"Collecting Firm level data on Intangible Assets

Two SME Case Studies"

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Two SME Case Studies

Abstract

The difficulties of collecting firm level data for intangible assets has been well documented for the UK by both ONS and Jonathan Haskel. The reason that these intangible assets matter so much is that they are considered by economists to be the main drivers of economic growth. This paper sets out a roadmap for the collection and use of these missing intangible asset data using a custom SaaS application to be developed and tested by April 2022. Two UK SMEs have agreed to be co-creators and users of this SaaS application, the development of which, is being funded by a grant from Innovate UK (Application No. 100108220). Data from a wide variety of sources will be imported into the SaaS Platform and then 'classified' using the CHS taxonomy to create an Intangible Asset Register. Additional Registers will be created for Innovation and Infrastructure. A number of key reports can then be provided from these Growth Asset Registers. The Firm can use this new data to create and review forecasts for Growth, Investment, Funding and Valuation presented in Dashboards for discussion with the Board, Investors and other Stakeholders.

About the author

David Stroll holds a BA degree in Social Sciences with a major in Sociology from University of Leicester, UK. He also holds an MSc in Innovation and Entrepreneurship from Birkbeck College, University of London. He is a PhD candidate at Birkbeck College. His professional career has been in information systems at ICL and Digital Equipment Corporation. Since 1995 he has been an independent consultant and researcher and has spent the last 20 years working on the Socio-Economic Technical Systems and the Digital Work System and its precursors. He is now the Chief Technology Officer at Opagio Ltd.

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Analysis of UK Intangible Assets

I start this paper with a deliberately short data analysis. Other colleagues will be presenting on this topic in much greater depth, but I would like to make three points starting with the history in current prices. All data is taken from the latest ONS Intangibles Survey [1].

History in Current Prices

Since the start of digitisation investment has doubled in current prices and the share of intangibles has moved from 46.9% to 52.8%. That figure should start the red lights flashing – the economy is being transformed before our eyes but that doesn't show up in this data.

1997 Total £158.69bn; Intangible Assets £74.5bn; Tangible Assets £84.5bn: Intangibles percentage 46.9%

2018 Total £320.25bn; Intangible Assets £169.21bn; Tangible Assets £151.04bbn: Intangibles percentage 52.8%

Capitalised Intangible Assets vs Uncapitalised Intangible Assets

The second point looks at the changes in capitalised versus uncapitalised assets over the same time period. Surprisingly this has gone down slightly from 63.6% uncapitalised in 1997 to 62.2% uncapitalised in 2018.

1997 Capitalised £27.52 bn; Uncapitalised £47.64bn; Total Intangibles £74.5bn; Percentage Uncapitalised 63.6%

2018 Capitalised £63.8bn; Uncapitalised £105.41; Total Intangibles £169.21bn; Percentage Uncapitalised 62.2%

Uncapitalised Assets UK Forecast in Current Prices 5% growth

In order to understand the impact of these uncapitalised assets I have constructed the table below. This starts with my estimate of intangible capital investment growth of 5% in current prices (which is pretty much what happened for the last 20 years). This shows that total intangible investment growing to £171bn by 2028.

The second part of the table in red shows what happens if the Growth Asset Register for Intangible Assets enables the measurement of a proportion of these uncapitalised investments. This adds £6.4bn in the first year, rising to £51.4bn by 2028. At this rate it will take to 2040 or slightly beyond to fully capture all uncapitalised intangibles.

[1] Lewis, M. (2021) Experimental estimates of investment in intangible assets in the UK, 1992 to 2018, ONS, Newport, Wales, UK

Table 1. UK Uncapitalised Intangible Investment Forecast

2019	£110.68	DS estimate	
2020	£116.21	DS estimate	
2021	£122.02	**Incremental Capitalised Assets**	
2022	£128.12	GAR 5%	£6.4bn
2023	£134.53	GAR 10%	£13.4bn
2024	£141.25	GAR 15%	£21.2bn
2025	£148.32	GAR 20%	£29.6bn
2026	£155.73	GAR 25%	£38.9bn
2027	£163.52	GAR 30%	£49.0bn
2028	£171.69	GAR 35%	£51.4bn

Why does this matter?

