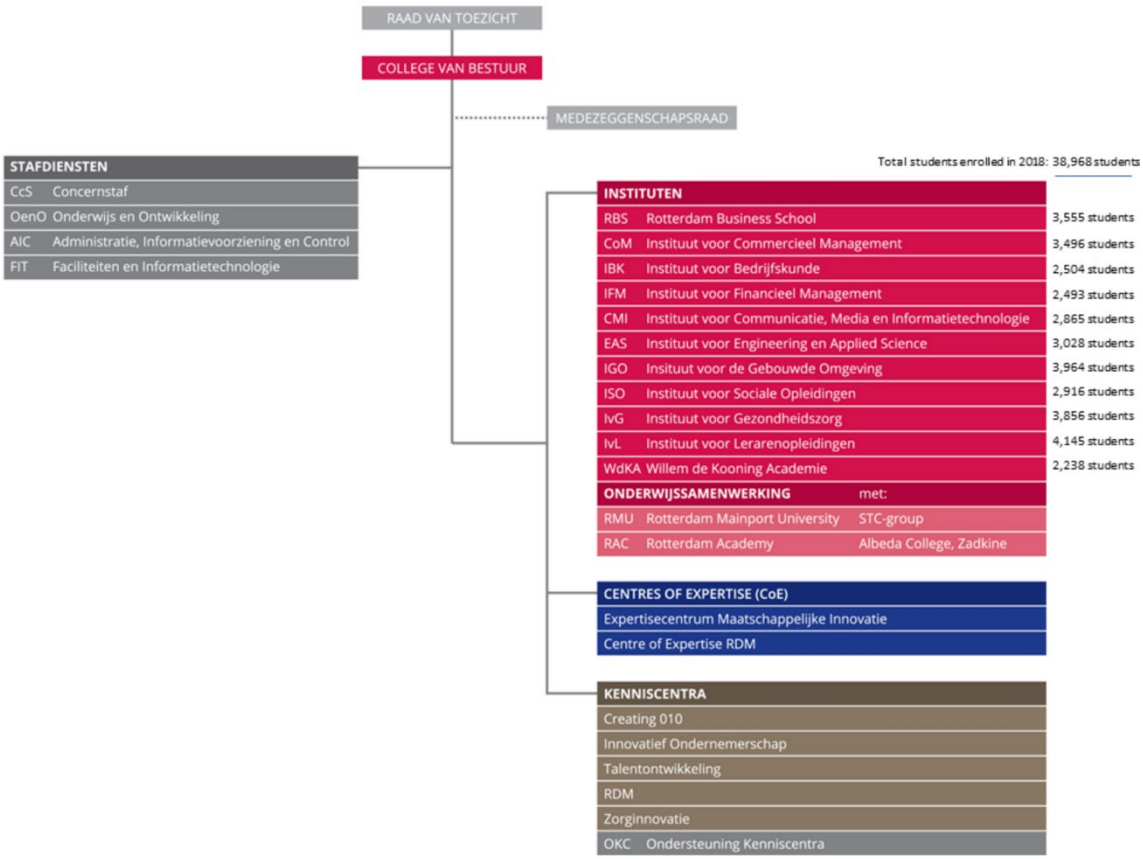


Figure 1: RUAS' organizational structure and student numbers before the establishment of the HR Business School

In 2019 institutes CoM, IBK, and IFM merged into the Hogeschool Rotterdam Business School (HRBS) with plans to add the Rotterdam Business School (RBS) at a later date. At the end of 2018, the university counted 38,968 students and 2,841 employees (Hogeschool Rotterdam, 2019).

[1] https://www.rotterdamuas.com/about/about-us/, retrieved on 10-08-2020.

2.2. Strategy

RUAS aims to create a rich and diverse learning environment in the fields of business, leaving little distance between student(s) and lecturer(s). The school prepares its students for the professional field through content that closely connects theory and practice, incorporating modern-day cases and involving students in actual projects sourced from the professional network of the university. (RUAS, 2016)

The central idea is to provide high-valued qualitative, inclusive and future-proof education.

"We are currently preparing students for jobs and technologies that don't exist yet … in order to solve problems that we don't even know are problems yet." (RUAS, 2016)

2.2.1. Vision

The executive board of the university has formulated the following vision that aligns with their core conviction: *"Educate in Rotterdam for the world of tomorrow."* (RUAS, 2016)

Hogeschool Rotterdam stands for education where quality is highly valued and stands for education that prepares its students for the continuously changing professional environment as well as preparing students for the continuously changing community. The translates itself to context rich education wherein education, the professional practice and professional practiced research are intertwined.

2.2.2. Strategic agenda

As RUAS is aiming to prepare students to be a professional in the world of tomorrow, which is constantly changing, a strong a clear strategy is paramount to ensuring that students can effectively build towards their (professional) futures in such uncertainty. The strategic intent is set at three main pillars (RUAS, 2018):

- To develop the basic quality by strengthening and improving it;
- To establish inclusive education concentrated on exploiting the force of diversity aimed at a successful education;
- To develop contextually rich education, to further anticipate the future, thereby delivering resilient students and creating agile study trajectories.

This strategic intent flows down into five distinct elements of the strategy (RUAS, 2018):

1. Prioritising learning process
2. Extensive decentralisation
3. Contiguous knowledge support
4. Communal framework and services
5. Coworking spaces

Concrete/operational actions in which these strategic themes will materialize are largely yet to take shape, but are presumed to include student participation, supporting services working directly for education teams, shared KPIs and supporting services, and empirical feedback.

2.3. Industry profile

Many first year students entering professional education are uncertain on what they want to achieve or where their interests lie. The first year of education – after which students acquire a propaedeutic diploma – is often the first encounter of the student and the chosen field of study. One aspect of this propaedeutic year is that is serves an exploratory goal.

RUAS primarily aims to develop competences, skills and knowledge throughout the full degree programmes, its courses, the group projects, career coaching, internships and specialization tracks. The individual institutes and study programmes also invest in facilitating extracurricular activities for students with the desire to develop themselves more in-depth – or in other directions – than the regular study programme has to offer.

Eligibility for enrolment in the associate or bachelor tracks is defined by the prior certification of the students. A degree in either senior secondary general education or middle management training grants

access to the associate or bachelor tracks. Without the required prior certification, students over 21 years of age can choose to take an entry test which, if passed, grants admission to a bachelor track. A bachelor degree is a definite prerequisite to starting a professional or academic master, the latter requiring a bridging programme – called a pre-master – to acquire admission to the academic master track.

Apart from the conspicuous served group, the students, (future) employers of graduates also form a group whose needs have to be met in order for RUAS to thrive in its vision to prepare students for the world of tomorrow. Although closely related, the needs of students and employers differ on certain aspects. For instance, the two most basic needs of students – acquiring a starting qualification and exploring a career path – are not as directly relevant for employers. Instead, these are prerequisites on top of which graduates need to distinguish themselves to become attractive potential hires. In other words, the employer's need axis starts higher up the students'. Apart from that, employers see tertiary education as a source of (thesis) interns, consultancy projects and insights from the research centres. In some cases, employers use HBO institutes to develop the knowledge and skills of their human resources.

This results in a subtly different market definition, with interestingly similar technologies to cater to the needs of these dissimilar market segments. This implies that synergistic balance between the needs of these two different served groups – as well as the between the means to meet these ends – is a crucial element of providing high-quality education.

While the route to employment via a full degree programme at a university of applied sciences is common, it is not the only path. Starting, students who either completed pre-university education (VWO) in high school or attained at their propaedeutic diploma at a university of applied sciences, have the possibility of following a full degree programme at an academic university. For VWO graduates, this is the most common route. Other paths to an employable degree are a part-time associate or bachelor degree, often pursued by people who have picked up studying (again) later in their careers. These are also offered by RUAS. Some people also opt to pursue a flexible degree (e.g. at LOI or NHA), often (mostly) digitally, and which is often not covered by governmental tuition reimbursement.

3. Trends & Developments

This chapter discusses the two most important clusters of trends & developments for business education at the university of applied science (HBO) level in the Netherlands. It defines these clusters based on key variables through which their trends & developments would ultimately affect the strategic position of the HRBS – which is the relative fit (compared to other alternatives) between the education it offers, labour market demand and student preferences. Each cluster is modelled in a way that captures the logic of how the various trends & developments that are part of it influence the key variables. The discussion of each cluster concludes with the extremes of the bandwidth of possibilities within which the key variable could develop as a result of these influences from now until 2025.

3.1. Key Uncertainties

The two clusters of trends and developments in the following paragraphs were selected as cornerstones for the scenarios in chapter four based on the potential impact and uncertainty of their key variables. Figure 2 provides an overview of the various clusters of trends & developments that students have constructed and considered, scored in terms of their relative impact and uncertainty.

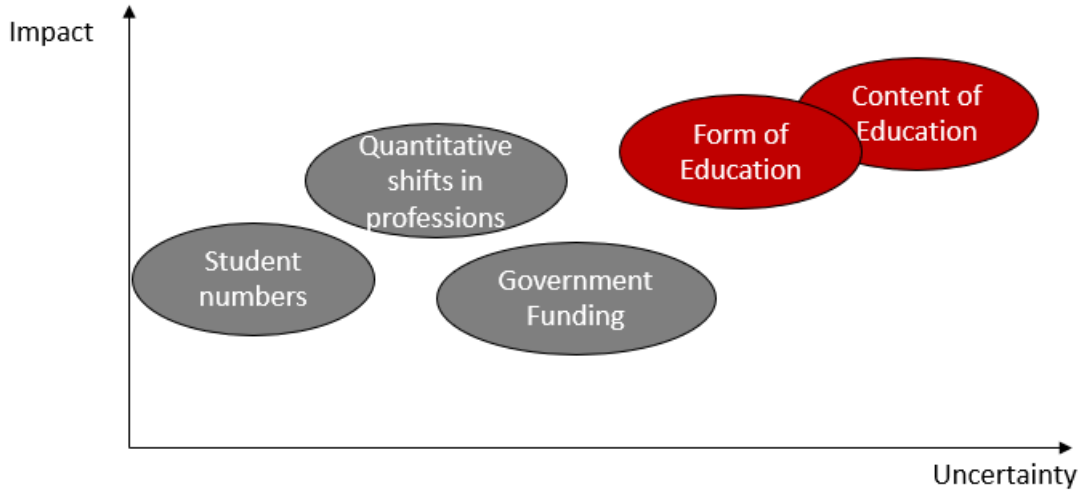


Figure 2: Key uncertainty matrix for HRBS

The content of education (as affected by developments in artificial intelligence) and form of education (as affected by changes in the regulatory framework of higher education) score highest in terms of potential impact and uncertainty. In terms of impact, the automation and augmentation of work scores highest, because all of the potential outcomes would necessitate changes in the content of all educational programmes in the economic domain and require new competences from teachers. It also acts as the main determinant of quantitative shifts in professions, which makes it more fundamental. Flexibilization also scores high on impact, as changes in the regulatory framework that aim to make higher education more accessible and less rigid in structure could engender new competitive dynamics that affect student numbers and funding.

In terms of uncertainty, the automation and augmentation of work has the highest relative score. This is because its outcome depends on further technological breakthroughs in AI (which are unpredictable) and the scope of its adoption (which is contingent upon a complex set of interdependent factors). To what extent the framework for higher education will become more flexible is somewhat less uncertain, as the minister of education and OCW has made much of the regulatory changes it intends to make known in their strategic agenda. Yet it is still far from certain as the actual decisions still depend on the outcome of pilot programmes and political processes, as well as the extent to which incumbent university of applied sciences will adapt. Both therefore score higher than 'government funding' (which is a more unilateral decision) and quantitative shifts in professions and student numbers (which are more predictable).

3.2. Content of Education: Automation & the Augmentation of Work

The first key variable is the general skill profile that the labour market demands from business graduates. Though every business discipline (and every job) has a unique skill profile, it is possible to define a skill profile for business professionals in general at a more abstract level. Such a profile is based on the relative importance of various skill categories (see section 3.1.1). Changes in these categories could give rise to strategic challenges for business schools regarding the content of their education.

3.2.1. Skill Categories of the General Skill Profile

There are four dimensions on which the general skill profile can change over time. The first is the relative share of specific vs. general skills. Specific skills are domain/job-specific skills (e.g. degree knowledge). General skills are skills that are transferable between different domains and contexts (also known as transferable skills, employability skills, or 21st century skills). The second is the relative importance of specific categories of general skills. These categories of general skills are physical and manual skills, basic cognitive skills, social and emotional skills, higher cognitive skills, and technological skills (*add source*). The third is the relative dependence on technological skills, which weighs the extent to which a given employee could still perform a (not necessarily tech-focused) job without possessing technological skills. The fourth is the relative (in)stability of skills, describing the relative time that a general skill profile in demand remains the same.

3.2.2. Model of the Cluster

Figure 3 provides an overview of the trends & developments that influence the general skill profile. There are three themes that influence how the general skill profile will change over the following years: (1) digitalization & automation, (2) labour market structure and (3) changes in organisational contexts.

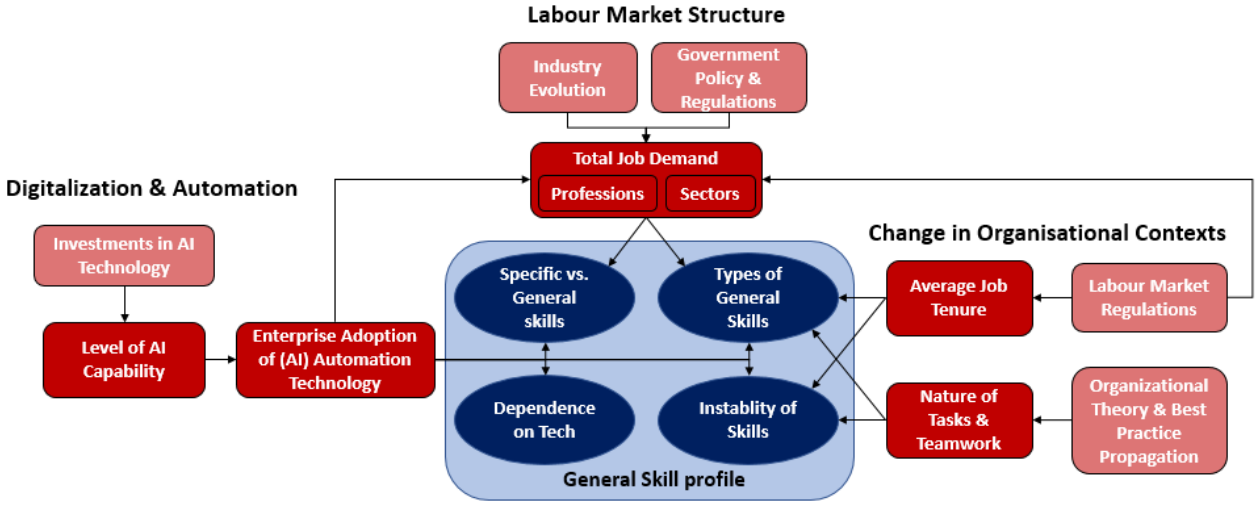


Figure 3: Model of the variables that influence the general skill profile that the labour market demands from business graduates

The theme of automation & digitalization is the most fundamental driver of changes in the general skill profile for two reasons. The first is that broader enterprise adoption of higher levels of AI applications has a big direct effect on all four dimensions of the profile. It affects the relative importance of various types of general skills (e.g. basic vs. higher order cognitive skills) through the automation of tasks previously performed by humans, increases our dependence on technology by augmenting tasks still performed by humans, increases the rate of change (instability of skills) in the general skill profile if it accelerates and broadens and affects the prominence of general over specific skills.

The second reason why automation and digitalization is so fundamental is that it also drives changes in the two other themes. Substitution of human labour through automation affects the amount of jobs in a particular profession and sector of industry as well as average firm size and average job tenure.

Changes in organisational contexts and labour market structure also affect the general skill profile directly and are driven by factors other than just digitalization and automation. Average job tenure and organizational size (organizational contexts) both affect the dependence on general vs. specific skills and the relative importance of specific skills. And average tenure and organizational size in turn are both influenced by labour market regulations, economic conditions and socio-cultural changes in professional lifestyle. Likewise, the total amount of jobs per profession and sector has a direct effect on the relative importance of specific vs. general skills and the types of general skills, while these amounts are influenced by government policies and industry evolution.

3.2.3. Historical Trends & Developments

Various measures show that general skills are and have become more important than job-specific skills in employer demand on a global level. An analysis of Australian job ads found that general skills were mentioned 20% more often in 2015 than in 2012 (Foundation of Young Australians, 2015). Between 1980 and 2015, the share of U.S. jobs requiring proficient social skills grew 83%, and that of analytical skills (such as critical thinking and computer skills) grew 77%, whereas the total amount of U.S. jobs grew by 50% overall (Pew Research, 2016); this indicates a rising relative importance of general skills as opposed to specific skills. This supposition is further supported by a survey of American employers, of whom 91% agreed that critical thinking and communication are now more important than someone's undergraduate major (Association of American Colleges & Universities, 2019).

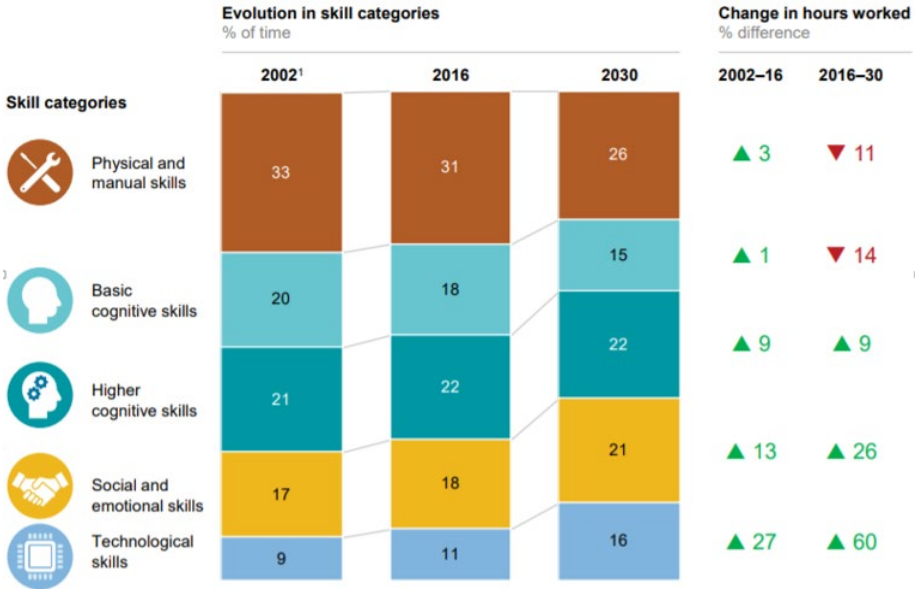


Figure 4: McKinsey

In terms of the relative importance of the various categories of general skills, technological, social and emotional skills have become increasingly important. Research by McKinsey (2018) across all sectors of the U.S. economy shows that the relative importance of technological skills has increased (see Figure 4) with 2% (to a total of 11%) in terms of total hours worked by the general working population (through O*NET data) over the 2002 to 2016 period. Social and emotional skills and higher cognitive skills both increased with 1% of hours worked (to 18% and 22% respectively) over the same period. These relative increases came at the expense of a 2% decrease in the shares of manual skills and basic cognitive skills each.

The relative reliance on technological skills has also grown significantly. Illustrative of this development are the growing digital requirements of most jobs. From 2002 to 2016, the share of jobs with low digitization decreased from 56% to 30%, the share of jobs with medium digitization grew from 40% to 48% and those with high digitization grew from 5% to 23% (McKinsey, 2018).