If we accept the hypothesis that investment in technology, innovation and intangibles drives growth, we then need to work backwards to understand what levels of funding are required to deliver this growth. A short example will suffice. The High Growth Firms in the study want to grow by 20% per annum (otherwise they will not be classified as high growth firms). At this rate of growth, they double revenues every five years. This is quite a modest goal as the world's largest high growth firm (Tesla) is doubling revenue every 18 months. Assuming that the firms have annual turnover of £10m and want to grow to £20m how much intangible investment will these firms need? One of the main objectives for collecting empirical data on innovation and intangible assets for real firms is to figure this out bottom up, but at this stage we just have to guess.

Let's assume that one firm wants to add 100 more yoga studios and that the cost of each studio is £100k; this includes investment in training of new teachers, marketing to new clients, setting up operations to manage these new locations, increasing the portfolio of services for NHS wellness clients and so forth. Let's say that the total investment needed is £10m and its pretty much all intangible. If the firm can only capitalise 30%, of this, the investors will look at the cashflow to see whether it can be funded and will probably walk away. This exact story is repeated for all 44,000 UK high growth firms. If you can't capitalise your growth investments, you can't fund them.

This means that the UK economy loses at least two third of the growth potential for its High Growth Firms. Another corollary is that every increase in capitalised assets unlocks incremental investment funding, and that's the problem we want to understand in detail.

Why do Intangible Assets Matter?

There are two answers to this question, the long one and the short one. The long one is thoroughly described and discussed by Haskel and Westlake (2018 [2]). A brief review of Haskel's five big challenges and my notes prepared for a meeting with him that year can be found in Appendix 3.

The short answer is that the emerging digital economy, which we can date from the Netscape IPO in 1995 and which provided access to the commercial Internet from the PC to the world, now accounts for 25% of UK trade [3]. This new digital economy depends on non-traditional Research and Development, particularly in technology, for products, processes, markets and organisational design. Investments in the knowledge, the specialist skills and experience from human capital required by the digital economy, and extraordinary investments in branding and marketing are also needed to bring these new digital products and services to market. This shift was recognised by the OECD in their 2005 Oslo Manual [4].

These new growth drivers of the digital economy show no sign of slowing down. Ark Invest [5] (an early investor in Tesla) publishes an annual view of a wide range of technologies which they think may lead to disruptive innovations over the next 20 to 30 years. Many of these are driven by the need to decarbonise the planet by 2050. Tony Seba has independently documented several of these disruptive innovations and their impacts on the energy and automobile markets. He has a chart which he first published in 2010, which shows the expected cost decline in battery technology and runs to 2030. He periodically updates this chart, and the empirical data to date supports his forecast.

These technological innovations will have a dramatic impact on developed and less developed economies over the next 30 years, but they will only be brought to market if they can be funded with long-term investments. The capital markets in the USA have evolved in depth and sophistication to provide the extraordinarily high levels of funding which will be required. It has, however, provided this funding without recognition of these unmeasured intangible assets in the published statutory accounts of firms or in the national econometric statistics. Herein lies both the problem and the opportunity.

If the digital economy, innovation and intangible assets are all inextricably linked, and if they are going to provide the economic growth drivers for the next 30 years, then we had better start measuring them where it matters: inside the firm. Given that many of the firms which exploit the growth in the digital economy will be new (starting as SMEs), and the successful ones will grow rapidly to become High Growth Firms (HGFs), it makes sense to start the empirical research in that slice of the economy.

A word of caution should be added here. In my research on the UK productivity puzzle, and labour productivity in particular, I discovered that Directors and managers

[2] Haskel, J. and Westlake, S. (2018) Capitalism without Capital, Princeton University Press, Woodstock, Oxfordshire, UK

[3] BBC news October 23rd

[4] OECD. (2005) Oslo Manual. OECD Publishing, Paris, France.

[5] ARK Invest (2021) Big Ideas. New York, NY, USA

in general had little understanding of, or interest in, econometric measures in general or in economic analyses in particular as firm growth drivers. The two frameworks exist in parallel universes. The measures and units of analysis are quite different, even though on an aggregated basis they are analysing the allocation of the same resources.

Economists analyse labour services, dispersion, innovation, total factor productivity, complementarities, recipes, management practices, growth equations, general education and skill levels, none of which make much sense to a High Growth SME. Economists talk about national GDP, Regional GVA, industry intangible investments and provide international comparisons of productivity between countries and over long time periods.

Firms are guided by statutory accounting principles and measured on revenue and profitability growth. Directors and managers in High Growth Firms worry about weekly footfall, broken supply chains, rising wages, labour scarcities, raising funding for growth, and most importantly of all their unit of analysis is not the nation, the region or even the industry sector, but their own firm.