Though it is hard to perfectly measure temporal instability at the level of the general skill profile, various proxies point to an increase in the rate of change. Global research by IBM (2019) found that the average

number of days it took to close a capability gap in organizations through training increased from 3 days in 2014 to 36 days in 2018. A quarterly survey on the fastest-growing skills in the U.S. freelance market produced an index, for the 2nd quarter of 2018, in which 70% of the skills were included for the first time (Upwork, 2018). And where the half-life of an engineering degree (i.e. the time it takes for 50% of the acquired knowledge to become obsolete) was 35 years a century ago, it is now estimated to be two years (Wrike, 2019).

Automation & Digitalization

The most important driver of changes in the general skill profile, the level of *AI capability* (as an enabler of digitalization and automation), has seen some breakthroughs in recent years. Table 1 defines five stages in the development of AI.

Stage	Definition	Reached
I: Rule based systems	Knowledge is represented in a set of rules that tells what to do or what to conclude in different situations.	Yes. Examples are robotic process automation (RPA) and aircraft autopilots.
II: Context awareness and retention	Learns from and makes suggestions on the basis of patterns of behavior. Trained with the knowledge and experience of humans.	Yes. Examples are chatbots, robo-advisors and interactive wearables.
III: Domain specific expertise	Can develop knowledge beyond human capability through a set of learning rules and objectives.	Yes. Examples are AlphaGo, AlphaGo Zero and IBM Watson.
IV: Reasoning machines	Can negotiate, interact and attribute mental states.	No. Algorithms are starting to be developed.
V: Self Aware Systems / Artificial General Intelligence (AGI)	Human-like intelligence.	No.

Table 1: Five stages in the development of AI (source: Gigabit, 2018)

Rule based systems, the most commonly adopted technology, are 1st stage AI. We see this technology manifested as robotic process automation (RPA) software in businesses, and as aircraft autopilots (Nandan, 2019). The 2nd stage is 'context awareness and retention'. This type of AI is trained with the knowledge and experience of humans. It learns from patterns and makes suggestions on the basis thereof. This technology can be found in chatbots, robo-advisors and interactive wearables. The 3rd stage, domain specific expertise, can develop knowledge beyond human capability. It learns through a set of learning rules or objectives. While its capabilities extends beyond what humans can do in, for example, chess, it cannot transfer what it has learned there to, for example, poker; its expertise is domain-bound (i.e. non-transferable). The 4th stage, so-called 'reasoning machines', can (or should become able to) reason, negotiate, interact and attribute mental states. Reasoning algorithms should have a sense of beliefs, intentions, knowledge and understanding of the working of its own logic.

RPA software started to emerge in the early 2000s. It now uses screen scraping software, machine learning and workflow automation software in order automate (aspects of) processes, allowing organisations to streamline and scale their processes (UI Path, 2016).

The first idea for a 'chatterbot', ELIZA, originates from 1966 (Chatbotlife, 2019). Chatbot capabilities have developed considerably in the past decade. Although it is a disputed result, a Russian chatbot (as first ever) managed to pass the Turing-test in 2014 by convincing one of three human judges it itself was human (Gizmodo, 2014). The first robo-advisor was made public in 2008. In 2010, Betterment launched and further popularized robo-advisors. In 2014, assets managed by robo-advisors totaled up to $19 billion. By 2017 this amount had increased to $225 billion (RoboAdvisors, 2017). The best-known example of a level III AI application is Google's Alpha Zero. This AI system taught itself how to play chess through 'reinforcement learning'. Doing so, it was able to master chess within just four hours and beat the best human-programmed chess engine (StockFish) in the world (Packt, 2019).

Another well-known example is IBM's Watson, a supercomputer that combines sophisticated analytical software and AI. It was conceived in 2007 and managed to beat two of the best players in history on the show Jeopardy in 2011. Ever since, IBM has been commercializing the application of Watson. This has evolved IBM Watson into a licensable platform of technologies and AI techniques that can be utilized through the cloud. Whether Watson is a relatively powerful AI or 'just' a commercially powerful combination of different techniques is debatable. However, its commercial utility is far ahead of and most impactful (PC World, 2016).

Though the impact of these developments in AI capability on the general skills profile has long been suppressed by low *enterprise adoption rate*, this adoption rate is now rapidly rising. A global survey indicated that where merely 20% of organisations had embedded at least one AI capability in their business processes in 2017, this share surged to 47% in 2018 (McKinsey 2018). Exemplary of the commercialization of rule based systems is the growth rate in RPA adoption; RPA adoption grew 29% from 2016 to 2017 according to Reuters (2019), while Gartner (2019) reports a growth rate of 63.1% from 2018 to 2019. Chatbot adoption has grown substantially too. In 2016, the global chatbot market size stood at USD 190.8 million (Statista, 2019); in 2017, the global market size was USD 864.9 million, and in 2018 this was USD 1274.428 million, showing a growth rate of 47.3% in 2017-2018 (Mordor Intelligence, 2019). No data on domain-specific expertise adoption was found.

The rise in the level of AI capability and the scope of its adoption so far has been twofold: it has automated routine tasks (replacing humans) and augmented non-routine tasks (complementing humans). Once certain tasks are automated, the relative importance of the skills necessary for those tasks decreases as these are now performed by an automated system. This explains the decrease in the relative importance of physical/manual skills and basic cognitive skills. The focus of employees then shifts to tasks that cannot be automated, which explains the increase in social and emotional skills and higher cognitive skills. The first things to become automated were the repetitive, rule-based, forecastable actions. Take the example of online content managers. Rather than having to continuously attend different channels and posting content at the desired times throughout the week, this can all be done, scheduled and automated in advance at a prior point in time – leaving time to spend on other activities. A similar impact can be seen with chatbots: initially, a customer service employee attending a chat function full-time would have to be virtually idle throughout the day to attend to potential issues arising. One the one hand, this does not necessarily obstruct him from picking up other tasks. On the other hand, this does continuously interrupt from conducting these other tasks. In a similar fashion to RPA, chatbots clear employees from non-challenging, repetitive distractions and create the opportunity to spend time on more challenging, non-routine tasks – where we cannot be automated.

In some areas where we cannot be automated, however, we can be augmented. Augmented systems helps us do better what itself cannot be automated firstly of course by automating the simple and routine parts, but secondly and moreover by improving the process of conducting higher level tasks that can now be focused on. Take, for example, augmented analytics (as offered by IBM Watson). One the one hand its integration of advanced analytics, natural language processing and machine learning makes conducting (a certain extent of) advanced analyses accessible to non-statisticians/mathematicians/data scientists, which could arguably lower the relative importance of analytical skills. On the other hand, the increased accessibility of organisational benefit by advanced analyses could (arguably as well) skyrocket demand (amongst a larger scale of organisations) for employees with comprehension of analytical methods (and their role in business) at a balance that does allow them to optimally exploit the augmented systems while they are not necessarily experts at the science behind, effectively creating a new norm (and therefore reliance) similar to the basic digital skills (such as Outlook or CRM software) that are now prevalent in consequence of the widely proliferated productivity software. This explains the rise in relative importance of technological skills as a share of general skills, as well as it does the relative reliance on technological skills.

Determinant: Changes in Organisational Context

At the level of changes in the nature of tasks and teamwork, there has been an increase in collaborative activities, more remote work and less management positions. A survey indicates that the time managers and employees spend on collaborative activities has increased by more than 50% in the past 20 years (World Economic Forum, 2017). Between 2005 and 2017, there was a 159% increase in remote work in the U.S. (Flexjobs, 2019). At the same time, the amount of managers – a position that business education has traditionally educated for – is in decline. According to Statistics Canada, one in ten management positions has disappeared since 2008 (MacLeans, 2015).

The average job tenure in the Netherlands has decreased substantially in the last decade. Where the average job tenure of back-office employees in the Netherlands was 9.2 years in in 2001, this dropped to 2.9 years in 2011 (Volkskrant, 2011). Of the entire working population in 2016, 14.7% have a job tenure of 0-1 years, 13.9% of 1-2 years, 18.5% of 2-5 years, 20.8% of 5-10 years, and 32.2% of 10> years. The average job tenure differs strongly per sector and age group.

The general skill profile is influenced by the trends in organisational contexts in different ways. The rise in time spent collaborating could have stimulated both the increase in the relative importance of social and emotional skills (tasks as team effort) and that of higher cognitive skills (more complex tasks). Working remotely changes the nature of collaboration and therefore that of social skills, while it also makes employees more reliant on technological skills in order to work remotely effectively. Less managers could contribute to an increasing relative importance of social and emotional skills and higher cognitive skills; more autonomous employees are likely to be more reliant on their own stress-management, collaboration, leadership and problem solving skills. Lastly, shorter job tenure results in changing roles and environments more frequently; this requires employees to be able to deal with uncertainty and be more adaptable. This contributes to the increasing relative importance of generic skills as opposed to specific skills. More specifically, it contributes to the increasing relative importance of social and emotional and higher cognitive skills.

3.2.4. Forecasts

It is a highly debated whether, to what extent and when further AI breakthroughs will be achieved. There is, on the other hand, a broad consensus that digitalization and automation will continue to transform the nature of work. While robotic process automation, context awareness and retention, and domain-specific expertise are already a reality, their technological capabilities are still growing and converging with one another. Machine reasoning algorithms are currently being developed and proving their potential with IBM Watson as a leading example. Predictions whether or when we will achieve level IV and V AI are scattered (The Verge, 2018; Enterprise Management 360, 2018; Scientific American, 2018). AI will continue to permeate the organizational landscape, and augment and automate the workforce (UI Path, 2019; Techzine, 2019; DailyMail, 2018; Gartner, 2018; Spiceworks, 2018). One such manifestation, augmented analytics, is highly anticipated yet also highly debated to the extent that it can reduce the reliance on (advanced) technological skills in an age of ever-increasing digitalization of work. The market sizes (indicatory to adoption) of AI and each of its constituent/applicatory technologies are expected to grow at a CAGR of 55.6% until 2025 (Allied Market Research, 2019a).

It seems likely that RPA will further develop and become integrated with intelligent technologies, further extending the scope of automatable tasks. Its adoption will be stimulated by growing cloud storage services (UI Path, 2019), and by a further proliferation of low/no-code RPA (Techzine, 2019).

Context awareness and retention technology for chatbots is expected to become increasingly sophisticated over the next five years. One prediction states that, in 2025, chatbots will be more aware of the context in which they operate, anticipate user needs by analysing data, adapt custom conversation patterns and develop a custom personality that will a specific user. Moreover, chatbots will transcend their service as automated customer service agents; they, for predict example, could help us which products will become most successful (Chatbots Magazine, 2018).

The AI and Robots chair of Singularity University predicted that, by 2024, AI will give rise to new pattern recognition and intelligence results with more strategic complexity than the current AlphaGo Zero

(Singularity Hub, 2019). This means that what we know as 'narrow' or 'domain-specific expertise' (stage 3) AI will continue to further exceed human capability.

Advanced technologies like IBM Watson will continue to develop. Concrete future plans are not openly available. Today, IBM Watson is a supercomputer that fulfils roles ranging from (but not limited to) business analysis, product development, cancer research and refinery safety management (DailyMail, 2018).

In interviews with AI experts conducted in 2017, the average prediction of level V AI (AGI) to become reality was 2099. Ray Kurzweil – director of engineering at Google – suggested that by 2029, there would be 50% chance of AGI being built. Rodney Brooks, co-founder of iRobot, predicted this to happen in 2200 (The Verge, 2018). It's clear that, even amongst AI experts, wide disagreement is prevalent. Some believe that this level of machine intelligence will never be achieved (Enterprise Management 360, 2018). Others say that in order to achieve AGI, we first have to achieve quantum computing. Yet again, whether we will achieve quantum computing is at least as ambiguous a question. Whereas some argue that applicable quantum computing is just three years away, others firmly reject this statement and pose ten years as a more reliable timeframe (Scientific American, 2018).

Level IV AI (reasoning machines/theory of mind) is currently being developed, but is not ready to be commercialized. At which point it will be ready for commercialization is still uncertain. For this stage of AI to be reality, algorithms would need the ability to attribute mental states (to themselves, and others) (Gigabit Magazine, 2018); they must be able 'understand' the psychological state of humans to a certain extent. As of now, computer programs are able to 'understand' other computer programs by referring to their own algorithm (ScienceMag, 2018). Facebook engineers have already created a cooperative AI through a multi-agent solitaire set-up (Engadget, 2019). While human emotion recognition algorithms exist, they are controversial, often criticized, and do not amount to a 'theory of mind' but rather to detection of emotional signalling (The Verge, 2019). While there are already complex interlinked neural networks learning from observed behaviour (Singularity Hub, 2018), qualifying them as level IV AI would be a stretch.

However, true AI breakthroughs are not necessarily required to significantly impact the nature of work. There are a variety of level I-III AI applications that seemingly will continue to permeate many aspects of labour, regardless of whether AGI will be achieved in 2029, 2200, or at all. One trend, coined by Gartner, is the democratization of data through AI-infused (or, 'augmented') analytics, making advanced analyses accessible to non-statistically/mathematically educated employees. This trend, dubbed 'citizen data scientists', would empower business to become increasingly data-driven, by making conclusions drawn from data more reliable and data insights more broadly available across the business. Gartner predicts that, by 2020, more than 40% of data science tasks will be automated, and that the amount of 'citizen data scientists' will outgrow that of expert data scientists by a multitude of five. Additionally, they predict that, by 2024, the suppressing shortage of data scientists will no longer pose an obstacle to organizational adoption of data science and machine learning technologies (Gartner, 2018). Others, however, are less optimistic about the extent to which citizen data scientists will mitigate the draught of data scientists; a co-founder of the Domino Data Lab states that, the extent to which citizen data scientists can work with and apply automated (and automated analytical) techniques is limited, and that statistical reasoning is still a prerequisite skill to conduct (advanced) analyses (Datanami, 2019). While not all employees are nor will be data scientists, most decisions will be driven (at least partially) by data (Interesting Engineering, 2019). This would increase the importance of analytical skills even further, as these analyses expand beyond the scope of the traditional data scientist role and further permeate other roles.

Digitalization, as a critical enabler for enterprise automation (Gartner, 2018), will likely continue to grow; during 2019 budget predictions, approximately 89% of companies declared that their budget allocated to IT was to be onset or grown (Spiceworks, 2018). The Software-as-a-Service (SaaS) market size is also a clear indicator (as it is an enabler) of further digitalization (and therefore automation). Forecasts differ considerably: one report predicts a CAGR of 9% from 2019 to 2023 (Bloomberg, 2019), whereas another report forecasts a CAGR of 21.2% from 2019 to 2023 (MarketWatch, 2019c). The two largest barriers to

digital transformation were found to be legacy systems and architecture, and lack of skills and expertise in digital domains (EY, 2017).

Overall AI market predictions range from forecasted market sizes between USD 169.41 billion (Allied Market Research, 2018) and 208.49 billion at a CAGR of 31.1% (MarketWatch, 2019a) by 2025. The market for RPA technology is predicted to grow at a CAGR of 31.1% by 2025 (Grand View Research, 2019). The global chatbot market has been forecasted to grow at a CAGR of 24.3% in the timeframe 2017-2025, being expected to reach a market size USD 1.25 billion (Grand View Research, 2017). The robo-advisory market of Europe is expected to grow at a CAGR of 53.7% and reach USD 14.69 billion by 2023 (MarketWatch, 2019c). It is difficult to find forecasts for the category of AI that is parallel to 'domain specific expertise' and 'reasoning machines'. However, the market size for cognitive computing – the application of IBM Watson can be categorized as such – has been forecasted to grow at a CAGR of 32.89% from 2018 to 2025 (Verified Market Research, 2019).

One report values the global augmented analytics market size at USD 4,094 million in 2017, and projects it to reach USD 29,856 million by 2025, which constitutes to a CAGR of 28.4%. This development is project to impact (nearly) all organization sizes, business functions, industries and regions (Allied Market Research, 2019b).

As the capabilities and proliferation of automation technologies increase, they will affect the general skill profile in multiple ways. The nature and size of these effects are contingent on the state and organizational adoption of automation. As *more organizations* adopt *better AI* for *more applications* (or either one of the three factors), more tasks previously performed by humans will be automated, of which the involved skills therefore lose relative importance over the skills involved in other tasks that cannot be automated.

As more companies adopt and find more applications for domain-specific expert systems, the relative importance of job-specific skills will decrease in relation to that of general skills (namely technological skills, social and emotional skills, and higher cognitive skills). As long as organizations are still largely hindered in their adoption of automation technologies or/and a democratization of data analytics is not a reality, technological skills will be the most heavily sought after skills due to the inability to automate tasks within this category and misalignment with the workforce. For business professionals, the relevant technological skills are basic digital skills, advanced IT skills and programming, and to a slightly lesser extent advanced data analysis and quantitative skills (McKinsey, 2018). The importance of social skills (namely entrepreneurship and leadership) and higher cognitive skills (namely creativity, and complex information processing and interpretation) would also follow the trend of sharp increase, all at the cost of the relative value of physical/manual skills and basic cognitive skills.

As the number of automated tasks grows more and more quickly and therefore more roles are displaced more frequently, the skills instability will grow. When the *majority* of organizations adopt better AI for more applications, the dynamics of the skill demand evolvement will likely shift to one that makes technological skills in subcategory of data analysis and quantitative skills, at the level of non-technology oriented degrees, less important than higher cognitive skills and social and emotional skills. However, since such an outcome would be logically and necessarily preceded by a surge in organizational digitalization, the demand for basic digital skills would increase even more than it has over the past few years; the required level of a technological skill would decrease, whereas the reliance on technological skills would increase vastly.

Changes in Organizational Context

Changes in organizational context are predicted to involve more complex/non-routine tasks, more collaboration, an increasing centricity of digital tools, an increasingly younger workforce, and a rise in the number of people workings on-demand jobs.

The time spent on tasks will likely shift towards the activities that are more difficult to automate, as it has historically. These include applying expertise to decision making, planning, creative tasks, managing others and stakeholder interactions (McKinsey, 2016).

The nature of teamwork is, in consequence of the rising proportion of time spent on collaborative activities, predicted to centre more around efficient collaboration. Multi-team projects, collaboration with diverse actors and blurred lines in when and how teams work together pose challenges to efficiency. Digital tools are predicted to become an increasingly important aspect of collaborative activities, ranging from formal meetings to project management (Klaxoon, 2019). The global team collaboration software market size was valued at USD 8.19 billion in 2017, and has been forecasted to grow at a CAGR exceeding 9.0% from 2018 to 2025 (Grand View Research, 2018). This projected growth in digital collaboration tools is likely correlated to a sustained increase in remote working, as the one is a productivity prerequisite of the other. One could argue that an increase in time spent on collaborative activities and a growing centricity of digital collaboration tools promotes a higher degree of self-management, and therefore would further decrease the proportion of managers in a given organization (which is in line with the historical trend of less management positions). However, no such concrete predictions were found.

The average job tenure has decreased significantly over the past decade(s) and is shorter for younger generation workers. While no predictions regarding the average job tenure were found, the proportion of younger generation worker is only expected to increase. By 2020, 'Millennials' (D.O.B. 1980-2000) are forecast to make up 50% of the U.S. workforce. Globally, they are predicted to make up 75% of the workforce by 2025 (Inc, 2019). The historical trend of an increase in flexible contracts comes hand-in-hand with an increase in diversity of income: the number of people working on-demand jobs (i.e. 'gigs' – work in the gig economy) was forecasted to grow from 3.9 million Americans in 2016 to 9.2 million in 2021 (NACo, 2017).