Methodology for Data Collection

Innovate UK have awarded Opagio Ltd funding to deliver a Growth Asset Register with Econometric Reporting, together with a suite of four Dashboards. This project runs from November 1st 2021 to March 31st 2022 and I am the lead researcher. We have been working with two UK SMEs for the past six months (Neatsmith and More Yoga) both London based, and they have both agreed to participate in this project as Case Study customers.

Work Packages

We have proposed four work packages for research and software development, which are set out below and the detailed requirements for each work package are summarised in the rest of this document.

Firm Input Data: Financial, Project, Innovation & Infrastructure and Creation of Growth Asset Registers

Firm Econometric Reporting

Firm Growth Strategy

i. **CEO Strategy Dashboard**
ii. **Investment Budget Dashboard**

Growth Funding and Valuation Forecasts

iii. **Investment Funding Dashboard**
iv. **Business Valuation Dashboard**

Multi-disciplinary knowledge is needed

This project requires a high level of knowledge in multiple domains, these include economics, information technology, data modelling, econometric reporting, business modelling, innovation, accounting and investment funding. We have put together a multi-disciplinary team which includes the required knowledge, skills and experience. The team has already delivered a fully operational Digital Work System to one of the Case Study participants, which focuses on labour productivity measurement and improvement, and includes all the knowledge and skill domains outlined above. This productivity Case Study, referred to as Operational Excelence, is being documented separately, but will be available on request.

FIRM INPUT DATA

Introduction
A wide range of data is needed from a variety of sources and in variety of formats. Registration will use the ONS / BEIS format used for the biennial innovation survey. Organisation and Locations will use the data model from the Digital Work System. Accounting data will be provided by SAGE and we plan to build a software connector to import data (at agreed frequencies) without manual intervention. Project data is messier and can be found in a variety of formats; Infrastructure data is also messy and will require careful work to analyse and import. Lastly the BEIS Innovation Survey is a well-structured survey whose data model maps closely to the OECD Oslo Manual.

REGISTRATION
Firm Registration
ONS Survey (for sector comparison)

ORGANISATION
Directorates - updated
Processes - updated
Projects -extended
Existing Schema to be extended

FIRM LOCATIONS
Existing Schema

ACCOUNTING DATA
Software Connector: SAGE
Current year plus five years history
Profit and Loss
Balance Sheet
Sales Ledger
Payroll & Labour Hours
Purchase Ledger
VAT Returns
Working Capital

PROJECT DATA (Organisation schema extended)
Manual Data Collection Google Sheets
Manual Data Collection Excel Sheets
Software connector: Jira, Atlassian

INFRASTRUCTURE PROJECTS (Organisation schema extended)
In order to obtain the investment data for the firm's digital infrastructure it will be helpful to scan their purchase ledgers for the past few years to identify the likely suppliers. From this data it should then be possible to decide which part of the expenditure is an asset (either tangible or intangible) and which part of the expenditure is an operating expense. For those expenditure items which are judged to be intangible capital investments these should be

added to the Intangibles Register created in an earlier step. A useful illustration may be found in Appendix 1 which includes the following five steps.

- Acquisition
- Activation
- Retention
- Referral
- Revenue

BEIS INNOVATION SURVEY

The Oslo Manual, published by OECD in 2005 set out the four main types of innovation: product, process, market and organisation. Economists agree that innovation is one of the main drivers of labour productivity and capital productivity and that the measurement of innovation expenditure is therefore an important part of macro-economic data. All OECD countries have agreed to a representative survey of firms every two years to capture this data. This application has already been built and has its own user interface and database schema and should be updated to include current year spending, and three-year history. The BEIS schema [6] includes:

- Product Innovation projects
- Process Innovation projects
- Market Innovation projects
- Organisation Innovation projects
- Innovation Human Resources

[6] BEIS (2009) Innovation Survey Questions. London, UK

CREATING INTANGIBLE, INNOVATION AND INFRASTRUCTURE REGISTERS

Introduction
Having ingested the data from multiple sources and stored it in the database, we now need to map these data to the three Registers which underpin growth. The software which underpins the work of classification is quite sophisticated because it needs to be able to view the database schemas for the different types of input data and at the same time view and update the database schemas for the three registers: Intangible Assets, Innovation Projects and Infrastructure Growth. These three registers are all part of the Firm's Growth Asset Register.