The changes in organizational context affect the general skill profile similarly to digitalization and automation. These developments are all intertwined. As the capability of automation technology improves and its adoption rises, time will be spent on tasks that cannot be automated (namely interpersonal and higher cognitive skills). Digitalization drives a shift in the nature of teamwork, possibly increasing the relative reliance on technological skills. The decrease of the average job tenure has made the relative importance of general skills more important, and has increased the skills instability.

The observed developments illustrate an uncertain future state to plan towards. When trying to imagine and make decisions with respect to the 2025 state and momentum of AI capability and adoption, it helps us to envision a bandwidth of possibilities. It may either largely disappoint, if the state and momentum of AI and its adoption do not increase by much, or bring disrupting change in result of exponential growth in intelligent technology and organizational adoption. Two extremes in this bandwidth are described below. Framing the uncertainties will later help us to construct the scenarios.

3.2.5. Bandwidth of possibilities

In the first extreme, we do not achieve reasoning AI, and domain-specific expert systems have *not* been adopted en masse. The skill profile of 2025 looks similar to that of 2020. Barriers such as legacy systems and architectures, and lack of skills and expertise in digital domains (EY, 2017) hamper adoption. Digital collaboration tools are important, and programming and advanced data analyses will not be democratized to across entire organizations. We see a relatively sustained flexibility of work, and the nature of tasks and teamwork remain largely the same. General skills remain more important than specific skills. Within the category of general skills, technological skills are most sought after. Social and emotional skills outgrow higher cognitive skills by a bit due to increased collaboration and augmentation, while the skill profile does not grow much more instable. The relative dependence on technological skills continues its small linear increase.

- General skills remain more important than specific skills.
- Within the category of general skills, technological skills are most prevalent.
- Social and emotional skills slightly outgrow higher cognitive skills in relative importance.
- The skills profile retains the same level of stability.
- The relative dependence on technological skills still increases (however slightly so).

The second extreme is that reasoning AI is technologically possible and organizational adoption grows, as well as that of domain-specific expert systems. Adoption grows exponentially, as companies allocate more resources to IT (Spiceworks, 2018), the human-system interaction improves, and the potential impact of automation grows. Digital collaboration tools are at the core of collaboration processes and experience is a prerequisite (or rather an assumption) for employment (such as Microsoft Office has become in 2019). Work grows more flexible as more automation technologies are deployed; more employees work on a 'gig'-basis. No/low-code becomes the norm, and programming is only useful with advanced comprehension of it. Similarly to this, augmented analytics democratizes data analysis across the organization, effectively transforming the nature of many roles in a lot businesses.

- General skills remain more important than specific skills.
- Within the category of general skills, higher cognitive skills are most important, followed by social and emotional skills slightly lagging behind.
- Technological skills are still important and sought after, yet considerably less so for non-experts.
- The skill profile grows more unstable.
- The relative dependence on technological skills is still prevalent, yet more so for basic digital skills, system savviness and data interpretation.

3.2.6. Impact & Uncertainty

While both extremes would have implications for the strategic position of the HRBS, the first extreme would be most impactful. A business environment that places widespread demand on technological skills would necessitate the HRBS to adapt the content of its education. Integrating more technology-oriented content would require changes at the strategic, tactical and operational levels, as well as different organizational capabilities embodied by the competence profile of teachers. At the strategic level, placing more emphasis on technology and digital business could implicate the business school portfolio and structure, as well as its (long-term) partnerships. At the tactical level, focussing on technological skills could lead to human resource reconfigurations in terms of the teacher competence profiles. At the operational level, the changing nature of the content of education could lead to altering the role that physical classrooms have in the education process, which could differ across different types of courses (e.g. human resource management [predominantly qualitative] vs. big data analysis [predominantly quantitative]).

It is highly uncertain whether the business environment in 2025 will end up to be (closer to) extreme 1 or extreme 2. This uncertainty stems from the fact that the capability and adoption of automation technology is contingent on a lot of (interwoven) factors. If one or some of these factors develop slower than expected, this could stall the second extreme to a point later in time. For example, while IT budgeting and further adoption of RPA may indicate an environment resembling extreme 2, any unforeseen hurdles in the development of natural language processing would indicate a future closer to extreme 1. Other such factors include (but are not limited to) the presence of technological skills in businesses, the ability for SMEs to reliably train algorithms with limited data, the ability for non-statisticians to perform advanced analyses, and the investments in legacy IT infrastructures. Perhaps the most telling and important distinction between extreme 1 and extreme 2 is to what extent augmented analytics will democratize data and create citizen data scientists across all units and levels of an organization. Experts, however, strongly disagree whether and when this could become reality.

3.3. Form of Education

The second key variable is the 'market share of various models of higher education'. This variable provides a quantitative measure of the various forms of higher education that full-time students embark upon to obtain their professional starting qualification and part-time students use to upgrade their skills. As such, this variable tracks the degree to which new models of higher education replace traditional ones.

3.3.1. Models of Higher Education

Though the market share of various models of higher education provides a powerful perspective on strategically relevant changes in the business environment, selecting and defining what counts as a model and measuring its market share is not without challenges.

The first challenge is to decide at what level different models of education should be defined in order to arrive at the most meaningful measure for market share from a strategic perspective. Differences in form of education exist at the level of the work format (e.g. lecture vs. flipped classroom, etc.), a course, an entire degree programme or even the basic teaching philosophy (e.g. social constructivism). Here we have chosen to select and define models of higher education at the level of educational programmes, because it is at this level that the potential strategic challenges for the HRBS are expected to be greatest.

The second challenge is to arrive at a selection and definition of models of higher education at the programme level based on an against the backdrop of all the various models that have hitherto been defined. The existing academic and popular literature mentions of plethora of different models that often overlap or are not that clearly linked to either the course or programme level.[2] Here, we have decided to define our own models against the backdrop of what the available literature offers, because this allows us to connect them to the most important trends and developments that we have identified (see section 3.3.3).

[2] OC&W (2016, p. 7) defines 7 different dimensions of flexibilisation. SURF defines four scenarios (see: https://www.surf.nl/files/2019-04/Flyer%20versnellingsplan%20-%20zone%20Flexibilisering.pdf, retrieved on 23-11-2019).

	Model name	Cohort vs. individual	Programme content & structure	Focus	Dominant formats
M0	*No higher education*	-	-	-	-
M1	*Traditional higher education*	Cohort	Fixed	Degree	Lectures Self-study Workshops Project-based learning
M2	*Blended higher education*	Cohort	Fixed	Degree	The above + E-learning
M3	*Flexible higher education*	Cohort or individual	Flexible	Degree	The above + workplace learning
M4	*Modular higher education*	Individual	Flexible	Modular education Career requirements are leading.	Same as model 3

Table 2: Overview of various models of higher education and their characteristics

Table 2 provides an overview of the various models of higher education that we have defined at the programme level. The first model is *traditional higher education*, which is characterized by its standardized, cohort-based and degree-driven structure and the dominant use of educational formats that revolve around live teaching. The second model is *blended higher education*, which is similar to traditional education in terms of its standardized, cohort-based and degree driven structure and uses the same teaching formats, but integrates various forms of e-learnings in most of its courses. The third model is *flexible higher education*, which differentiates itself from the previous models based on the possibility for students to (amongst other things) select their own modules and determine their own order as well as the pace at which they complete their courses and degree programmes. The fourth and final model is *modular higher education*, which is similar to the flexible model in terms of personalization, but distinct in no longer being degree-driven. Under this model, students would typically start or continue their careers without obtaining a full degree. They would instead tailor a self-styled selection of smaller educational modules based on their personal and professional development goals in a way that fits their present employment situation second. Stacking these modules could still culminate in (the equivalent of) a traditional degree.

3.3.2. Conceptual Model of the Cluster of Trends & Developments Regarding the Form of Higher Education

Figure 5 provides a model of the direct (dark red) and indirect (light red) determinants of changes in the market share of the six various forms of business education.

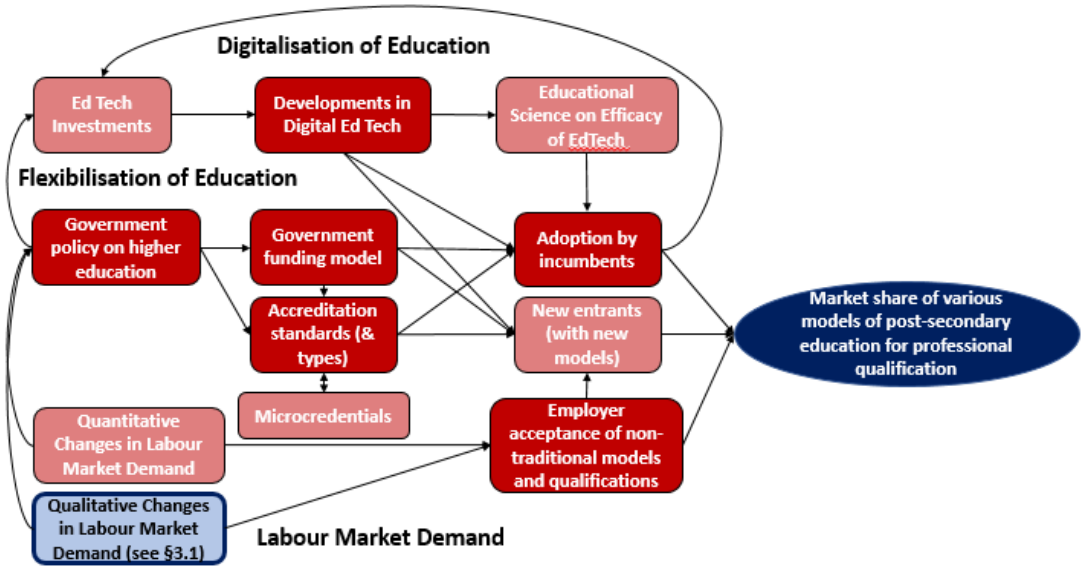


Figure 5: Model of the variables that influence the market share of the various models of business education

Changes in market share are ultimately driven by three direct determinants. The first is the degree to which new entrants successfully enter the market for business education with models that draw students away from other models. The second is the degree to which incumbents (existing universities of applied science that offer business degrees) innovate their programs in ways that changes their model. The third is the degree to which employers will accept non-traditional models as professional qualifications (with the latter being of particular influence on the market share of the flexible and modular models of education.

These direct determinants of the market share of the various models of business education are influenced, in turn, by various trends & developments that can be grouped in three major themes. The first is labour market demand. Here, (substantial) changes in the previous cluster's key variable of the general skill profile (section 3.1) engender qualitative changes in labour demand that could directly affect prospective student's choices, as well as the degree to which new entrants and incumbents develop and offer new models. The same goes for quantitative changes in labour market demand. Mismatches in the supply and demand for business graduates will make employers more flexible (in times of shortages) or more selective (in times of oversupply), which affects prospective students' choices directly and spurs innovation amongst incumbents and new entrants.

The second theme is digitalisation. The developments in this theme come from investments in educational technology (EdTech) that lead to the creation of new educational products, services and formats that substitute more traditional methods of education through digitalisation. Changes at the level of these variables affect the market share of various models of education by enabling and stimulating innovation by incumbents and new entrants but also depend on the extent to which incumbents adopt these technologies.

The third theme is changes in government policy on two levels. The first consists of changes in the legal framework to which higher education is bound and the accreditation standards against which its quality is assessed. Changes in the legal framework and/or accreditation standards enable and could stimulate innovation from incumbents and the entry of new entrants with (more flexible) models of education. The second level is that of funding. Changes in the way higher education is funded could also enable and stimulate the innovation of incumbents and the emergence of new entrants with other (more flexible) forms of education.

Though each of these themes are relevant, the last one is most decisive as changes in this theme are a precondition for significant changes in the market share of various models of education. Due to the dominance of this factor and the constraints in time and scope, the following paragraphs will mainly focus on how this last theme has affected the market share of various models of education.

3.3.3. Historical Trends & Developments in the Market Share of Models of Higher Education

Determining the market share of each model requires us to define the size of the total addressable market for higher education at the university of applied science level in the Netherlands first. At the highest level, this market falls apart in two major market segments.

Full-time education

The first of the major market segments consists of students who have obtained an mbo-4, havo or vwo degree that makes them eligible for enrolment in a full-time programme at a university of applied science. Figure 6 shows how the size of each group of graduates has developed over the 2008 to 2017 period. The total number of vwo-graduates has remained stable between 30.000 and 35.000. The number of havo-graduates has increased from just above 40.000 to over 46.000. And the number of mbo-graduates has risen from 54.000 to over 70.000.

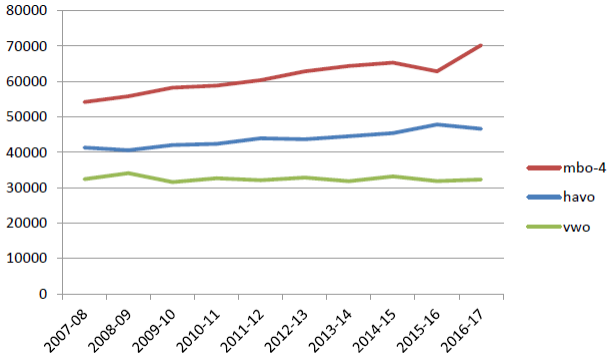


Figure 6: Total addressable market of mbo-4, havo and vwo graduates (source: Inspectie van het Onderwijs, 2018,

Contrary to the historical developments at this level of the total addressable market, quantifying the market share of each model of education over time is more difficult. This is because enrolment numbers for higher education are administrated by degree type only. Many of the further distinctions that would be needed to track the historical developments in enrolment by model of higher education as we defined them are not available.

In order to deal with these problems, we approximate the market share of each model based on what enrolment numbers are available at the level of degrees based on the following series of assumptions.

- The combined market share of the traditional (M1) and blended (M2) models of higher education corresponds to the percentage of mbo-4, havo or vwo graduates that enrolls for an hbo degree programme directly or one year after graduation.
- The present market share of the flexible (M3) and modular (M4) models of higher education is assumed to be 0% for full time students, given that current laws and regulations for higher education block universities of applied science from offering these forms in full time programmes.
- The market share of no higher education (M0) is the residual of the total addressable market after the market share of models 1 and 2 and other routes (e.g. havo > vwo, havo > mbo or vwo > wo) or detracted.

Starting with the segment of havo graduates, Figure 7 shows that the total percentage of havo graduates that enrolled for an hbo programme directly or one year after graduation ('havo-graduates > hbo in total') increased from around 87% in 2007/8 to close to 90% in 2012/13, but then declined to 85.8% in 2015/16.

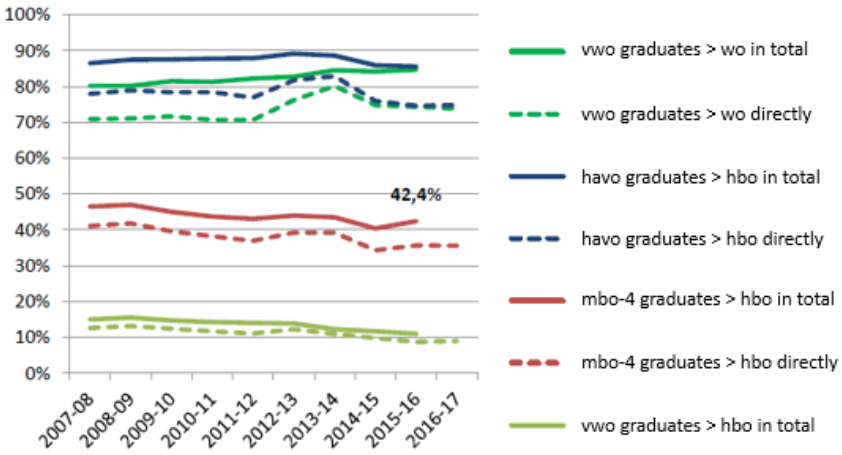


Figure 7: Conversion of mbo-4-, havo- and vwo-graduates to hbo enrolments from 2007/08 to 2016/17 (source: Inspectie van het Onderwijs*, 2018, p. 23)*

Having to remain agnostic about which percentage of havo graduates enrols for programmes that qualify as traditional (M1) or blended and contextualized (M2), the combined market share of both models is the same. Detracting this market share and the percentage of havo graduates that enrols for vwo or mbo programmes after graduation from the total addressable market results in a 2.6% and 5.3% market share for no higher education (M0) for the 2009 and 2016 cohorts of havo graduates respectively. This results in the approximated distribution of market share between models 0, 1 and 2 amongst havo graduates depicted in Figure 8.

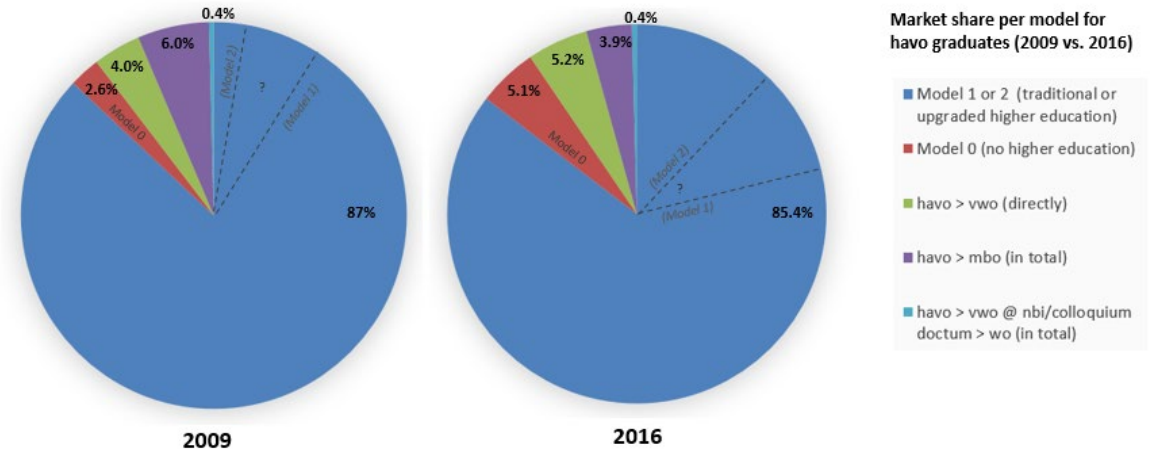


Figure 8: Market share per model of higher education for the 2009 and 2016 cohorts of havo graduates at the national level

The percentage of mbo-4 graduates that enrolled as for a full-time hbo programme directly or one year after graduation declined from over 45% in 2007/08 to 42.4% in 2016/17. Given that mbo-4 graduates only have the options to (a) enter higher education at the hbo level based on their degree or (b) enter the workforce with their mbo-4 degree (forgoing higher education), these numbers translate directly to the distribution of market share between models 1 and 2 and model 0 in Figure 9.