Classification to creation the Intangible Asset Register
Given that the CHS schema is well-defined, a database schema with an input user interface will be developed so that the classification done by the co-creator and Opagio can be stored in the database. It is important to note that all Intangible Assets must be classified as ''In Use'' or ''In Development''. In addition to the CHS Schema itself, additional data for each Intangible Asset will also be needed to include:

- the purpose of the asset
- the expected results of the asset mapped against the firm's growth metrics
- the total cost of the relevant project
- the skills and experience of the personnel who have implemented the project,
- the costs and descriptions of any external human resources, services or materials
- the life of the asset
- the annual depreciation rate
- the capital services charge for the use of the asset
- the Directorate and Work System where the asset will be deployed
- the expected return on investment from the asset
- this data will constitute the firm's Intangible Asset Register
- the Intangible Asset register can be used to calculate Capital Productivity

Classification to create Innovation Projects Register
In this classification, data from the BEIS database (Project; Process; Market, Organisation and Resources) is mapped to each Directorate. This mapping must include ''failed projects'' because these contribute to the growth assets of the Firm.

Once the innovation projects have been mapped to the Firm's Directorates, there is a need to decide which of these innovation projects will also result in intangible assets. A second round of classification is therefore needed.

Classification to create the Infrastructure Growth Register
There are a number of Infrastructure investments which are generally charged to operating expenses (Opex); they do not result in the creation of intangible assets, and are not in themselves innovation projects. However, if they are made for the intention of growth then they will be classified in the Infrastructure Growth Register and included in the Growth Assets Register.

ECONOMETRIC REPORTING

Introduction
The objective of this work package is to develop and test a suite of econometric reports based on the data collected in the previous sections for the CEO and his direct reports**.** Most of these econometric reports will be unfamiliar to the Directors and Managers of our Case Studies and as High Growth Firms they may not yet have the managerial infrastructure listed below. However, as these firms grow, they will need to expand their own management teams to include all the functions below.

Chief Executive Officer (CEO)
Chief Marketing Officer (CMO)
Chief Revenue Officer (CRO)
Chief Technology Officer (CTO)
Chief Financial Officer (CFO)
Chief Innovation Officer (CIO)
Chief Operating Officer (COO)

Intangibles Register (Econometric)
The Intangibles Register is a major addition to a firm's current set of reports. It is intended to fill the gap so clearly identified by ONS between those intangible assets which are currently recorded and placed on the firm's balance sheet and those intangible assets which are not recorded or measured. We are not proposing any changes to Statutory Accounting here, so the newly identified intangible assets will form part of an Econometric Balance Sheet which supplements the former.

Intangible Capital Services Charges (Econometric)
Many, but not all intangible assets have shorter lives than traditional tangible assets. This is reflected in the ONS estimates. In order to charge for the use of these assets for the purposes of productivity measurement, the lifetime of the asset must be known, and an annual service charge calculated for the use of the asset. These charges are known as ''Capital Services Charges'' and are Econometric measures.

Gross Value Added (GVA) Econometric
Under Statutory Accounting rules firms are required to maintain a profit and loss account and measurements. Economists take a different view of the firm for GDP measurement. Because GDP is a national measure the sum of firm turnover is much greater than output GDP. This is because the firm's P&L reports its revenues, its expenditures on labour services and depreciation of tangible and intangible assets and its purchases from other firms. GVA is the econometric measure of the firm which includes its outputs (revenues) and its inputs (labour services and capital services charges) but excludes its purchases. It measures the econometric value-added of the firm, which is not the same as its accounting value added.

Intangible Capital Service Charges % GVA Econometric
Once the firm's GVA is measured on a quarterly basis (following the ONS measurement cycle) some new econometric reports can be provided. The first of these is a measure of the

Firm's intangible capital services charges as a percentage of GVA. Different industry sectors will of course have different measurements and within each industry sector there will be a wide dispersion also. The importance of this measure is that it provides a very strong indication of growth potential, since economic growth at national level is strongly correlated with investment in intangible assets.

Innovation Register – Econometric and Investor
The innovation register records all expenditures on innovation as reported in the BEIS survey instrument. It should be noted that these expenditures include both successful innovations and unsuccessful ones. Since most innovations fail, it is important to understand what percentage of innovations are judged successful in that they are brought to market within the firm (i.e. implemented in operations). A high level of innovation expenditure combined with a high level of failure provide the best possible indicator of future growth success. This fact can be empirically observed in all disruptive industries where the innovator decides to take managed risks on new products, technologies and markets which establish competitors ignore or find too risky. Disruptive innovations promise both high risk and high reward.