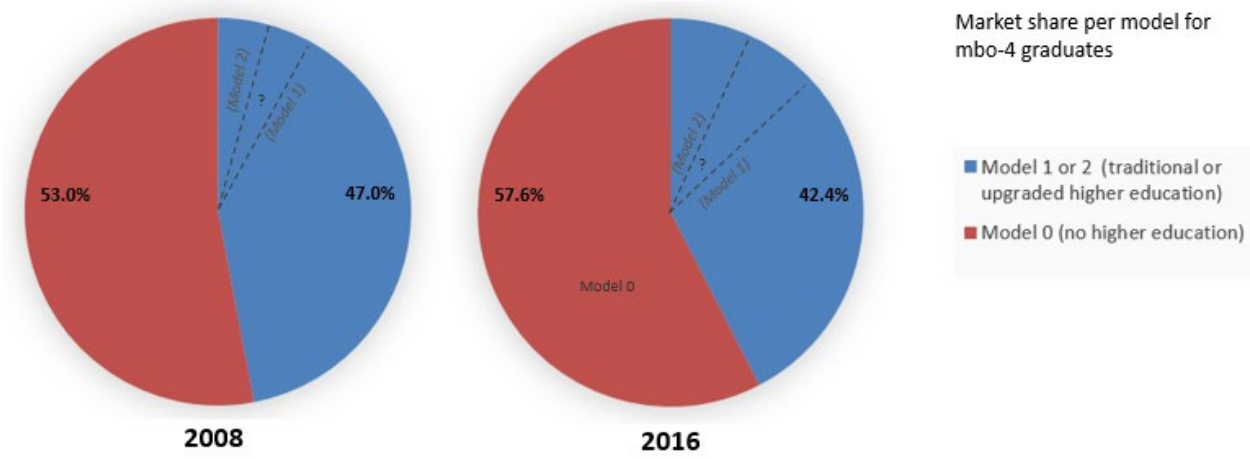


Figure 9: Market share per model of higher education for the 2008 and 2016 cohorts of mbo-4 graduates at the national level

The percentage of vwo-graduates that enrols as an hbo student directly or one year after graduation also declined from around 15% for the 2008 cohort to around 11% for the 2016 cohort. Detracting this market share and the total percentage of vwo graduates that enrols for higher education at the wo level results in a 4.0% market share of 'no higher education' among both the 2009 and 2016 cohort of vwo graduates. This translates to the (approximated) distribution of market share between models 0, 1 and 2 for vwo graduates in Figure 10.

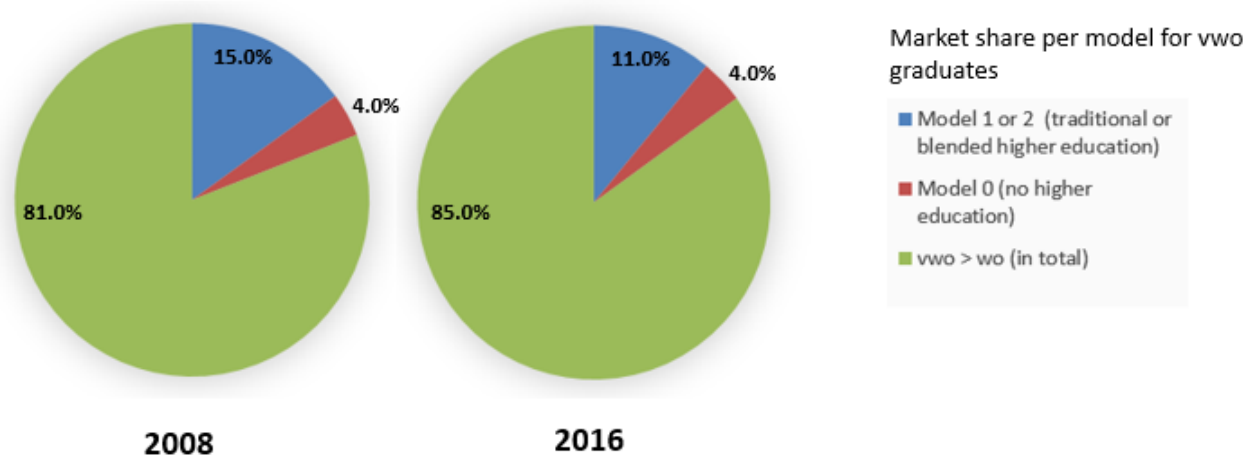


Figure 10: Market share per model of higher education for the 2008 and 2016 cohorts of vwo graduates at the national level

Part-time education

The second major market segment of eligible students consists of the share of the working population that chooses to pursue a hbo level bachelor degree later in life (more than one year after obtaining their qualifying degree) part-time. Data about the size of this market is only available at the national level in terms of total enrolments (not new enrolments on a yearly basis). This means that the market share of the various models of higher education for part-time students has to be calculated based off of the stock of total part-time students, rather than the flow of new students (that was used for full-time students).

The market of part-time students can be subdivided in students who are enrolled for a part-time degree at government-financed institutions and part-time students who are enrolled at private institutions ('niet-bekostigde instellingen' or 'nbi's' in Dutch). The total number of part-time students enrolled in part-time education has declined with almost 30% from 2010 (77.000 students) to 2015 (55.000 students), but has grown back to around 60.000 students in 2018 (see Figure 11).

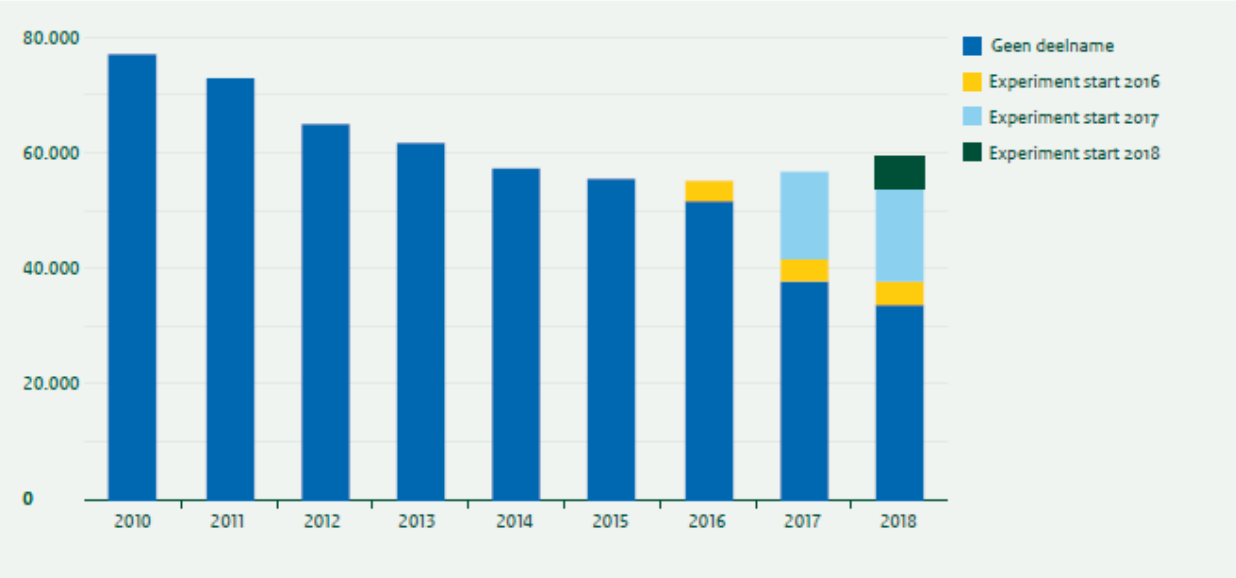


Figure 11: Total number of part-time students enrolled in government-financed hbo programmes in the Netherlands, subdivided in terms of their programme's (first year of) participation in the government-initiated pilot 'Experiment Leeruitkomsten' from 2010 till 2018 (adopted from: Inspectie van het Onderwijs, 2019, p. 182)

The distinction Figure 11 makes between the number of part-time students that attends educational programmes that do and do not participate in the pilot 'Experiment Leeruitkomsten' a calculation of the relative market share of the flexible model of education (M3) and traditional (M1) and blended (M2) forms of education among part-time students enrolled at government-financed institutions of higher education at the hbo/level. The pilot 'Experiment Leeruitkomsten' consist of (a) a liberalization of two key points in the law on higher education that allows for flexibilisation of educational programmes that participate and (b) the obligation to comply to accreditation standards that demand some degree of flexibilisation. As such, the total number of students enrolled in programmes that participate in the pilot can be taken as representative for the market share of flexible education. Converting these numbers into percentages, Figure 12 shows that the market share of the flexible model of higher education (M3) has grown from 0% to 43% of the part-time market of higher education at government financed institutions.

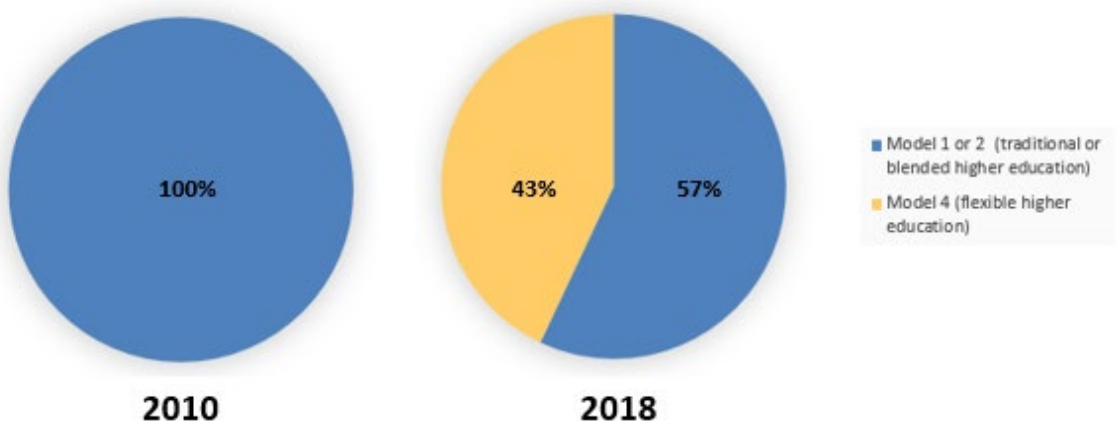


Figure 12: Market share per model of higher education for the 2008 and 2016 cohorts of vwo graduates at the national level

There is far less reliable data for the purpose of market share calculation for the group of students that was enrolled as part-time students at private institutions (nbi's) for hbo level higher education.[3] It is known that over 65.000 students were enrolled for some form of education at private institutions in 2018 and that the majority was enrolled for education at the hbo level. Yet it is not possible to determine how many of these students actually pursue a hbo bachelor degree (Inspectie van het Onderwijs, 2019, p. 182).

Though it is known what forms of education private institution offer percentage-wise per institutions (see Figure 13), this unreliably computes to a measure of market share as there are vast differences between the number of students per institution (see: SEO, 2018, p. 25). We therefore take the increase in the percentage of institutions offering blended forms of education at the expense of those only offering traditional education (shown in Figure 13) as indications that blended forms of education are gaining market share at the expense of traditional models of education without quantifying them.

[3] Central administration of data about this group has only started in 2018 (*De Staat van Het Onderwijs 2019*, 2019, p. 182)

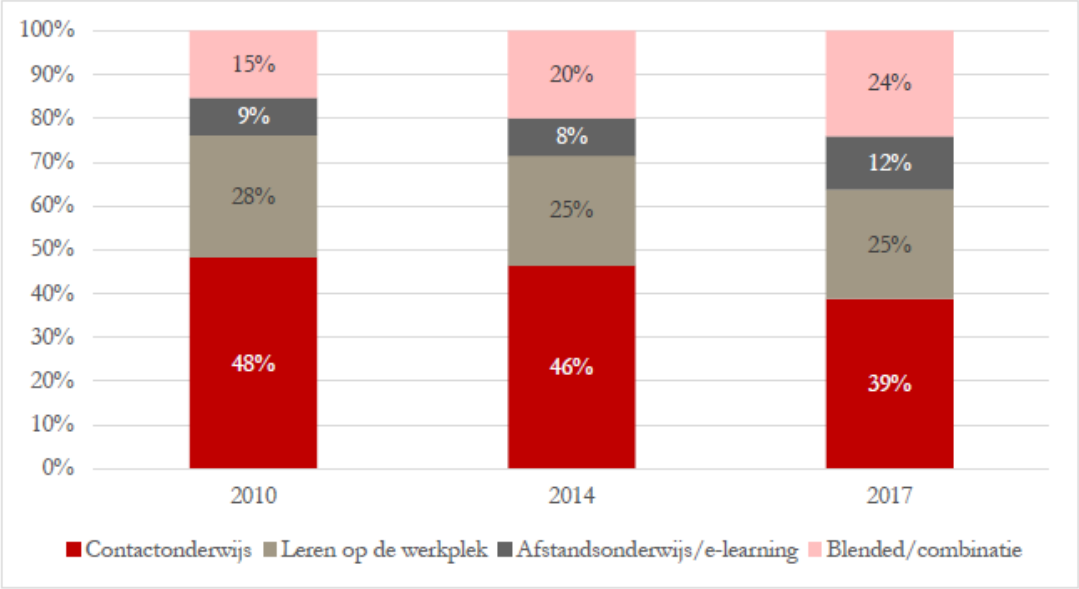


Figure 13: Percentage of institutions that offers traditional of education ('contactonderwijs'), distance learning ('afstandsleren'), work place learning (leren op de werkplek) or blended learning ('blended/combinatie') as their model of education (adopted from SEO, 2018, p. 21)

Digitalization & Blended Learning

The development of new educational technologies (EdTech) are one of the most important enablers of innovations in educational models.

On the one hand, there has been a series of developments that could lead to the substitution of traditional forms of education by innovative online, digital versions of distance education. A brief summary of some of these developments by VSNU (2017, pp. 12–13) discusses the most important new technologies and their consequences for higher education. The first of these was the emergence of *e-learning* in the 1990's, which made it possible to watch instructional videos, do exercises and make tests online rather than at school. After that, *open course ware* effectively began to commoditize knowledge from 2002 onwards, when MIT decided to make all its course material freely accessible online in 2001/02 and other major universities soon followed suit. The development and launch of *massive open online courses* (MOOCS) around 2008 was another major milestone. MOOCS did not merely offer knowledge, but provided a well-organized package of video lectures, reading material, exercises and tests in a format that is analogue to and could completely substitute for traditional courses in higher education.

Each of the developments described above could contribute to the substitution of the traditional model of higher education (M1) by supplementing it with digital EdTech. Online lectures, learning materials, exercises and tests can supplement traditional forms of learning and transform that into what has become known as blended learning (M2). Here, newer generations of *digital learning environments* also go beyond the logistical support functions that earlier generations fulfilled. They enable the application of *learning analytics* to better track student progress, identify sticking points, diagnose learning difficulties and even predict failure and dropouts in advance.

Yet although these developments in EdTech enable the substitution and augmentation of more and more aspects of the traditional education model in theory, their actual adoption in the programmes of traditional institutions is relatively slow and limited. One reason is the relatively low acceptance of EdTech among teachers or students, which also has negative effects for investments by and competition between EdTech companies in innovation (Kos, 2019). Another reason is that the effectiveness of many digital forms of EdTech is questionable compared to traditional forms of education. On average, less than 10% of all students who starts a MOOC completes it (Jordan, 2014) and research on the effectiveness of e-learning shows mixed results (Nguyen, 2015).

Government policy, funding, accreditation standards & flexible & modular education

When it comes to flexible higher education, government policy has had the biggest influence. Up until 2015, flexible higher education had no market share in the market of government-financed full-time and part-time education (as Figure 11 already showed). The main reason was that, before this time, existing laws and regulations prohibited or stood in the way of making higher education more flexible. That situation changed shortly after an advisory panel commissioned by the minister of education concluded that (a) part-time education could not fulfil the labour market's growing need for highly educated professionals and Life Long Learning (LLL), because (b) it was not flexible enough to meet the needs of adult students or their employers (Rinnooy Kan, 2014, pp. vi–ix).

Based on the recommendations of the report, the ministry of education launched three pilot programmes. The first pilot programme ('Experiment Leeruitkomsten'), exempted educational programmes that participated from existing regulations on two points: (1) the content of degree programmes no longer had to be fixed and documented in advance (OER) and (2) credit points awarded for the completion of educational modules no longer had to be justified in terms of a fixed and predetermined number of hours (*Handreiking Pilots Flexibilisering Hoger Onderwijs*, 2016, p. 10).[4] Removing these two constraints enabled educational programmes who participated to make their educational offering more flexible in terms of pace, time, location, content, form, examination method and coaching (*idem*, p. 7).

The breadth of participation in this first pilot pilots was substantial. As of September 2018, 450 part-time degree programmes participated in the experiment. 350 of these programmes were hosted at government-financed institutions. Combined, these 350 programmes educated 25.500 out of the total number of 59.136 part-time students at government financed institutions in 2018 (Inspectie van het Onderwijs, 2019, p. 182), which adds up to a market share of around 43% (as Figure 11 already depicted).

The second pilot programme ('Experiment Vraagfinanciering') was based on financing higher education for part-time students through a voucher system. Whereas Dutch higher education is normally financed through a fixed statutory fee (paid by the student to the institution) and a government contribution (paid by the government to the institution), educational programmes that participated in this pilot would only receive a full tuition fee from the students, paid for 30 ECTS modules at a time. Institutions were allowed to set these fees themselves, up to a maximum of € 3.750,-. Students would get vouchers that would give them a discount of € 1.250,-.[5] This pilot was successful in terms of student participation, with 3,911 students in total making use of the vouchers over 2016/17, 2017/18 and 2018/19. Yet the pilot turned out to benefit private institutions more than government-financed institutions: 89% of the participating students enrolled at a private institution, as participating programmes at government-financed institutions became more expensive with the voucher system relative to the fixed statutory fees that would otherwise apply.[6] Due to the adverse effects for government-financed institutions, and because the funds that OCW had reserved for subsidizing the vouchers were exhausted by the 2016, 2017 and 2018 cohorts, the minister decided not to allow new cohorts of students or expand the number of participating institutions in April of 2019.[7]

The third pilot programme (Experiment Flexstuderen) enables students to pay per credit point, rather than the annual statutory fee (that is fixed regardless of student participation in terms of credit points). Institutional interest in this experiment was limited when this pilot programme first started in 2016 and was limited to full time students, with only four institutions opting in.[8] This changed when OCW amended the experiment to also include part-time students and opened up the experiment again for other institutions as

[4] https://www.rijksoverheid.nl/onderwerpen/hoger-onderwijs/documenten/richtlijnen/2016/11/25/handreiking-pilots-flexibilisering-hoger-onderwijs, retrieved on 22-11-2019.
[5] https://zoek.officielebekendmakingen.nl/stb-2016-146.html and https://www.rijksoverheid.nl/onderwerpen/hoger-onderwijs/vraag-en-antwoord/hoe-kan-ik-meedoen-aan-het-experiment-vraagfinanciering, both retrieved 29-6-2020.
[6] https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2019Z08226&did=2019D16699, retrieved on 29-06-2020
[7] *Ibidem*
[8] Universiteit van Amsterdam, Tilburg University, Hogeschool Utrecht and Hogeschool Windesheim

of February 2021.[9] Twelve universities of applied science and two universities[10] have communicated their interest to join in the second cohort of the experiment. This increase in interest is likely due to the fact that institutions (a) perceive flexible participation to be a better fit for the target group of part-time students and (b) that the OCW's exploration of alternative funding mechanisms (as announced in their strategic agenda) makes it prudent to participate in this experiment as a means to prepare for such changes.

3.3.4. Forecasts

Though further increases in the market share of blended (M2) and flexible (M3) forms of higher education are to be expected, there is still much uncertainty to what extent higher education will be flexible and/or modular in 2025.

Expectations of industry incumbents and strategic sector level plans all point towards an increase in blended learning. A survey amongst private institutions showed that most of them expect the biggest growth (50% of respondents), strong growth (24% of respondents) and no decline in blended education, compared to 22% seeing a decline in traditional education (SEO, 2018, p. 23). Vereniging Hogescholen's (VH) strategic vision states that blended learning will make education more personalized and contribute to the flexibilisation of higher education by making learning more time- and place-independent (VH, 2015). OCW (2019, pp. 66–67) commits to continued financial support of a collaborative programme between institutions of higher education (Versnellingsplan onderwijsinnovatie) that aims to integrate digital learning in higher education.

The extent to which blended learning will replace traditional education will, however, depend on the extent to which some of the strategic and tactical challenges that typically stand in the way of innovations in higher education are overcome. On a strategic level, these impediments consist of challenges around business model redesign and the absence of a vision on the subject at the board level (SURF, 2015, p. 11). On a tactical level this is the challenge of developing digital skills amongst teachers and digital capabilities of systems and support staff (*ibid.*).

Historical trends in the adoption of flexible forms of higher education and the strategic agendas of VH and OCW point to an increase of their share in the part-time market as highly certain. Figure 11 shows that flexible forms of higher education rapidly proliferated in the part-time market once legal constraints are removed. As soon as the LUK Experiment allowed for two key exemptions in the WHW, flexible forms of higher education grew from 0% to 43% market share in part-time education. VH and OCW have both clearly communicated the ambition to normalize these exemptions. VH (2019, p. 13) states that the experiment should be broadened and OCW (2019, p. 60) even commits itself to generalizing the exemptions to higher education in general when the LUK experiment ends in 2022-23 (as long as NVAO assess the level and quality of the participating programmes as positive).

Given the rapid adoption within the confines of the experiment, flexible forms of higher education thus seem sure to gain more market share in the part-time market.

Though there are reasons to also expect an expansion of the flexible model in full-time higher education, this is less certain. The fact that OCW explicitly states that the legal exemptions from the LUK experiment would also be generalized for full-time higher education makes an increase of the market share in this segment possible. Yet VH seems to be more conservative. They state that the Experiment LUK should be expanded to all other part-time programmes, but merely talk about room for experiments in full-time higher education. It could be that the actual policy decision by OCW towards the end of the LUK Experiment will turn out to match this position: generalizing the exemptions for part-time higher education, but only for a select group of full-time degree programmes within a full-time version of the LUK Experiment. And even if the exemptions were generalized for (all or a select group of) full-time programmes, adoption could still be

[9] https://www.rijksoverheid.nl/documenten/kamerstukken/2020/06/17/id11058-brief-voorhang-tk-besluit-uitbreiding-experimenten-leeruitkomsten-en-flexstuderen, retrieved on 09-07-2020

[10] Institutions that have shown an interest to join the experiment are: Hogeschool van Amsterdam, Haagse Hogeschool, Hogeschool Zuyd, Hogeschool Arnhem-Nijmegen, Breda UAS, Hanze hogeschool, Hogeschool HAS, Universiteit Leiden en Universiteit Twente

much lower or even negligible for other reasons. One is that full-time degree programmes are under far less pressure from declining student numbers and competition from private institutions than part-time programmes. Another is that various aspects of the flexible model will prove to be much less necessary or even effective for full-time students than part-time students who already have a job.

Where further flexibilisation of part-time education is rather certain, it still remains uncertain to what extent government policy will enable and facilitate a further evolution of flexibilisation to modular higher education.

On the one hand, there are plans to explore methods of funding higher education and certifying educational accomplishments on a smaller scale than annualized tuitions and bachelor and master degrees. Citing the successful results of the flexible participation experiment, OCW (2019, p. 63) promises to make flexible participation possible for all accredited programmes. They also add that they will use 2020 to explore whether the method of funding higher education should be changed in order to make this possible and whether that should apply for all types of students (*ibid.*). Most importantly, OCW has also announced a pilot in which they will explore the use of micro credentials (2019, p. 65). Funding mechanisms for flexible participation and micro credentials are important preconditions for enabling a modular model of education. These steps therefore show that the emergence of modular higher education could become possible in 2025.

Yet there are some very important contingencies and contrarian indications that make it very difficult to predict whether or not the modular model will gain a market share in higher education. Though OCW has committed to exploring the need for a different funding mechanism and micro credentials, the outcome is still uncertain. Their motivations for doing so is not to arrive at an unbundling of existing degree programmes. They even state that the structure, coherence and degree-drivenness of traditional degree programmes should not be abandoned (2019, p. 58). So although OCW is exploring important preconditions for modular higher education, it is far from sure whether their amendments in funding mechanisms and the laws and regulations will actually enable modular learning paths for part-time and especially full-time students.

3.3.5. Bandwidth of Possibilities

Based on the overview of forecasts in the previous section and the uncertainties that still persist the actual market share of each of the models of education discussed in section 3.1 can be expected to fall somewhere between the two extremes depicted in Figure 14.

The first extreme is characterized by a market for full-time higher education where the market share of the blended model (M2) has further increased at the expense of the traditional model (M1) with no flexibilisation (M3) and (b) a market for part-time higher education where the market share of the flexible education (M3) has increased, but without the fragmentation (M4) of degree-driven educational programmes. Though traditional education is still around (~20% market share), most full-time education programmes will have become blended (M2), with 28% of all mbo-4, havo and vwo graduates enrolling for degree programmes where most modules mix digital and traditional education. Part-time will have become mostly flexible with 60% of all students attending flexible forms of higher education and a small remainder attending programmes that are still completely traditional (10%) or mostly blended (10%) but not flexible. Laws and regulations that still prevent the flexibilisation of full-time higher education and the absence of preconditions required for the acceptance of the modular model of education make that the flexible model and the modular model have not gained any market share in the full-time and part-time markets respectively.

The second extreme is characterized by the partial flexibilisation and modularization of the full-time and part-time markets for higher education respectively. Here, flexibilisation does not remain confined to the part-time market, as 20% of all mbo-4, havo and vwo-graduates will embark upon a higher education degree where at least part of their programme that has adopted some form of flexibilisation. The part-time market has not only become more flexible, but has also become modularized: 30% of students who attend part-time education at government-financed institutions enrol for separate modules based on their specific

career needs without a predetermined plan to (but the possibility of) stack(ing) these into a traditional degree. The boundaries between full-time and part-time education also begin to blur, as some students that start out in full time programmes will start working before completing their degrees and finish them by following the remainder of their modules part-time (combining work and higher education).

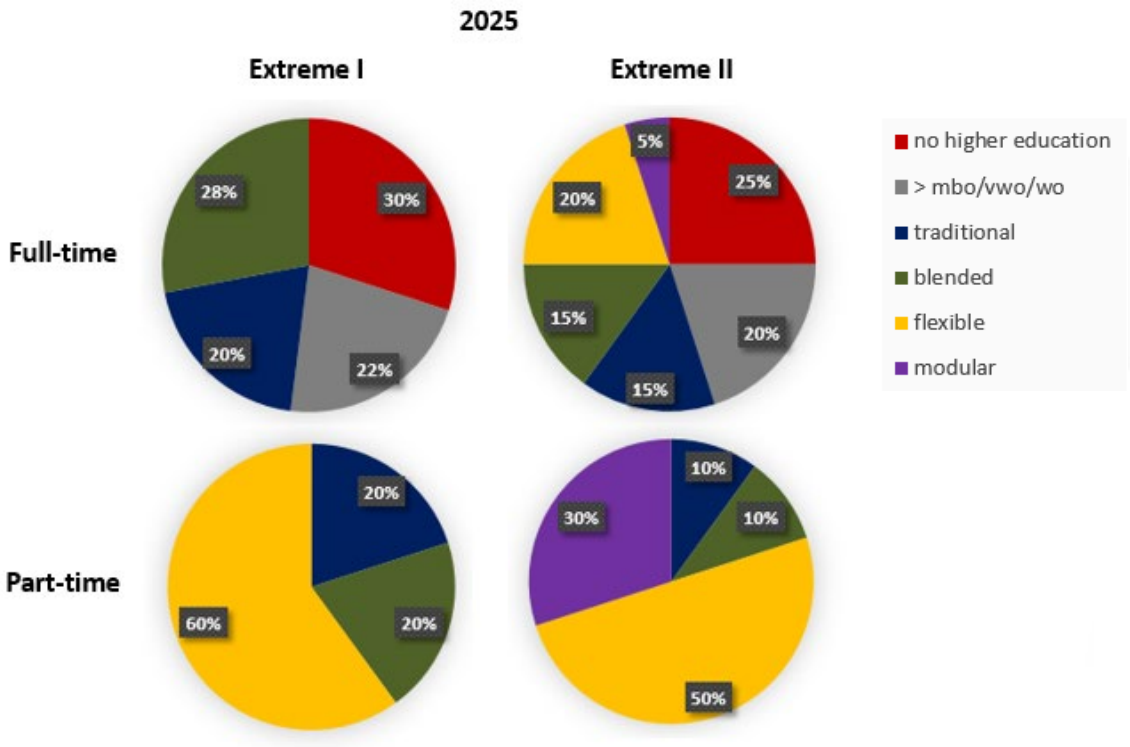


Figure 14: The extreme outcomes for the market share of the various models in the fulltime and part-time markets for higher education in 2025

3.3.6. Impact & Uncertainty

Though both extremes would affect the strategic position of the HRBS, the second extreme would have the highest impact. An environment in which an increasing amount of government-financed institutions offers flexible model of higher education (that heavily relies on blended learning) would create competitive pressures for the HRBS to adapt. Adapting to such a model would require changes at the strategic, tactical and operational and would shift the required competence profile of teachers to a different set of capabilities. At the strategic level, adapting to a flexible model of higher education could have consequences for the portfolio and organizational structure of the HRBS. On a tactical level, flexibilisation and digitalization could lead to human resource and administration requirements that would lead to a redefinition of the task profiles for teachers and the redesign of many of the administrative systems and processes. On an operational level, shifting roles of teachers would require new ways of planning and collaborating between teachers.

Whether the 2025 business environment ends up to be (closer to) extreme 1 or extreme 2 is highly uncertain. This uncertainty stems from the fact that there are several universities of applied science (e.g. Saxion and Windesheim) and related organizations (SURF) who aim and plan for progressive forms of flexibilisation for their part-time and full-time programmes. But whether or not flexibilisation will spill over to full-time education depends on a number of contingencies whose outcome need not be supportive. Laws and regulations would have to be revised to generalize the exemptions made in the pilot 'Experiment Leeruitkomsten' for all forms of higher education (including full-time). And even if these exemptions were generalized, institutional adoption could still be low for similar reasons that impeded the adoption of blended learning. The same is true for fragmentation. Even though the infrastructure for micro-credentials is currently being developed, formal recognition (in terms of accreditation standards) and acceptance by employers are still needed to vouch for student choices of separate modules. And even if these conditions

would be met, institutional adoption could still be hampered by low acceptance or negative results concerning the efficacy of more flexible and modular models of education.

4. Scenarios

The previous chapter clustered various trends & developments around two key strategic variables. This chapter presents four scenarios that have been constructed on the basis of these key variables. The two key uncertainties that were identified in section 3.1 translate into four different scenarios for the business environment of the HRBS in 2025 (see figure 15).

These scenarios are discussed in sections 4.1 to 4.4 of this chapter. Before that, section 4.1 discusses the outcomes of other trends & developments clusters that are more certain and – as such – will therefore be a part of every scenario.

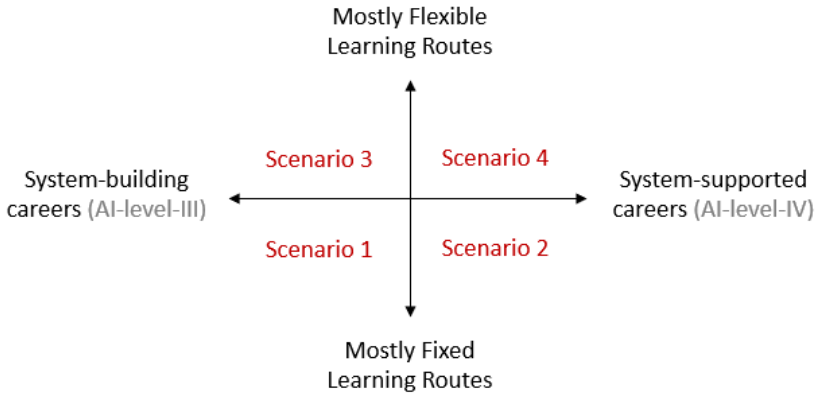


Figure 15: Overview of the four scenarios

4.1. Scenario 1 – Mostly Fixed Routes to Intelligent System-Building Careers

Under the first scenario, 2025 is defined by (1) a labour market in need of business professionals who are able to develop, tailor and manage domain-specific intelligent systems within their organisations and (2) an educational system where flexibilization remains confined to part-time programmes.

> Zeyneb works as a junior marketeer for an online retailer of e-health and domotica products for the elderly. She was hired because of the practical experience she gained in using Google Online Sales Suite (an AI-level-III intelligent system that integrates market research, online multi-channel content management and add placement functionalities) during the first two years of her bachelor degree in commercial economics and the healthcare-related electives she chose during the third and fourth year.
>
> Most of Zeyneb's workday is dedicated to optimizing online presence and reach, digital lead generation and online sales conversion. This means that she translates the opportunities identified by GOSS' big data analysis into new content creation tasks for the creative team that she implements and fine tunes with the systems advanced A/B testing functions. Though the system is able to automate much of the analytical work and changes to the online content, it still requires supervised machine learning sessions, constant monitoring and decision-making interactions with Zeyneb to work. In doing so, Zeyneb is using GOSS to build and develop an organization-specific intelligent sales system.
>
> Zeyneb's understanding of the core marketing principles from the first two year of her studies is still necessary to understand what she is doing, but her experience in working with GOSS is indispensable to being able to act in the fast-paced and increasingly digitalized world of online marketing.

4.1.1. Route to this Scenario

Looking back from 2025, a lack of further breakthroughs in AI capability has further increased the importance of technological skills within the general skill profile for business professionals. By 2023 AI scientists and engineers had not yet been able to develop deep reasoning algorithms that could understand abstract relationships. As a result, the development of artificial intelligence applications and their adoption remains confined to the level of domain-specific intelligent systems. Here, existing trends in the digitalization and automation of work and decision-making processes will persist to the point that all business units can benefit from AI-supported, data-driven and (partially) automated decision-making. This

extended horizontal locus of automation does not transfer through organisations vertically, as augmented analytics and natural language processing have not persisted to the point of data analytics democratization —employees without some background in data science, statistics, mathematics or similar fields cannot produce sensible conclusions from advanced analyses reliably. In addition, because the system's underlying intelligence does not exceed AI level III, there is still significant human input and operational supervision (e.g. teaching, managing, monitoring and maintaining these systems) in specific organisational contexts and business environments. As a result, the knowledge and skills required to build, manage and use domain-specific intelligent systems will come to top labour market demand in 2025.

By 2025, it has also become clear that OCW's strategic agenda was too optimistic about the degree to which its ambitions regarding flexibilisation of higher education would be adopted by incumbent universities (of applied science). Though the two key legal exemptions of the LUK experiment were normalized in the WHW as of 2022/23, full-time programmes proved reluctant to adopt flexible principles for two reasons. The first was a lack of urgency. Whereas part-time educational programmes had seen substantial declines in enrolment numbers until the start of the LUK experiment, enrolment numbers for full-time programmes were far more stable. As a result, universities (of applied science) were less inclined to reorganized their educational offerings. The second reason was that – in the full-time programmes that did take the chance to experiment – many full-time students (particularly groups that already struggled in the traditional model of higher education) proved far less willing and able to choose and manage their own learning routes. This created (sometimes insurmountable) challenges in sufficiently coaching and supporting them, with negative effects on study progress and student satisfaction as a result. The adoption of flexible forms therefore did continue to expand in part-time higher education, but remained muted in full-time higher education.

The modular model of higher education did not take root at all. The primary reason for this was that the funding model for government-financed institutions was not changed in ways that would accommodate learning routes in higher education that are no longer coupled to primary institutions or specific bachelor or master degrees. OCW's explorative study of alternative funding mechanisms found that the current model provided sufficient room for flexible part-time education and that abandoning the annual tuition model for full-time students was undesirable. OCW therefore definitively decided not to radically change the funding mechanism for higher education in 2023 (and opt for more incremental instead). Another reason why the modular model did not take root was that micro credentials did not gain enough traction in supplementing or substituting for full degrees as accepted credentials in the labour market. Though the pilot project for microcredentials was technically completed in 2021, adoption remained muted because the quality assurance system (at the national level) did not find a way to officially recognize and accredit microcredentials that balanced pragmatism and quality assurance. So although microcrendentials were technically facilitated, adoption never topped 5% of all full-time and part-time educational programmes by 2023. Due to the absence of the right preconditions in terms of funding and certification, the modular model of higher education does not have any market share in 2025.

4.1.2. This Scenario's Business Environment

The roles that business schools prepare their students for in 2025 are not only supported by digital technology, but focused on operating domain-specific intelligent systems within and tailoring them to specific organisational contexts. There are various smart systems that have automated and continue to automate an increasing share of operations and decision-making processes in organisations. Yet the core functionality of these systems remains tied and confined to (sub)domains of the traditional business functions (e.g. marketing & sales, finance & control, operations & logistics, procurement, etc.). More importantly, their effective use depends on input from humans. In order for these systems to work, they need to be tailored to specific organisational contexts in a way that requires AI learning (i.e. human teaching), monitoring and maintaining these system's and their operational performance.

The importance of domain-specific intelligent systems in every day work and their continued reliance on human users and administrators makes employers and system developers eager to invest in education. Employers need human resources who are able to use these systems. System developers need business

professionals who are able to work with these systems to enable the adoption of their systems. Both groups are therefore willing to invest in higher education for employees as well as the creation of educational content that teaches professionals in domain-specific disciplines to use the systems that have established themselves or are vying to establish themselves as the dominant design in that profession. Yet because higher education remains relatively traditional and inflexible in the structure of most of its full-time programmes, employers and system developers will continue to focus on shorter educational formats for working professionals. These will either be developed in-house by system-developers or through collaborations between (them,) employers and private institutions, with some innovative part-time programmes of government-funded universities of applied science taking part.

This increase in the demand for intelligent system-savvy business professionals and the willingness of both system developers and employers to invest in education creates various opportunities and threats. It increases the overall (life-long learning) need for upskilling and reskilling among the working population. The willingness of both employers and system-developers to invest in education creates opportunities for collaboration in the co-development of up-to-date educational content that prepares for intelligent system-use. Yet there is also a threat that the knowledge and skills that were traditionally taught in business schools will insufficiently qualify business graduates for the start of their career without further training or even render them obsolete. Another (corollary) threat is that private parties (system-developers, employers, private schools or other new entrants) will use the widening qualitative gap between what the labour market needs and traditional forms of education offer to develop substitutes.

With muted adoption of flexible principles in full-time higher education, the business environment for higher education has changed the most for part-time higher education. Though full-time programmes have adopted more blended-learning this has not changed the pace and structure of traditional higher education much (as it mostly substituted for and/or supplemented traditional homework and lectures). Part-time higher education, on the other hand, has become much more competitive. Flexible forms of higher education have succeeded in drawing bigger numbers of students "back to school" at government-financed institutions for upskilling and reskilling during their career. In response, some of the bigger private institutions have tried to position themselves more firmly by offering more attractive and tailor made programmes to big employers and specific (sub)classes of professionals in need of retraining. This creates the threat of further drops in the number of full-time students as a result of increased competition from private institutions and new entrants.

Opportunities	Threats
• **High demand for profession-specific technological skills**	• **Substitution of much of the knowledge and skills that universities of applied science traditionally taught by domain-specific intelligent systems.**
• **High demand for educational formats that suit life-long learning.**	• **Competition from incumbents and private parties that focus on the growing demand for domain-specific (intelligent) system skills.**
• **Private party (employers and system developers) interest in (to invest in) co-education on domain-specific tech skills.**	• **Declining number of job openings for traditional business disciplines that are rule-based.**

Table 3: Opportunities & Threats for Scenario 1

4.2. Scenario 2: Mostly Fixed Routes to Intelligent System-Supported Careers

Under the second scenario, 2025 is defined by (1) a labour market where social, creative and critical thinking skills are far more important than technological skills and (2) an educational system that has become more flexible for part-time students, but where most full-time educational programmes remain traditional in being cohort-based, fixed in structure degree-driven.