Innovation Register % GVA – Econometric and Investor
The importance of this measure is that it provides a very strong indication of growth potential, since economic growth at national level is strongly correlated with investment in innovation. Firms with low levels of innovation expenditure are unlikely to be disruptors and more likely to be disrupted.

Infrastructure Growth Register – Econometric and Investor
As was noted earlier, much of the growth in pure digital businesses is driven by infrastructure expenditure, where it is rigorously measured. This data may not show up in the productivity statistics as the expenditure mostly comprises purchases from suppliers, which is not recorded in GVA. It should however show up in GVA per Hour data, were this to be measured at firm level. The infrastructure growth register summarises the expenditure by type and the funnel example provides an example of the report structure.

Infrastructure Growth Register % GVA – Econometric and Investor
The importance of this measure is that it provides a very strong indication of growth potential for digital businesses, since economic growth in these firms is strongly driven by continuously improving the digital infrastructure of the firm. Clearly not all firms are 100% digital businesses but firms in almost every industry sector are implementing digital innovations in some parts of the firm. This can be seen in the transformation of the UK retail industry from bricks and mortar to click and collect by purely digital brands and internet retailing without stores.

Growth Asset Register (GAR) % GVA – Econometric and Investor
This brings us to the final metric is this section. The Growth Asset Register is a summary of the total annual expenditures on the Intangible Asset Register, Innovation Register and Infrastructure Growth Register.

GVA per Hour – Econometric and Investor
The GVA per Hour worked measure is an extremely important measure for both economists and investors. It has the great merit that it can be easily calculated from widely available accounting data (sales ledger, purchase ledger and payroll). The data is available nationally from ONS for both region and sector and is increasingly being used to compare the performance of different UK regions as part of the UK Government's 'levelling up' strategy. GVA per Hour worked provides a standard measure of labour productivity.

GVA Surplus – Econometric and Investor
Firm GVA is the key measure used by macro-economists to measure the relative efficiency of firms. In every economy there is a wide dispersion between firms in the top quintile and those in the bottom. The UK is characterised by a 'long tail' of poorly performing firms. GVA surplus measures the difference between firm revenues (less purchases) and firm labour services. It is therefore a key performance measure for managers, investors and economists.

Labour Productivity % Increase / Decrease – Econometric and Investor
GVA per hour provides an excellent snapshot of the Firm's labour productivity. What is also needed is a time-series so that the trends in labour productivity can be seen. In GAR we measure GVA quarterly so a time-series report can be provided as GAR is updated.

Capital Productivity contribution to GVA – Econometric and Investor
As more complete data becomes available within the Firm on the capital services charges from Intangible Assets and Innovation Expenditures, it becomes possible to create a Firm Level measure of capital productivity to GVA. The Total Factor Productivity Measure used by macro-economists to measure national and regional economic performance is not helpful at the firm level. Firms need to understand the impact of Continuous Improvement on Labour Productivity, which is provided by Operational Excellence. They also need to understand the impact of investments in Intangible Assets and Innovation which at the present time they cannot. This proposed Capital Productivity Report would go a long way to providing a report that is useful to the Firm's managers, Investors and Macro-Economists.

Growth Metrics – Investors
Investors in digital businesses place strong reliance on three key reports.

CAC. Cost of Customer Acquisition – Lower CAC is Good
LTV. Long Term Value of Customer – Higher LTV is Good
Churn. This is the rate at which customers renew their subscriptions – Lower Churn is good

Relationship between Econometric measures and Growth metrics
Economists measure economic growth, innovation, tangible and intangible investments, productivity (labour and TFP) and GVA at the national, sector and regional levels on a quarterly basis. Investors are concerned with the firm's growth metrics, quarterly profit growth and earnings per share. It should be noted that these measures are both ''views'' of the same data. As soon as we have firm GAR data for a reasonable sample (say 10 firms) updated quarterly, we will quantify the empirical relationships between the Growth Metrics and Econometric metrics.

Total Annual Investment in GAR – Econometric and Investors
Economists and investors are very interested in the firm's commitment to growth. The GAR report includes intangible assets, innovation projects and infrastructure investments for growth. These sum of these investments, provides a very important measure for economists and investors.