4.2.1. Route to this Scenario

Looking back from 2025, further breakthroughs in AI capability and its adoption has made higher order cognitive and creative skills more important than technological skills in the future careers of business graduates. Before the end of 2023, scientists and engineers succeeded in developing deep reasoning algorithms that were able to understand abstract relationships. These algorithms were able to learn in unaided and mostly unsupervised ways when given access to data and to develop automated work and decision-making processes based on conversational interactions with human instructors. This technology was successfully integrated and commercialized in a foundational deep reasoning platform that powers and connects various domain specific intelligent systems with their own or one general (Siri or Alexa-like) virtual assistant as a user interface. Though these platforms have only just begun to be adopted in 2025, they almost immediately proved capable of vast increases in efficiency and effectiveness. Their first successful use cases therefore point to a future where technological skills will become far less important than higher order cognitive and creative skills.

Besides these differences in the development of AI capability, the route to this scenario is similar to the first regarding flexibilization. By the end of 2023, the adoption of flexible learning routes will have become more common in part-time education, but remain negligible in full-time education for the same reasons that were given in section 0. Modular education did not take root because OCW decided not to change the funding mechanism for higher education before the end of 2022 (see section 0), thus making it impossible for modular higher education to be realized on a larger scale.

4.2.2. This Scenario's Business Environment

The adoption of higher order AI capabilities has had a profound effect on the quantitative and the qualitative demand for business professionals. The quantitative demand for business professionals will lower across the board, as intelligent systems are able to substitute much of the operational execution and tactical decision-making that are a substantial part of their work today. Traditional business disciplines that are highly rule based (e.g. accountancy) will suffer especially steep drops. This quantitative decline in labour market demand threatens the strategic position of business schools, because there are less jobs to fill than the projected number of graduates based on present enrolment numbers.

> Sarah works as a business performance manager at a franchise chain of small gyms that is exclusively open to private lessons from independent personal trainers who bring their own clientele.
>
> Sarah spends most of her workday talking to Alfred, a (Siri/Alexa-like) virtual assistant that functions as the verbal user interface (VUI) of her company's single, fully integrated (AI-level-IV based) support system. Her workday always starts and ends with updates from Alfred about changes in timeslot utilization rates and the projected yields per gym. This is followed by (a) an analysis of how the dynamic pricing strategies that Alfred runs within preauthorized parameters and patterns that Sarah has selected have affected both metrics and (b) and decisions about proposed changes (by Alfred) that would deviate from these parameters. It is Sarah's job to balance the projected enhancements in yields as a result of such changes with what is considered acceptable and fair to clients in terms of price differentials. The rest of her day is focused on approaching specific personal trainers with package deals based on her selection of promotional offers that Alfred has proposed.
>
> Since Alfred does most of the analytical work, Sarah's added value comes from her ability to balance longer-term customer relationships with short-term financial performance. Though an understanding of the basic principles upon which Alfred operates is necessary to do her job, it are these social skills that make her sufficiently qualified. She was hired because her university of applied science was known to have solid training programs in managing machine-learning-based performance optimization and customer relationship and experience management skills as part of its core curriculum. Like most firms, her employer still looked for a bachelor degree as a starting qualification in much the same way as that happens today, but is more selective in terms of which universities offer curricula that prepare their graduates to manage advanced intelligent systems, but to manager customer relationships and experience in a world that operates on them.

Contrary to the first scenario, technological skills have also become far less important than higher order cognitive and creative skills. Just as the launch of Microsoft Windows eliminated the need to learn MsDos commands, the deep reasoning capabilities and the conversational user interfaces of higher order AI

technology will make intelligent system-use much less dependent on technological skills. This shift in demand to higher order cognitive skills and creativity creates an opportunity for business schools to offer a revamped curriculum that develops these skills.

Opportunities	Threats
• **Growing demand for creative and higher order cognitive skills**	• **Overall decline in quantitative demand for business graduates in the labour market**
	• **Steepest decline in quantitative demand for graduates in highly rule-based disciplines**

4.3. Scenario 3: More Flexible Routes to Intelligent System-Building Careers

Under the third scenario, 2025 is defined by (1) a labour market that demands a tech-focused general skill profile and (2) a market for higher education where flexible and modular models have gained and continue to expand their market share among full- and part-time students.

4.3.1. Route to this Scenario

Similar to scenario 1, there have been no major breakthroughs in the development of AI capability and the development of artificial intelligence applications. Their adoption therefore remains confined to the level of domain-specific intelligent systems. As a result, the knowledge and skills required to build, manage, maintain and use domain-specific systems will come to dominate the labour market demand in 2025.

Contrary to the previous two scenarios, looking back from 2025, OCW's strategic agenda marked the beginning of a transition towards more flexible and modular higher education. Before the end of 2020, the positive results of the LUK Experiment led to a generalization of the two key legal exemptions for higher education in general. OCW´s exploration of alternative forms of funding resulted in a new funding mechanism that required institutions to enable students to pay per study point, which was signed into law and applied as of 2023-2024. The micro credential pilot delivered an open infrastructure for educational badges and certificates that was rapidly adopted by part-time educational programmes of front-running participants in the LUK experiment and – more importantly – quickly accepted by employers for two reasons: (1) OCW and NVAO managed to integrate the accreditation of micro credentialing in accreditation at the level of institutional assessments (ITK) and (2) innovating institutions managed to co-opt large employers as co-developers of the educational modules for which some of the first and most popular micro-credentials were awarded.

4.3.2. This Scenario's Business Environment

The business environment of this third scenario resembles that of the first in terms of the roles that business schools prepare their students for. Business graduates have to be able to not only use but also develop and tailor domain-specific intelligent systems to the organizational contexts in which they work. And the high demand for business graduates makes employers and system developers willing to invest in the education of business professionals.

The shift to a more flexible framework for higher education has created a more competitive environment for universities of applied science on two levels. At what could be called the macro level of competition, where institutions compete for applications for full degree programmes, flexibilisation has created more distinct choices for students. Universities of applied science can choose to make their educational programmes more flexible through the personalization of content, the personalization of the pace with which and the times at which students study and the personalization of didactical formats. Because these three aspects cannot all be maximized at the same time, different institutions have chosen different models, differentiating their offering, thereby implicitly or explicitly targeting different target groups. Some universities of applied sciences have come to focus more on making the pace at which a degree can be obtained as flexible as possible, while others focus more on tailoring their content as much as possible to the interests of students and recent developments in the professional field. Due to these differences in the way in which each institution has moved away from the traditional market share, the distribution of market share is being defined much more by how well institutions are able to meet the needs of prospective student(segment)s and employers than by regional demographics in the choice of primary institutions.

Quincy works as an independent financial performance consultant and software engineer for SME´s. Apart from his commercial skills, clients hire him because of his experience with and expert-level licensee in the use of OmniFin,an AI-level III powered system that uses real-time financial analysis to report results and identify potential cost-savings in operational processes.

The majority of Quincy's work goes into installing, connecting and tailoring OmniFin to his client's business and running and supervising machine-learning processes that ensure that all types of transactions and internal activities can be assigned to products and process steps. Once this is completed, the focus shifts to training employees at his client firms in using the financial reporting functions and dashboards and consulting them about potential sources of cost saving.

Quincy started his business after obtaining his basic license in OmniFin during one of the business economics modules he enrolled for after his foundational year for the bachelor in business administration and an internship at Deloitte where he gained more experience and completed the intermediate and advanced training programmes in OmniFin, for which he also obtained ECTS, because it allowed him to demonstrate the learning outcomes for modules that were offered by a partner university.

Besides increased competition for applications for full degree programme, the much more flexible framework of higher education also creates a broader competitive dynamic (at a more micro level) in course selection between institutions. Within the flexible framework of higher education, students have much more freedom to select educational content across institutions. Where students could only opt to enrol for half a year of elective programmes (through Kies op Maat) before, they can now choose to complete different modular parts of their full degree programmes at different institutions and stack these towards a degree from their primary institution. As a result, some government-financed institutions will invest heavily in attractive modular offerings in order to draw students to them for short-term participation. But there will also be new entrants who, without being accredited to offer full degrees, will offer shorter educational models that enable students to meet their main degree programme's learning outcomes in more attractive ways. This micro-competitive dynamic makes managing the net balance between incoming and outgoing students a new concern for institutions.

Within a broader external environment where the labour market is in desperate need of business graduates who are able to work with domain-specific intelligent systems, the aforementioned modularization of higher education – combined with the rise of micro-credentialing – has facilitated much more intensive collaboration between third parties and universities of applied science. Recognizing that shortages of system-savvy business professionals are a bottleneck to adoption, big system developers (e.g. Salesforce.com, Google and SAP) are investing heavily in the development of educational content for universities of applied science. At the same time, large employers that need graduates who are able to work with these systems will form partnerships with universities of higher education to ensure that they have access to the knowledge and skills they need. As a result, there modules that are co-developed by universities of applied science and high profile have come to play an important role in bridging the gap between what schools teach and what the labour market needs. Modules that give students an opportunity

to work with sought-after employers and earn micro-credentials that are co-branded will be strong assets for universities of applied science at both the macro and the micro level of competition.

Opportunities	Threats
• High demand for profession-specific technological skills	• Substitution of much of the knowledge and problem-solving methodologies that universities of applied science traditionally taught by domain-specific intelligent systems.
• High demand for educational formats that suit life-long learning.	• Competition from incumbents and private parties that focus on the growing demand for domain-specific (intelligent) system skills.
• Private party (employers and system developers) interest in (to invest in) co-education on domain-specific tech skills.	• Declining number of job openings for traditional business disciplines that are rule-based
• **Recognized credentials create a bigger, open market for up-schooling, re-schooling and retraining in shorter formats.**	• **Micro competition from incumbents (and new entrants) at the level of shorter educational formats, particularly in the market for life-long learning.**

4.4. Scenario 4: More Flexible Routes to Intelligent System-Supported Careers

Under the fourth scenario, 2025 is defined by (1) a labour market that demands a tech-focused general skill profile and and (2) a market for higher education where flexible and modular models have gained and continue to expand their market share among full-time and part-time students.

4.4.1. Route to this Scenario

The route towards this fourth scenario resembles aspects of the routes from previous scenarios. Like scenario 2, the breakthroughs in AI capability around the year 2023 and their adoption (see section 4.2.1.) makes higher order cognitive and creative skills more important than technological skills. Like scenario 3, the transition to a more flexible framework of higher education as a result of changes in the regulatory framework and funding mechanisms from OCW (see section 4.3.1.).

4.4.2. This Scenario's Business Environment

The biggest changes in the landscape of higher education are similar to scenario 3 in terms of the system becoming more modular and flexible with some key differences. Contrary to scenario 3, the rapid advances and adoption of more generalized forms of artificial intelligence has made the content of education much less dependent on domain-specific intelligent systems. With labour market demand focused on social, creative and critical thinking skills, rather than domain-specific intelligent system skills, system developers are far less significant and barely involved as co-developers of educational content (as opposed to scenario 3). On the other hand, collaboration with companies has become more important for two reasons.

Samuel works as a junior product category manager for a supermarket chain that generates more than 50% of its revenue from home deliveries. He was hired at the age of 19 after being scouted during an online serious gaming contest that his employer organized for recruitment purposes. He still has to complete his bachelor degree, which he now does as a part-time student by completing modules that mostly consist of practical assignments that can be performed at his job when he has the time.

Like Sarah, Samuel spends most of his day talking to 'Ally', a (Siri/Alexa-like) virtual assistant that functions as the verbal user interface (VUI) of the company's single, fully integrated (AI level IV supported) operational system. Within Samuels domain, Ally optimizes sales by adjusting procurement orders, internal distribution and consumer prices automatically based on physical and online point-of-sale data in real time. The first order of business in Samuel's daily conversations with Ally is a(n often pro forma) review of the effects of Ally's autonomous changes on sales volumes and prices based on patterns that Samuel pre-authorized. The rest of the day is spent on scheduling promotions and product placement decisions for the days and weeks ahead. Alternatives are prepared by Ally, who matches wholesale supplier prices with current and historical inventory and sales data and presents suggestions with expected revenue and P&L outcomes. Based on this overview Samuel makes a selection that makes sense from a human perspective and sets the parameters for dynamic adjustments. From here on, Ally executes everything from short-term flexible framework contracting with suppliers, just-in-time ordering planning to dynamic pricing adjustments.

Samuel would not be able to fulfill his position without a high level understanding of business economics and more in-depth knowledge of consumer behavior, which he obtained by following core courses on both subjects. But those would not have been sufficient if he had not also developed the higher order cognitive skills that were required for interacting with Ally. He developed these in a series of training modules that were developed and offered by another university of applied science who partnered with the company behind Ally. Though Samuel is already making big steps in his career, he still wants to complete his bachelor degree by stacking micro-credentials, which a flexible degree-structure based on micro-credentials allows.

The kind of skills that are required to work in an intelligent system-supported way are best developed and difficult to practice outside of real world organisational contexts. This makes companies attractive for universities of applied sciences whose curricula have to prepare students for intelligent-system supported careers. To the extent that these employers are smaller to medium enterprises, they are happy to participate – as they see universities of applied science as partners who can help them to start working with intelligent systems. With less of a demand for domain-specific intelligent system skills and more of a demand for general skills that are mostly inherent, large sought after employers are less likely to backward integrate their human resource activities into higher education than under scenario 3 with the exception of talent programmes. This provides opportunities in collaborating with SME's on the adoption of intelligent systems. At the same time, the shifting priority to more general skills is a threat because it could lead to a skills and capability mismatch between traditional teaching staff and what the labour market requires.

Opportunities	Threats
• Growing demand for higher order cognitive skills	• Declining quantitative demand for business professionals in the labour market
• Formalized micro-credentials for shorter educational formats and flexible learning paths enable co-creation with professional practice	• **Substitution threat for higher education from on the job training and early stage talent scouting through gamification**
• **SME's are in need of transition partners in the adoption of general intelligent systems.**	

5. Stress-testing

The previous chapter proposed four scenarios of what the future business environment of the HRBS could look like. This chapter assesses to what extent the HRBS is prepared for each of these scenarios. Section 5.1. describes HRBS' current strategic position and their existing strategic plans. Sections 5.2 to 5.5 test this position and these plans against the opportunities and threats of each scenario to determine the extent to which the HRBS is prepared for each of them.

5.1. HRBS Strategic Position

As the merger of three out of four institutes into the new HR Business School has been completed, its future strategic position will depend on the strategic plans behind this reorganisation to an important extent. These plans will be discussed in section 5.1.2.

Yet in order to fully understand the strategic position that the HRBS is currently planning for, their current strategic position must be understood first. All of these plans depart from this position. Some of its current strengths and weaknesses are not changed by plans. And while others might, the present situation shows how big of a change (and a challenge, therefore,) this would be. The next section therefore starts with a discussion of the HRBS' present strategic position in terms of its current strengths and weaknesses.

5.1.1. Current Strategic Position

One of the current strengths of the HRBS is that is both institutionally (as part of RUAS) and specifically (at the level of its individual programmes) accredited to award formal bachelor degrees. Another strength is that some of the teams responsible for specific degree programmes have shown to be capable of innovating both the form and content of their individual degree programmes. A final strength is that RUAS in general and the HRBS in particular have managed to integrate the in-house applied research (programmes) of their knowledge centres (KCBI in the case of HRBS) in their educational programmes (of which the educational programme that has led to this report is an example).

One of the current weaknesses of the HRBS is that its teaching staff, due to the relatively long average tenure and the speed of technological developments in professional practice, are not up to date with the general and especially the domain-specific technological skills that have become increasingly important in professional practice. Another weakness is that the HRBS' legacy structure (built around degree programmes based on the traditional business functions) has created various core rigidities that stand in the way of developing cross-disciplinary educational content (both across traditional business disciplines and other disciplines like engineering, healthcare, social work etc.).

Strengths	• Institutional accreditation to award bachelor degrees
	• Adaptivity and innovation in programme level teams
	• In-house collaboration between applied research & education
Weaknesses	• Limited or outdated domain-specific technological skills of teachers
	• Core rigidities around traditional business function-based structure

Table 4: Current strengths & weaknesses profile of the HRBS

5.1.2. Strategic Plans

The strategic aspects of the reorganisation plans for the HRBS contain a number of points that would change the strategic profile of the HRBS is they were to be executed successfully. The project plan (HRBS, 2018) and the formal decision to form the business school contain four general objectives regarding the strategic position of the HRBS in 2025 and six transition lines along which these four objectives should be reached (see Appendix A for a summary). Table 5 provides an overview of the relevant strategic aspects of the plan that can be found as part of the six transition lines.

#	Aspect of plan	Original text in organisational plan (HRBS, 2018, p.14)
P1	**Culture of collaboration**	'Stimulating a culture of collaboration and renewal; to take down dividers between study programmes, promote innovation'
P2	**Cross-over content**	'We will pursue an educational model with greater focus on working together; making multidisciplinary learning and cross-overs between study programmes (and domains) possible; increasing integration of education and applied research.'
P3	**External relations**	'strengthen relations internal/external'
P4	**Education/research relations**	'strengthen relations education/research'
P5	**Organisational development**	'Responsibility at a lower level in the organisation. Acknowledge Professional autonomy, give room and take responsibility.'

Table 5: Strategic aspects of the organisational plan for the HRBS (2018)

The most important change to the HRBS' current strategic profile would come from what Table 5 denotes as a 'culture of collaboration' (P1) combined with 'cross-over content' (P2). If the reorganisation of the HRBS were to successfully develop what, under these points, is envisioned as 'an educational model with greater focus on working together; making multidisciplinary learning and cross-overs between study programmes(and domains) possible' and 'to take down the dividers between study programmes', this would overcome or substantially reduce the core rigidities of its current structure that is based on monodisciplinary programmes.

Other strategic aspects of the reorganisation plan would also improve the HRBS's strategic position. Strengthened relations between research and education (P3) and 'internal/external' (P4) could enhance the fit between its educational offering and what the future labour market demands (under the condition that these are aligned). The same goes for 'organisational development' (P5), which could fortify and generalize the innovative strength that the teams of individual degree programmes have hitherto shows into an overall strength of the business school.

The aforementioned improvements of HRBS' strategic position do, however, depend on the successful execution of each of the relevant transition lines. If one or more aspects of the plan are not executed successfully, these contributions to HRBS future strategic position would not be realized.

5.2. Stress-testing Scenario 1 (Mostly Fixed Routes to System-Creating Careers)

This paragraph tests the future strategic position of the HRBS against Scenario 1 (see Table 6), which is characterized by mostly fixed/traditional educational routes and high demand for general and domain-specific technological skills.

Scenario 1			Opportunities				Threats			
			High quantitative and qualitative demand for domain-specific tech-skills	Private party interest in co-education in (domain-specific) tech skills	Growing demand for shorter life long learning formats		Traditional knowledge & skill substitution by rule-based intelligent systems	New forms of competition focused on educating domain-specific system skills	Declining labour market demand for rule based business professions	
HRBS	Current Strenghts	Institutional accreditation to award bachelor degrees	++	++	+		+			
		Adaptivity and innovation in programme level curricula and teams	+	++	+			+		
		In-house collaboration between applied research & education	+	+	+		+	+	+	
	Current Weaknesses	Limited or outdated domain-specific technological skills of teachers	--	+	--		--	--	--	
		Core rigidities around traditional business function-based structure			--		-	--	--	

Table 6: Stress-test of the current strategic position of HRBS against Scenario 1

5.2.1. Preparedness of the current strategic position for scenario 1

The current strengths & weaknesses profile puts the HRBS in a position to exploit some of the opportunities scenario 1 presents. The high quantitative and qualitative demand for general and domain-specific technological skills in the labour market implies that there is a need for graduates whose skills in that area are formally recognized. The mandate to award accredited bachelor degrees enables the HRBS to formally

recognize that business graduates have developed these skills through – what is still today – the most valued starting qualification on the labour market. The ability to award these bachelor degrees also makes them a very attractive partner for private parties who want to invest in co-education in these particular skills. This willingness of private parties to invest in co-development also poses an important opportunity for the HRBS, as the limited or outdated general and domain-specific technological skills of teaches (W1) is what makes the HRBS unprepared for the development of educational programmes that teach general and domain-specific technological skills that are up to date at the present point in time.