GAR as a % GVA – Econometric and Investors
The GVA of any firm can only grow by increasing labour productivity, innovation spending and capital productivity. Remember that GVA growth is not the same as profit growth. UK firms have successfully grown profits since the 2008 Financial crash, but they have not grown GVA. This has a significant impact on the growth of real wages which have been flat since 2008. Real wages appear in the quarterly GDP reports as a key component of consumption, which must match with the sum of firm GVA in each sector of the economy. Over the long term-economic growth is always driven by a combination of population growth, productivity growth and innovation. In the UK a significant component of economic growth since 2008 has been driven by population growth which is confirmed by the data (some 6 million EU citizens have applied for permanent residence in the UK since Brexit).

Total Investment Composition – Investors
Firms are very interested in the sources of funds. Traditionally firms can fund investments from retained earnings, Bank Loans, Corporate Bonds, the Capital Market, Private Equity and Venture Capital providers. The composition of support and collateral for investment funding is equally of interest to all investors, both public and private.

CEO Dashboards: Strategy and Investment

Introduction

Four Dashboards have been designed to assist the CEO and Board to fully understand and estimate the impacts of alternative product / market strategies based on forecasts. The historical data for these forecasts is provided by the Growth Asset Registers and Econometric Reports.

1. CEO Strategy dashboard
2. Investment Budget dashboard
3. Growth Funding dashboard
4. Business Valuation dashboard

Development Methodology

Our Case Study customers are SMEs who wish to become High Growth Firms and grow sustainably at 20% per annum and higher. Like most SMEs they do not have spare managerial capacity to focus on growth, or the entire range of managerial disciplines which would be present in larger firms.

Our approach to working with these firms can be best summarised as **rapid incrementalism.** Because the Dashboards are highly visible and presentation focused, we will build them using wireframes to get the look and feel right. It is an old truism that customers will always know what they want once they have seen it!

We actually start the development of the four dashboards at the start of the project in parallel with the work of data input and classification. We will show early wireframe versions with simplified data as early as possible, so that the management team may ask simple questions – like how much investment will it cost to scale up to 100 locations or 150 locations and so forth; what data will we need to fully understand our current costs to start up a new location; how long will it take the new location to break even?

In other words, the questions may be quite simple in the Dashboard, but the hard part will be finding accurate data and updating to keep the Dashboard current. There is therefore by-design, a tension between data input, classification, growth registers and econometric reports and the Dashboards.

CEO Strategy Dashboards 1.

Feature Description
The CEO Strategy dashboard highlights the overall spend, revenue and financial performance of the business, the growth metrics as well as the valuation of the business. The Dashboard helps to understand the connections between the data points to make decisions and improve valuation. The Dashboard shows the impact of growth investment on firm valuation, marketing and business growth metrics (CAC, LTV, ROAS), on firm valuation and growth investment. The Dashboard also shows that the company valuation would be based on a new set of indicators. At the core, there is a strong econometric database with historic data that are split up and recombined to show growth capital.

Existing Technology and Knowledge
Currently business valuation is based on traditional financial information (P&L and balance sheet), market analysis and growth forecasts:

1) Market Capitalization
2) Times Revenue Method
3) Earnings Multiplier
4) Discounted Cash Flow Method
5) Book Value
6) Liquidation Value

These methods are very limited as they do not take into account the actual growth assets, such as real investment into innovation and intangible assets derived from technology and marketing investments. Also, professional valuations and fundraising consulting can cost up to 5% of the amount of funds raised. Lastly, even the most detailed valuation does not provide any actionable insights on how to improve it over time.

Needed Technology Knowledge
This dashboard will show the exact stage of growth of the company and will include a series of metrics:

a) Traditional financial indicators
b) Opagio's growth capital indicators
c) Business growth metrics
d) Industry growth metrics

This is powered by the novel econometric historic database supporting the Growth Asset Register and Econometric reports which is documented earlier. The Dashboard is built on our technology stack of HTML5, CSS, J Query JavaScript framework, and MySQL. We import data from trusted third-party sources on innovation spend by industry and sector using batch file imports, screen scraping and API's.

Technology/Knowledge to be Developed
To automate data collection for the dashboard, we will integrate with a series of

- SME and HGF-focused accounting platforms such as Xero, Sage and Quickbooks

- Project management tools including JIRA, Asana, Monday.com
- CRMs such as Salesforce, Hubspot
- Marketing analytics systems e.g. Google Analytics, MixPanel, Adobe Experience Cloud

Value Added

Whilst traditional valuations look at financial and market data, Opagio brings econometric measurements relevant for valuations for the first time. Opagio provides a "real" valuation tool that takes into account the actual growth capital of the firm. Since this is automated and available through a very low SaaS, Opagio makes valuations and capital raising much more achievable and affordable.

Also, Opagio breaks down the valuation in a way that it easy to understand for users. In other words, CEOs can become valuation experts of their own company. Opagio allows CEOs to derive actionable insights. CEOs will see where and when to invest to enhance the company's value. They can correctly and empirically manage their growth and investments over time, which increase the value of the company.

In addition, we can take into account data on innovation. The Oslo Manual, published by OECD in 2005 sets out the four main types of innovation: product, process, market and organisation. Economists agree that innovation is one of the major drivers of labour productivity and capital productivity and that measurement of innovation expenditure is therefore an important part of macro-economic data. All OECD countries have agreed to survey a representative sample of firms every two years to capture this data. This survey in the UK is administered by ONS working on behalf of BEIS.

CEO Dashboards: 2. Growth Investment Budget Dashboard

Feature Description

Growth Investment is the dashboard that highlights the areas of investment driving the most growth in the business. The Dashboard helps the CEO and executives to link their investments to short term, medium term and long-term growth objectives. Depending on the lifecycle stage of the HGF executive teams should spend more on technology and product in the earlier phases with an increase in marketing and sales in later stage businesses. The Investment budget dashboard provides indicators to help guide better investment decisions and link investments to business performance and intangible asset creation. The Growth Investment Dashboard will also provide unique industry benchmarks and guidance for businesses at different stages of maturity and growth.

Existing Technology and Knowledge

Product investments tend to use a cost-based model for investment decisions with project ROI analysis estimates based on likely impact on business performance. This will form part of our investment budget dashboard. Mathematically, it is expressed as:

((project financial gain or loss – project total cost) / project total cost)) x 100

Marketing investments will be budgeted based on Return on Advertising Spend (ROAS) with a focus on scalable growth with a good ratio of CAC to LTV. The budget will focus executives on the ratio of investments into growth related activities v operations and business as usual (BAU) activities. Highlight budget overruns and variance.

Needed Technology Knowledge

The Investment budget dashboard will help the CEO and executive team to understand the longer-term intangible assets their growth investments are creating. The link between short term investments and short and long-term payback will be central to our investment budget dashboard. It will highlight best practice ratios and suggestions for businesses of different levels of maturity and investment which will require research and market testing.

Current run rate of the firm and runway of capital.

Fund raising needs of the business.

Build this on our technology stack of HTML5, CSS, JQuery JavaScript framework, MySQL.

Technology/Knowledge to be Developed

To automate the data setup for the dashboard, we will integrate with a series of

- SME and HGF-focused accounting platforms such as Xero, Sage and Quickbooks
- Project management tools including JIRA, Asana, Monday.com

- Marketing platforms like Google Ads, Youtube ads, Twitter ads, Facebook Ads, Other automatic marketing bidding platforms.

Value Added

Whilst traditional investment budget analysis looks at ROI and ROAS there is a lack of understanding of long-term value creation brought about by investments in Intangible Assets. Statutory accounting standards do not account for in-house built technology investments to go onto the balance sheet.

CEO Dashboards: 3. Investment Funding

Feature Description
The growth investment dashboard is a series of graphs and insights on the growth performance of the firm. Growth is split up into a number of metrics including:
CAC, LTV, MRR, Conversion rates, retention.

The contributors to changes in growth rates are a key part of the growth investment dashboard as this helps identify the underlying intangible assets driving growth.
The dashboard provides strategic insights to help management executives focus on the areas with best payback and long-term value creation.

The dashboard supports ongoing analysis and insights and importantly the identification of new growth opportunities and products.

The platform aggregates marketing performance metrics to provide valuable links between sources of new clients, their value and the value of the intangible assets used to acquire and retain those customers.

Existing Technology and Knowledge
Growth investment evaluation are heavily focused on marketing with a strong focus on the analytics provided by the likes of Google and Facebook. Whilst these systems are comprehensive, their way of presenting the data is designed to encourage more advertising spend as a key desired outcome.

There are cross channel marketing analysis platforms like Mixpanel that focus on the complex problem of multi-channel attribution and missing data attribution. The platform will complement these marketing analysis platforms by supporting the comprehensive management of the intangible assets that drive growth most productively, enabling long-term value growth step by step.