The limited or outdate general and domain-specific technological skills are not just an impediment to the successful exploitation of opportunities in this scenario. It is also a problematic weakness given its threats of traditional business knowledge & skills being substituted by domain-specific intelligent systems (S1T1), new forms of competition that *are* om educating domain-specific technological skills (S1T2) and the overall decline in labour market demand for rule based business professions (S1T3). Defending against each of these threats requires an integration of general and domain-specific technological skills in curricula that most of teaching staff do not possess themselves.

Another point where the present strengths & weaknesses profile does not prepare the HRBS for this scenario results from the core rigidities around traditional programmes. The structural and cultural drawbacks of being organised around individual degree programmes that are tied to the traditional business functions (e.g. marketing & sales, finance, HRM, etc.) also make the HRBS less prepared to seize opportunities in the market for life-long learning opportunities. It also adds to the inability to defend against the threats of new forms of competition that *are* on educating domain-specific technological skills (S1T2) and the overall decline in labour market demand for rule based business professions (S1T3).

5.2.2. Preparedness of the HRBS' future strategic position for scenario 1

Though its current strategic position does not fully prepare HRBS for all of the opportunities and threats of this scenario, some of the strategic aspects of the plans (see section 5.1.2) are touched upon by strategic aspects of the plans (as shown in Table 7).

Scenario 1				Opportunities	High quantitative and qualitative demand for domain-specific tech-skills	Private party interest in co-education in (domain-specific) tech skills	Growing demand for shorter life long learning formats	Threats	Traditional knowledge & skill substitution by rule-based intelligent systems	New forms of competition focused on educating domain-specific system skills	Declining labour market demand for rule based business professions
					Sc1O1	Sc1O2	Sc1O3		Sc1T1	Sc1T2	Sc1T3
HRBS	Strategic Aspects of HRBS' Plans	P1	Culture of collaboration		(+)						
		P2	Cross-over content		(+)						
		P3	Strenghtening external relations			(++)					
		P4	Strenghtening education/research relations		(+)	(+)					
		P5	Organisational development		(+)		(+)				

Table 7: Stress-test of the strategic aspects of HRBS' existing plans against scenario 1

Some of the existing plans could be seen to match the opportunities and threats under this scenario if they were to be specified further in this direction. The plans to 'take down the dividers between programmes' (P1) and to develop more cross-over educational content (P2) could fit well with the opportunity of growing demand for a combination of general and profession-specific technological skills. Yet these plans are still very general and would have to be elaborated with a specific focus on general and profession-specific technological skills. Otherwise they would be to general to seize this opportunity. The same goes for the plans to strengthen the ties between research and education (P3) and professional practice ('internal/external') and education programmes (P4).

There are, however, also threats that are not addressed by the HRBS' current plans at all. The threat of domain-specific intelligent systems potentially substituting the need for much of the knowledge and problem-solving methodologies previously taught by universities, is not touched upon at all. Lastly, it is not

discussed how to (p)react to(/for) the threat of competition from incumbents and private parties that focus on the growing demand for domain-specific (intelligent) system skills.

5.3. Stress-testing Scenario 2 – Mostly Fixed Routes to System-Supported Careers

This paragraph tests the future strategic position of the HRBS against Scenario 2, which is characterized by mostly fixed/traditional educational routes to careers in which higher cognitive and interpersonal skills are most important due to a more rapid development and adoption of artificial intelligence.

5.3.1. Preparedness of the current strategic position for scenario 2

Although the current strengths and weaknesses profile could to some extent be seen to prepare the HRBS for scenario 2, there is less of a pronounced fit with its opportunities and threats (see Table 8) than with the previous scenario.

Scenario 3				Opportunities: High quarelitative and qualitative demand for domain-specific tech-skills	Private party interest in co-education in (domain-specific) tech skills	**Formalized micro-credentials fomats create an even bigger market for up-schooling and re-schooling**	Threats: Traditional knowledge & skill substitution by rule-based intelligent systems	New forms of competition focused on educating domain-specific system skills	Declining labour market demand for rule based business professions	**Microcoompetition in shorter educational formats, particulary in the market for life-long learning**	**Substitution threat for higher education from on the job training + part-time modular education**
				Sc3O1	Sc3O2	Sc3O3	Sc3T1	Sc3T2	Sc3T3	Sc3T4	Sc3T5
HRBS	Strenghts	S1	Institutional accreditation to award bachelor degrees	++	++	++	+			+	
		S2	Adaptivity and innovation in programme level curricula and teams	+	+	+		+		+	+
		S3	In-house collaboration between applied research & education	+	+	+	+	+	+	+	+
	Weaknesses	W1	Limited or outdated domain-specific technological skills of teachers	--	+	--	--	--	--	-	--
		W2	Core rigidities around traditional business function-based structure			--	-	--	--	--	--

Table 8: Stress-test of the current strategic position of HRBS against Scenario 2

The mandate to award bachelor degrees (S1) is, for example, still a valuable strength. But it is less important in an environment that puts a premium on higher order cognitive and creative skills *in general* (Sc2O1) than in an environment where proof of more domain-specific knowledge and (technological) skills is more important (scenario 1). Adaptivity and innovation at the programme level (S2) and the in-house collaboration with the research centre (S3) could also be valuable resources in relation to this qualitative demand shift, as well as in addressing the need of SME's for a transition partner (Sc2O2). But these, too, would still have to mobilized in that direction in order to be of use. The limited or outdated domain-specific technological skills of teachers (W1) would be less problematic under this scenario, as domain-specific technological skills have become far less important in work environments that are supported by more advanced intelligent systems.

There is, however, one big problem that the opportunities and threats of scenario 2 pose for the HRBS. The current core rigidities of the HRBS' structure and portfolio of educational programmes (W2) would be misaligned with a labour market that needs less business professionals in general (ScT1) and puts a premium on general higher order cognitive and creative instead of monodisciplinary skills (Sc2O1). As it stands, HRBS is not prepared to deal with that.

5.3.2. Preparedness of the current strategic position for scenario 2

Though some of the strategic plans of the HRBS could be seen to address the opportunities and threats of this scenario, they fall short of fully preparing them against the threats (see Table 9).

Scenario 2				Opportunities	Qualitative demand shift to higher order cognitive and creative skills	SME's are in need of a transition partner for the adoption of general intelligent systems	Threats	Declining quantitative demand for all types of business professionals
					Sc2O1	Sc2O2		Sc2T1
HRBS	Strategic Aspects of HRBS' Plans	P1	Culture of collaboration		(+)			
		P2	Cross-over content		(+)			(+)
		P3	Strenghtening external relations			(+)		
		P4	Strenghtening education/research relations			(+)		
		P5	Organisational development		(+)			

Table 9: Stress-test of the strategic aspects of HRBS' existing plans against scenario 2

From the perspective of its plans the HRBS can be said to undertake some actions that could address the opportunities and threats of scenario 2. Its ambitions regarding more collaboration (P1) and the development of cross-over content (P2) could provide an answer to the qualitative demand shift to higher order cognitive and creative skills (Sc2O1) and help to defend against the overall decline in the quantitative demand for all types of business professionals across the board (Sc2T1). The strengthening of external relations (P3) and between research and education (P4) could also be seen to improve the HRBS ability to act on the opportunity of SME's requiring a transition partner to adopt more generalized intelligent systems. But as with the previous scenario, this would require each of these plans to be elaborated and specified in this direction.

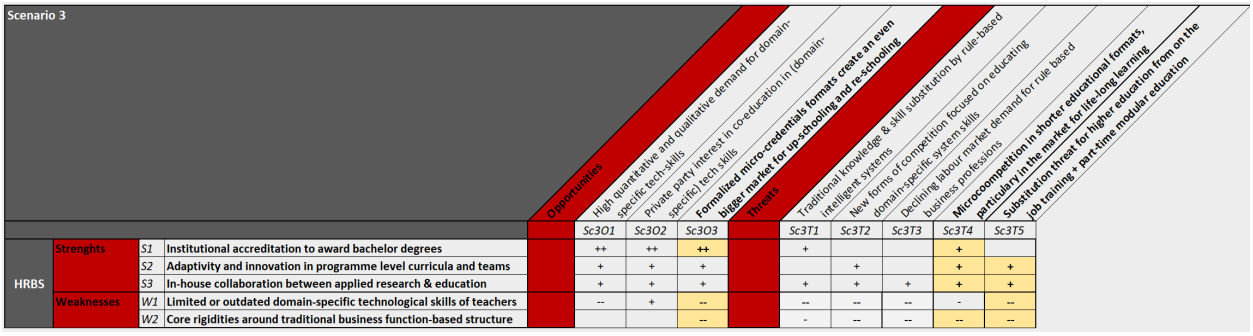
When judged from the perspective of the most important opportunities and threats of this scenario, HRBS' plans currently fall short of adequately preparing it for the future environment of scenario 2. Given the significance of the threat that the overall decline in quantitative demand for business graduates across the board would pose, the absence of any explicit recognition of this potentially happening in the future and concrete (contingent) actions to act upon that (if this would unfold) leaves the HRBS unprepared.

5.4. Stress-testing Scenario 3 – More Flexible Routes to System-Creating Careers

This paragraph tests the current strategic position of the HRBS and its existing strategic plans against the Scenario 3, which is characterized by more flexible routes and high demand for general and domain-specific technological skills.

5.4.1. Preparedness of the current strategic position for scenario 3

Since scenario 3 is similar to scenario 1 on many points, the degree to which the current strengths and weaknesses prepares the HRBS for this scenario is also similar on many point (see Table 10). The mandate to award bachelor degrees is also an important strength relative to the opportunities of a high quantitative and qualitative demand for domain-specific technological skills (Sc301) and the private party interest in co-education on general and domain-specific technological skills (Sc302). Likewise, the two weaknesses of the current strategic profile make the HRBS unprepared to defend against the three threats (Sc3T1, Sc3T2 and Sc3T3) that were also part of scenario 1.



Scenario 3				Opportunities: High quantitative and qualitative demand for domain-specific tech-skills	Private party interest in co-education in (domain-specific) tech skills	Formalized micro-credentials formats create an even bigger market for up-schooling and re-schooling	Threats: Traditional knowledge & skill substitution by rule-based intelligent systems	New forms of competition focused on educating domain-specific system skills	Declining labour market demand for rule based business professions	Microcompetition in shorter educational formats, particulary in the market for life-long learning	Substitution threat for higher education from on the job training + part-time modular eduction
				Sc3O1	Sc3O2	Sc3O3	Sc3T1	Sc3T2	Sc3T3	Sc3T4	Sc3T5
HRBS	Strenghts	S1	Institutional accreditation to award bachelor degrees	++	++	++	+			+	
		S2	Adaptivity and innovation in programme level curricula and teams	+	+	+		+		+	+
		S3	In-house collaboration between applied research & education	+	+	+	+	+	+	+	+
	Weaknesses	W1	Limited or outdated domain-specific technological skills of teachers	--	+	--	--	--	--	-	--
		W2	Core rigidities around traditional business function-based structure			--	-	--	--	--	--

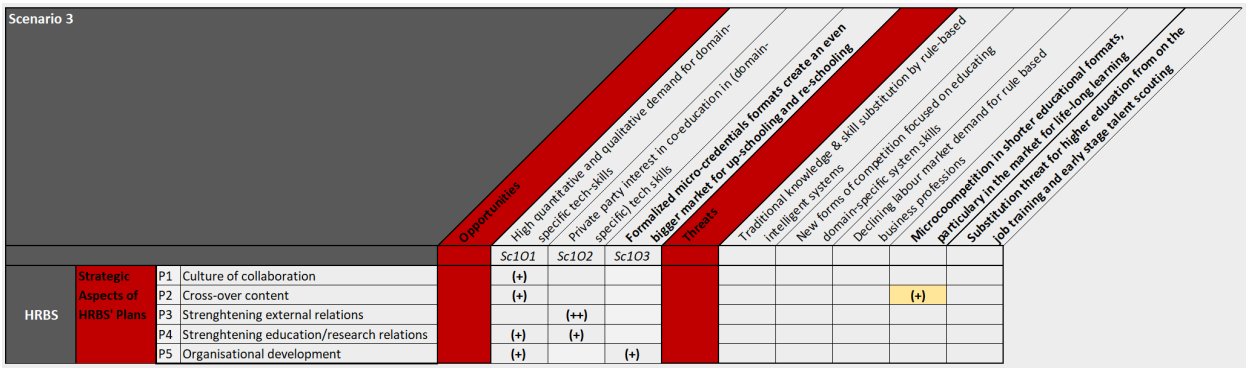
Table 10: Stress-test of the current strategic position of HRBS against Scenario 3

The degree to which the HRBS is currently prepared to deal with the opportunity that is unique to scenario 3 is mixed. Regarding the even bigger (as compared to Sc1O3) market in up-schooling and re-schooling that formalized micro-credentials would create (Sc3O3), the HRBS's mandate and institutional accreditation to award formal degrees (S1) would still be valuable. Yet the core rigidities around its current structure (W2) and the limited and/or outdated domain-specific technological of its staff (W1) would put the HRBS in a disadvantaged position to address this opportunity.

The same goes for the threats that are unique to scenario 3. On the one hand, the HRBS does already have some strengths that would help it to defend against the threats of micro competition in the market for shorter educational formats (Sc3T4) and the substitution threat from on the job training that is loosely linked to stacking micro credentials towards a formal degree (Sc3T5). Aside from its institutional accreditation to award formal degrees (S1), the adaptivity and innovation of some programme level teams (S2) and in-house collaboration between applied research and education (S3) do develop novel educational content with which the HRBS could compete in the market for shorter educational formats and mount a quality-based defence against the threat of substitution from on the job-training. But here, again, the HRBS weaknesses (W1 and W2) would still put them in a disadvantaged overall position to defend against the aforementioned threats.

5.4.2. Preparedness of the strategic plans for scenario 3

Many of the ways in which the HRBS' existing strategic plans prepare for the opportunities and threats are similar to what has been discussed in relation to the previous two scenario's (see Table 11).



Scenario 3				Opportunities: High quantitative and qualitative demand for domain-specific tech-skills	Private party interest in co-education in (domain-specific) tech skills	Formalized micro-credentials formats create an even bigger market for up-schooling and re-schooling	Threats: Traditional knowledge & skill substitution by rule-based intelligent systems	New forms of competition focused on educating domain-specific system skills	Declining labour market demand for rule based business professions	Microcompetition in shorter educational formats, particulary in the market for life-long learning	Substitution threat for higher education from on the job training and early stage talent scouting
				Sc1O1	Sc1O2	Sc1O3					
HRBS	Strategic Aspects of HRBS' Plans	P1	Culture of collaboration	(+)							
		P2	Cross-over content	(+)						(+)	
		P3	Strenghtening external relations		(++)						
		P4	Strenghtening education/research relations	(+)	(+)						
		P5	Organisational development	(+)		(+)					

Table 11: Stress-test of the strategic aspects of HRBS' existing plans against scenario 3

Regarding the opportunities and threats that are unique to this scenario, one could argue that the development of cross-over content would strengthen the HRBS position in a micro-competitive environment if this content would also be offered to external (and international) students.

The opportunities and threats that are unique to this scenario are not, however, sufficiently addressed by the exiting plans. The plans do not recognize the substitution threat of on the job training under this scenario (Sc3T5) or contain any aspects that would explicitly defend against this. Nor is the development of some cross-over content enough to – in and of itself – secure a solid strategic position in an environment

with much more intense micro competition (ScT4). Especially when both of these threats are intensified by formalized micro-credentials (ScO3) for which the HRBS has no strategic plan.

5.5. Stress-testing Scenario 4 – More Flexible Routes to System-Supported Careers

This paragraph tests the future strategic position of the HRBS against Scenario 4, which is characterized by more flexible routes to careers which higher cognitive and interpersonal skills are most important due to a more rapid development and adoption of artificial intelligence..

5.5.1. Preparedness of the current strategic position for scenario 4

The degree to which its current strengths and weaknesses prepare the HRBS for scenario 4 is a combination of points that were each already addressed in the previous three scenario's. The preparedness for the first opportunity (Sc4O1) and threat (Sc4T1) is similar to that of scenario 2 and the preparedness for the other opportunities (Sc4O2 and Sc4O3) and threats (Sc4T2) corresponds to that already discussed in scenario 3. Table 12 provides an overview.

Scenario 4				Opportunities: Qualitative demand shift to higher order cognitive and creative skills	Opportunities: Formalized micro-credentials formats create an even bigger market for up-schooling and re-schooling	Opportunities: SME's are in need of a transition partner for the adoption of general intelligent systems	Threats: Declining quantitative demand for all types of business professionals	Threats: Substitution threat for higher education from on the job training + part-time modular education
				Sc4O1	Sc4O2	Sc4O3	Sc4T1	Sc4T2
HRBS	Strenghts	S1	Institutional accreditation to award bachelor degrees	+	++	-	+	
		S2	Adaptivity and innovation in programme level curricula and teams	+	+	+		+
		S3	In-house collaboration between applied research & education	+		++	+	+
	Weaknesses	W1	Limited or outdated domain-specific technological skills of teachers	--	+	--	--	--
		W2	Core rigidities around traditional business function-based structure			--	-	--

Table 12: Stress-test of the current strategic position of HRBS against Scenario 4

5.5.2. Preparedness of the HRBS' strategic plans for scenario 4

The same goes for the match between the strategic aspects of HRBS plans. As Table 13 shows, HRBS' current plans touch upon the opportunities and threats of Scenario 4 in ways that have already been discussed in the previous subsections.

Scenario 4				Opportunities: Qualitative demand shift to higher order cognitive and creative skills	Opportunities: Formalized micro-credentials formats create an even bigger market for up-schooling and re-schooling	Opportunities: SME's are in need of a transition partner for the adoption of general intelligent systems	Threats: Declining quantitative demand for all types of business professionals	Threats: Substitution threat for higher education from on the job training + part-time modular education
				Sc4O1	Sc4O2	Sc4O3	Sc4T1	Sc4T2
HRBS	Strategic Aspects of HRBS' Plans	P1	Culture of collaboration	(+)				
		P2	Cross-over content	(+)			(+)	
		P3	Strenghtening external relations			(+)		
		P4	Strenghtening education/research relations			(+)		
		P5	Organisational development	(+)	(+)			

Table 13: Stress-test of the strategic aspects of HRBS' existing plans against scenario 4

And like the previous scenario's the most important opportunities (Sc4O1&2) and threats (Sc4T1&2) are insufficiently addressed by these plans.

5.6. Conclusion

The degree to which the present strategic position and their existing plan prepare the HRBS for the future varies across the two dimensions that are constitutive of the scenarios.

The opportunities and threats related to possible changes in the form of education (more flexible or completely modularized learning routes) are challenging, but could potentially be met by building on the

current strengths of adaptivity and innovation at the team level and the in-house collaboration between applied research and education. Yet in doing so, core rigidities that currently exist around the traditional business function-based structure of the HRBS can be a significant impediment, requiring substantial effort and a well-thought-out approach from a change management perspective. The HRBS also lacks any specific plans to address the growing demand for shorter educational formats (especially in life long learning) and the threats of increased micro competition (for students completing parts of their studies at different institutions) and substitution by on the job training (in a world where higher education is modularized and partially unbundled). It does, however, have several strengths (e.g. its institutional accreditation and mandate to award formal degrees and the innovative capabilities of programme level teams) that can be used to act upon this opportunity and defend against these threats. And some of the existing strategic ambitions could be translated and specified in(to) more concrete plans that would amend the weakness of the core rigidities around its structure and portfolio of monodisciplinary degree programme, which is most problematic in light of these threats.

The opportunities and threats related to possible changes in the content of education (as a result of the speed with which artificial intelligence develops and is adopted in intelligent systems) present a bigger challenge for the HRBS. On the one hand, the weakness that its teaching staff currently lacks these skills makes the HRBS ill-prepared to deal with the opportunities and threats of a future where domain-specific technological skills remain and become more important (due to a slow development in AI capability and adoption). The absence of these skills among its own teachings staff prevent it from meeting the needs of the labour market and defending against the threats from institutions and new entrants who can. On the other hand, the weaknesses related to the HRBS' monodisciplinary structure and programme portfolio would become highly problematic in a future where higher order thinking and creative skills become are most important (due to a fast development of AI capability and adoption). The quantitative drop in demand for business graduates across the board (as opposed to concentrated in rule-based disciplines) and the substitution threat from on the job training cannot be met by the HRBS if the core rigidities of its current structure would remain. Though these weaknesses could also be amended with a further elaboration and specification of some of the HRBS' current strategic ambitions in(to) more concrete plans, it is imperative that this is done through a substantial effort at the level of strategy development and change management.

6. Roadmap

This chapter presents a strategic roadmap that contains the strategic actions that are required to achieve strategic fit with each of the scenario's that were outlined in chapter 4. The strategic (contingency) actions that constitute the roadmap were developed as solutions to the shortcomings of the current strategic position and plans of the HRBS that were found through stress-testing in chapter 5.

6.1. Required Strategic Positions

In order to define the strategic actions that are required to achieve strategic fit with the future business environment for each of the scenarios, it is necessary to first define when strategic fit is achieved. The following subparagraphs therefore describe the required strategic positions that the business school needs to reach in order to ensure strategic fit first.

6.1.1. In general (Across All Four Scenarios)

There are a number of conditions that the future strategic position of the HRSB has to meet no matter which of the four scenarios actually materializes in 2020.

The first is that the HRBS should have a generalized structure in place for student participation in cross-over projects where students autonomously fulfil their disciplinary role in interdisciplinary contexts. Though the HRBS already offers 30 ECTS electives (minor programmes) in the fourth year of each study programme today, the contents of these current programmes is not necessarily and could in fact be completely unrelated to the main degree programme of the participants. As such, the business school does not yet offer interdisciplinary projects in which students autonomously fulfil a role that's based on their main discipline as a mandatory part of each bachelor programme. This stands in stark contrast to most of the roles that business graduates fulfil today, which do involve such autonomous representation of their main discipline in interdisciplinary projects or work processes. The difference between these two dynamics creates a gap between what the labour market needs and the experience that most HRBS graduates have to offer that already exists at the present point in time. Given that the gap is likely to widen in 2025 if nothing changes, the HRBS will have to include mandatory interdisciplinary projects in each of their main degree programmes to ensure strategic fit between what the labour market demands in terms of interdisciplinary skills and experience and the education that HRBS offers.

The second condition that the future strategic position of the HRBS has to meet regardless of which of the four scenarios materializes, is that it has a structure and process in place for the development of educational content in collaboration with private parties. Though each of the four scenarios is (somewhat) different in terms of the external developments that the HRBS' educational content has to adapt to, all four scenarios require some form of expertise or access to real world problems that private parties are better equipped to offer than inhouse development could. Regardless of what the nature of the actual content is, the HRBS should therefore create a policy framework as well as a structure and a process that enables collaboration with private parties in the development (and offering) of educational content that fits with the values of the HRBS and the legal obligations and constraints within which RUAS operates.

The third condition that the future strategic position of the HRBS has to meet regardless of which of the four scenarios materializes, is that it has developed a strong position in the market for life-long learning (LLL). Though the scenarios differ in the type of content that an LLL-oriented portfolio of educational content requires, the quantitative need for life-long learning will grow regardless of this content. This requires an educational offering that also includes shorter educational formats for working professionals aside from the full-time and part-time programmes that it currently offers.

The fourth condition that the future strategic position of the HRBS has to meet regardless of regardless of which of the four scenarios materializes, is that the HRBS (and RUAS in general) should have the institutional knowledge and the educational content to prepare students for working with (AI-based) intelligent systems. Though the level of AI capability is different across the four scenarios, each scenario is defined by the way in which AI will automate and augment the nature of work. HRBS (and RUAS in general)

should therefore develop an understanding of how AI will (based on the AI capability that is already available) and could (based on the AI capability that could possibly develop over the coming years) change the nature of work and what type of educational content is needed to prepare students for that.

6.1.2. Scenario 1

On top of the four points above, there are two additional requirement that the strategic position of HRBS should meet in order to ensure its strategic fit with the business environment of scenario 1. The first is that the lack of further breakthroughs in AI capability combined with a much wider proliferation of domain-specific intelligent systems requires HRBS' educational programmes to include a focus on the development of the type of technological skills that are required for the interaction with domain-specific intelligent systems that are based on level III AI capability. The second is that the general structure and process for the development of educational in collaboration with private parties (see section 6.1.1) should have produced modules that train students in the use of domain-specific intelligent systems.

6.1.3. Scenario 2

There are two requirements that the future strategic position of the HRBS should meet in order to ensure strategic fit with scenario 2. The first is that each educational programme should focus on the development of higher order cognitive skills (critical thinking, creativity, etc) that are required for value creation and responsible interactions with next generation (AI level IV) intelligent systems. The second is that the portfolio of educational programmes that HRBS offers should match the shifts in quantitative demand as a result of fast, wide-spread and high degrees of automation.

6.1.4. Scenario 3

The third scenario has the following two requirements for the strategic position. The first is that the HRBS has to have an attractive offer of educational content and enrolment formats to compete with other institutions at the level of shorter educational formats. The second is that the competencies of the HRBS teaching staff should fit the new roles of teachers as coaches for students who need guidance in designing their own personalized learning routes.

6.1.5. Scenario 4

The required strategic position for the HRBS for the fourth scenario is a combination of previous requirements. Like scenario 2, all educational programmes should focus much more on the development of those higher order cognitive skills that are required for value creation and the interaction with AI level IV intelligent systems. Like scenario 3, there is a need to offer attractive educational content and enrolment formats to compete with other institutions in an environment where higher education has become more modularized, as well as the need to have teachers who have the competences to fulfil the corresponding roles.

6.2. Core Action Plan

The strategic roadmap that enables the HRBS to reach the required strategic positions that were defined above is depicted in Figure 16. This roadmap consists of two type of strategic actions: actions that have to be undertaken no matter which of the four scenarios happens and actions that depend on which of the scenarios is going to happen. This paragraph discusses the first category of actions (dark blue in Figure 16) , which together form the core action plan of the strategic roadmap. The contingent strategic actions are discussed in the following paragraphs.

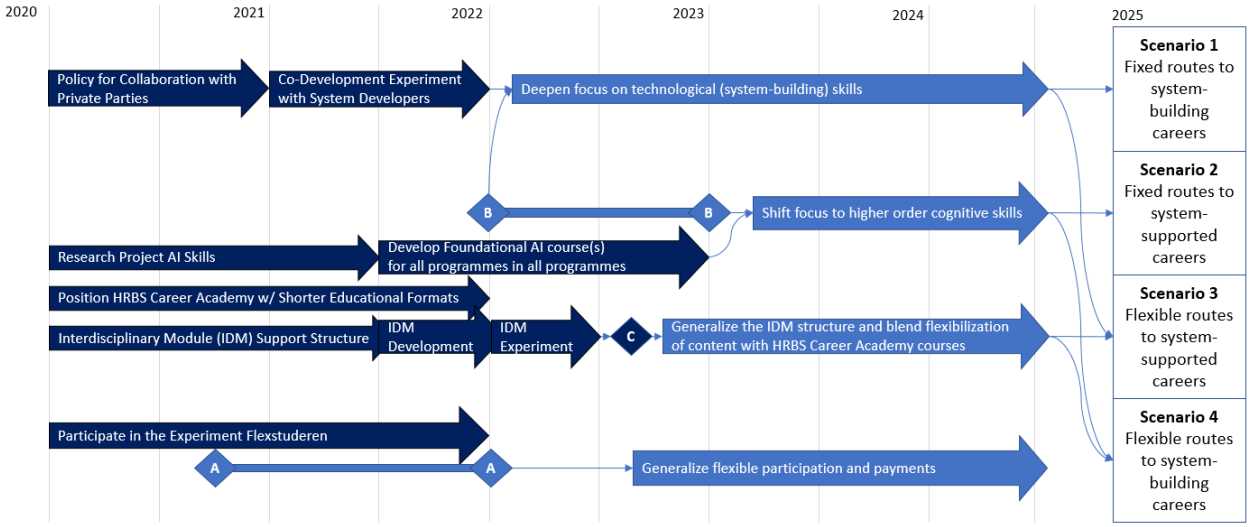


Figure 16: Graphic Representation of the Strategic Roadmap for HRBS

6.2.1. Research Project: AI-Skills

In order to have the institutional knowledge and the educational content that is required to prepare students for working with intelligent systems, the HRBS (or RUAS in general) should start a research project that aims to identify what knowledge and skills business graduates will need to prepare for careers in which they are likely to interact with intelligent systems. The goal of the research project is to identify (1) what tasks are likely to be substituted and augmented at different levels of AI capability, (2) what type of (new) tasks will become supported by and dependent on intelligent systems and (3) what kind of course content would be required to prepare students for that. That means that the research project should work with the assumption that the development of AI capability could be slow (no AI capability beyond level III developed in 2023) or fast (level IV AI capability developed before the end of 2023). The research project should yield its first results before the end of 2022 and then be translated into a series of core courses that are implemented throughout the curriculum of the HRBS in September of 2023 (depending on what type is required by then, see section 6.4). Due to the importance of this research-project for all domains, it should be designed to include participants from all current degree programmes and co-managed by the Research Centre for Business Innovation (KcBI) and the HRBS.

6.2.2. Interdisciplinary Experience & Experiments with Flexibilisation of Content

The second part of the core action plan is that the HRBS should develop a structure that enables students to participate in interdisciplinary projects of their choice where they autonomously represent their discipline in the final years of their study. This strategic action kills three birds with one stone: it would close the current gap between the dynamics of monodisciplinary school projects and the multidisciplinary organisational contexts in the real world, it would enable the HRBS to develop educational content around various themes that are related to the transition to a new economy and it would enable the HRBS (and RUAS) to gain experience with the logistical challenges of flexible learning routes. This structure, which would facilitate the choice of different interdisciplinary modules, should be ready towards the second half of 2021 and the first group of students should be able to choose from at least three interdisciplinary projects in the sixth semester cohort of February in 2022.

6.2.3. Collaboration with private parties in developing educational content

The third core action is the creation of a framework and a process for collaborating with private parties on the development of two different types of educational content. The first is educational content that teaches students how to work with intelligent systems that play a prominent role in the discipline of specific full degree programmes (e.g. Google Ads for students in the Commercial Economics programme). This type of content should be a part of the foundational courses in the first two years of the various main degree programmes that the HRBS offers. The second form of collaboration could be focused on the type of interdisciplinary projects discussed in section 6.2.2. The first step towards enabling such collaborations with

private parties is the development of a policy framework that defines what is and is not allowed. The second step is an experiment with two or three collaborations with private parties in various degree programmes. The third step is a decision about expanding the scope of collaboration to other degree programmes.

6.2.4. Positioning the HRBS Career Academy as a Regional Life-Long Learning Hub

The fourth core action is to develop the HRBS Career Academy as a Life-Long Learning hub for the region. The HRBS Career Academy already offers part-time programmes for working adults. Yet these are full degree programmes only. In order to fully satisfy the societal need for up- and reskilling and fulfil the societal function that universities of applied science will be expected to play in the near future, the Career Academy also has to offer shorter, formally acknowledged educational formats. Part of these formats should also be developed for large groups of professionals that have to participate in large scale internal mobility or outplacement projects as a consequence of changing labour market demand. This requires the development of credentials for shorter educational formats before September 2022, the opening-up of suitable content from HRBS' current portfolio of educational modules for contract education as of September 2022 and the development of new, tailored modules from February of 2023 onwards. In preparing for the launch of these shorter educational formats, the HRBS should invest in relations with its alumni through non-formal domain-specific supplementary courses and masterclasses in 2021 and 2022.

6.3. Decision Point A: The Funding Model for Higher Education

The first part of the strategic roadmap that is contingent are the strategic actions that depend on whether or not OCW decides to make the funding of higher education more flexible. Given that OCW is already exploring alternative models, a final decision that is or is not put into law can be expected in the second half of 2020 or in 2021 (as depicted by decision range A in Figure 16).

If OCW decides not to change the funding model, then the HRBS is free to choose whether it wants to limit their offer of shorter educational formats to the target group of prospective students with work experience through the HRBS. The decision to do so should be made if the experiments with shorter educational formats are successful in terms of (a) attracting enough students and (b) helping students to improve their position on the labour market. If the experiments are unsuccessful, the HRBS should remain degree-driven only.

If OCW does decide to change the funding model of higher education into one that allows flexible participation, HRBS (and RUAS in general) will be forced to enable more flexible forms of participation and payment. In this case, the administrative and logistical experience and processes that would have been developed can be levered and scaled-up to offer participation-based tuition fees. Beyond that, degree programmes should make the content of their curricula as independent and accessible as possible: most courses and exams should at the very least be offered year-round (or even on demand if possible). This would require a rethinking and redesign of various aspects of the current organisational structure and the administrative support processes of the HRBS.

6.4. Decision Point B: AI Breakthroughs and the Content of Education

Though further automation and digitalization through the adoption of intelligent systems is a given, it is still uncertain what level of AI capability will power intelligent systems over the next 5 years. If the level of AI capability does not cross the threshold of reasoning machines (AI level IV) before then end of 2023, then the curricula of business schools should continue to prepare students for careers where they are involved in developing, tailoring and managing domain-specific intelligent systems to their organisational contexts. This would require a further focus on general technological skills and the use of these systems in the curricula of every main degree programme offered at HRBS.

If, on the other hand, there would be a breakthrough in AI capability before the end of 2023 that would power the further automation and augmentation of work through intelligent systems with reasoning capabilities, this would require a shift in focus to higher order cognitive skills in all of HRBS curricula. Intelligent systems with reasoning capabilities will enable conversational interactions that require holistic

thinking, strategic insight and ethical evaluation on the part of human “administrators” of intelligent systems rather than the technological skills to build these systems themselves. The most important strategic action that has to be taken if such a breakthrough occurs, therefore, is the substitution of the courses that prepare for working with intelligent systems by teaching technological skills by ones that focus on higher order cognitive skills (or a substantial rebalancing of the two).

7. Appendix A: Summary of HRBS Organisational Plan

Due to the changing environment and cross-disciplinary implications of professions, the HRBS has decided that a flexible and adaptive organisational structure needs to be established to align with the current and future setting. Their project plan tackles general ideas on what role HRBS will intend to play, relating to pedagogics, didactics and internal/external cooperation. Primarily, the focus lies on constructing the self for the nearby future, which takes specific external trends less into account. In the document "Project Plan HR Business School" (2018) and the internally published "Intended Decision: Formation of the HR Business School" (2018) core motivations, ambitions and guidelines are described with a focus on the transition from the formerly separate institutes to a centralised single entity (HRBS).

On their path to 2025, the HRBS (2018) has set four objectives:

(1) Students should study with more pleasure and success;
(2) Students should be more well-prepared for the work in their future field and should be viewed as future-proof and resiliently educated young professionals;
(3) Students, teachers and researchers should collaborate, learn and develop knowledge actively, enthusiastically and with motivation;
(4) The business school should be acknowledged as a knowledge partners by the (regional) business environment.

In achievement of these goals, HRBS should be an adaptive organisation where research and education reinforce one another, and where different programs stimulate and challenge one another on the quality and renewal of education, as well as collaborate to create interdisciplinary education and improve study success. The culture it pursues is one of learning, active engagement and responsibility; teachers should take responsibility and act from professional autonomy.

Tangible metrics for these objectives are yet to be concretized, but should focus on:

- *(Inter)national ranking and quality characteristic internationalisation.* The HRBS should be exemplary for professional education in business & management in the Netherlands, and should stand in high regard internationally.
- *Study results and appreciation.* The study results of the HRBS should, at lowest, be equal to the average of RUAS, and all programmes should score sufficient on the NSE.
- *Realized innovations and broadening.* Crossovers between different programmes and innovations in educational content and methods.
- *Attraction and student numbers.* The multidisciplinary education (e.g. minors, fieldlabs, incubator academy) attract students from different institutes and universities.
- *Research.* Students, teachers and lectors collaborate closely on research projects. The practice-oriented research of the business school strongly impacts the professional field and science. Research results are implemented in curricula.

The HRBS (2018) states that it wishes to profile itself on the basis of its core values, namely as international, sustainable and entrepreneurial. Students and teachers should possess 'intercultural readiness' by integrating the internationalisation triangle in all programmes, should strongly focus on innovation that is sustainable within ecological and social constraints, and should actively recognize and capitalize opportunities by thinking critically, creatively and collaboratively.

In order to reach the aforementioned objectives, HRBS has formulated six transition lines:

(1) Converge programmes towards a shared educational concept as much as possible, which will emphasize collaboration in order to enable multidisciplinary learning and cross-overs between

programmes and domains, as well as enhance the integration between education and practice-oriented research.
    a. *Educational development:* This requires the implementation of an education concept for the HRBS.

(2) Empower the responsibility of programme teams and managers in order to enhance education quality and success.
    a. *Organisational development:* Shift responsibility to lower layers of the organisation. Acknowledge professional autonomy, create space and take responsibility.

(3) Optimise support; one the one hand decentralisation of tasks that involve students, teachers, external relations, and programme knowledge in benefit of education quality, on the other hand centralisation of tasks that can create organisational efficiency.
    a. *Restructuring:* Governing the support to add value to education.

(4) Redefine governance and governance philosophy in order to support new management structure.
    a. *Leadership development:* To remain in conversation and guard de intent of the norm.

(5) Formally integrate the institutes into one business school.
    a. Formal process of *reorganisation.*

(6) Stimulating a culture of collaboration and renewal to break through organisational silos, enhance innovation and improve the relations between education/research and internal/external.
    a. *Culture change:* Develop (new) norms, values and rituals together, for both employees and students.

This unification of the institutes into one business school involves three pillars, namely (i) increasing the autonomy of teams, (ii) developing the conditions for optimal support, and (iii) developing a shared ambition and education vision.

In pursuit of increased team autonomy, the HRBS has decided to change the top structure, develop a new governance philosophy and develop towards a value-driven organisation. In order to develop the conditions for optimal support, the plans discuss merging the four business offices into a new support structure that assumes decentralisation of a large share of supportive tasks, as well as improving the central services. The shared ambition and education vision should be embedded in a shared framework for the (broadening) HRBS minors and further development of the FieldLabs.

The renewed education concept is designed from three points of approach: pedagogical, didactical and organisational. In terms of pedagogics, the HRBS plans to focus on relational bonding between students and teachers, mutually set high expectations and an ambitious study culture, and talent-oriented education in which teachers help students discover and develop their talents. In terms of didactics, the HRBS aims to focus on the learning process, to stimulate active learning, and to use actualities in the professional field that will contribute to meaningful learning and context-rich education. It is also mentioned that digital learning methods will be used more. In terms of the organisation, the HRBS states that the organisation should operate at small-scale, should offer comprehensible yet intensive programmes, and should enforce ambitious norms.

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