Needed Technology Knowledge
Industry standard ratios of growth need to recognise investment levels in innovation, product and marketing appropriate for the stage of the company maturity. This will map the fund-raising stage of the business to sector guidelines for investment ratios across product, marketing and innovation. Early-stage pre-seed and seed stage firms will focus heavily on product and product market fit. Series A, B and C firms are focused on international expansion, additional products and growth in marketing.

Identifying the core underlying intangible assets that drive growth for most firms at different stages will help HGFs prioritise effectively for optimal investment and payback.
The platform builds this on our technology stack of HTML5, CSS, JQuery JavaScript framework, MySQL.

Technology/Knowledge to be Developed

To automate the data setup for the dashboard, we will integrate growth data from a range of third-party platform and marketing systems including:

- Google Ads, YouTube ads, Twitter ads, Facebook Ads, Other automatic marketing bidding platforms.
- API's and CSV's for ingesting internal performance data related to growth in client numbers, value per client, retention, and cost of acquisition

This will enable a time series of investment performance to be built over time, and the contribution of investments in intangible assets to the valuation of the firm to be measured.

Value Added

The unique element we bring to growth capital strategy is to help CEO's and executive teams to acquire a deep understanding of the value drivers in their firm. The use of intangible assets within the firm, as defined by CHS and adopted globally at macro-economic level assessments, will bring about a paradigm shift in the way that people value their investments in intangibles.

This will allow investors to gain a better understanding of the ability of executive teams to invest successfully in innovation and intangible centric growth.

Such an affordable SAAS platform can open up a deeper understanding of growth capital investing to a diverse and European-wide audience, reducing the need for expensive and somewhat elitist consulting services. This will allow all 400,000 European HGF's to access and adopt unique growth capital strategy insights and from this realise greater growth.

CEO Dashboards: 4. Business Valuation

Feature Description

Opagio features an innovative valuation dashboard to assist the CEO and CFO in understanding the impact of their growth capital investments on their firm's valuation. It combines the traditional financial valuation metrics like P/E ratios, which are relevant for mature businesses, with growth metric valuations like CAC:LTV ratios, MRR; and alternative net asset valuation ratios using our unique innovation and intangible assets register (GAR).

Growth Capital Valuation (GCV) provides HGFs with an alternative and more reliably predictive approach to valuing their firm. Executives with a clear understanding of the new drivers of growth will attract capital on better terms and allocate capital more successfully. GCV will provide unique industry benchmarks and guidance for businesses in different sectors and at different stages of maturity and growth. In order to deliver the GCV dashboard, we rely on integrating the outputs of the previous dashboards focused on Investment Budgets and Growth. The outputs of the GCV dashboards will provide the underlying data and presentation contents for executives to communicate controllable shareholder value creation to a wide variety of investors.

Existing Technology and Knowledge

Publicly traded companies are valued as a multiple of their earnings (EBITDA and profit after tax) with industry and sector specific multiples. In addition, a range of financial ratios (price to book, earnings per share, price to earnings, price/earnings to growth) are used. In contrast start-up valuations are notoriously difficult, with a number of approaches used to bridge the mismatch between low or non-existent earnings and growth prospects. The most popular is valuation by stage for rounds up to seed funding, and then growth metrics for Series A-D funding rounds. We are building valuation models to cater for start-up and scale-up businesses that are, or aspire to be, HGFs.

Needed Technology Knowledge

For our Growth Capital Valuation to go beyond industry norms we will require additional knowledge to support reliable assessment of the wide range of innovations and intangible assets driving value growth.

This of necessity goes beyond standard statutory accounting practices, and incorporates recognition of intangible assets, as defined by economists. This is necessary to build more scientific valuation models for early and late stage HGF's. European capital markets suffer from a "glass" ceiling at the €500m level with very few growth funds willing or able to back the next leg up of growth to Unicorn valuation and global leader status. European firms need to attract capital from US funds to break through this "glass" ceiling and scale into global firms. As a result, Europe's leading HGFs are driven to favour a listing in the US due to the much higher valuation protocols which are standard there.

This approach prevents the majority of European firms from becoming participants in the

broad range of disruptive innovations documented by ARK Invest. It leads European centric investors (including major pension funds and endowment funds) to miss out on most of the investments with the greatest returns and to be invested in companies with slower growth, traditional business models and greater risk of being disrupted.

Technology/Knowledge to be Developed

New valuation models for our Growth Capital Valuation functionality will be built, which take into account innovation and intangible assets together with human capital requirements. This requires deep understanding of CHS's econometric definitions of intangible assets, OECD's definitions of innovation types and scale and levels of innovation complexity.

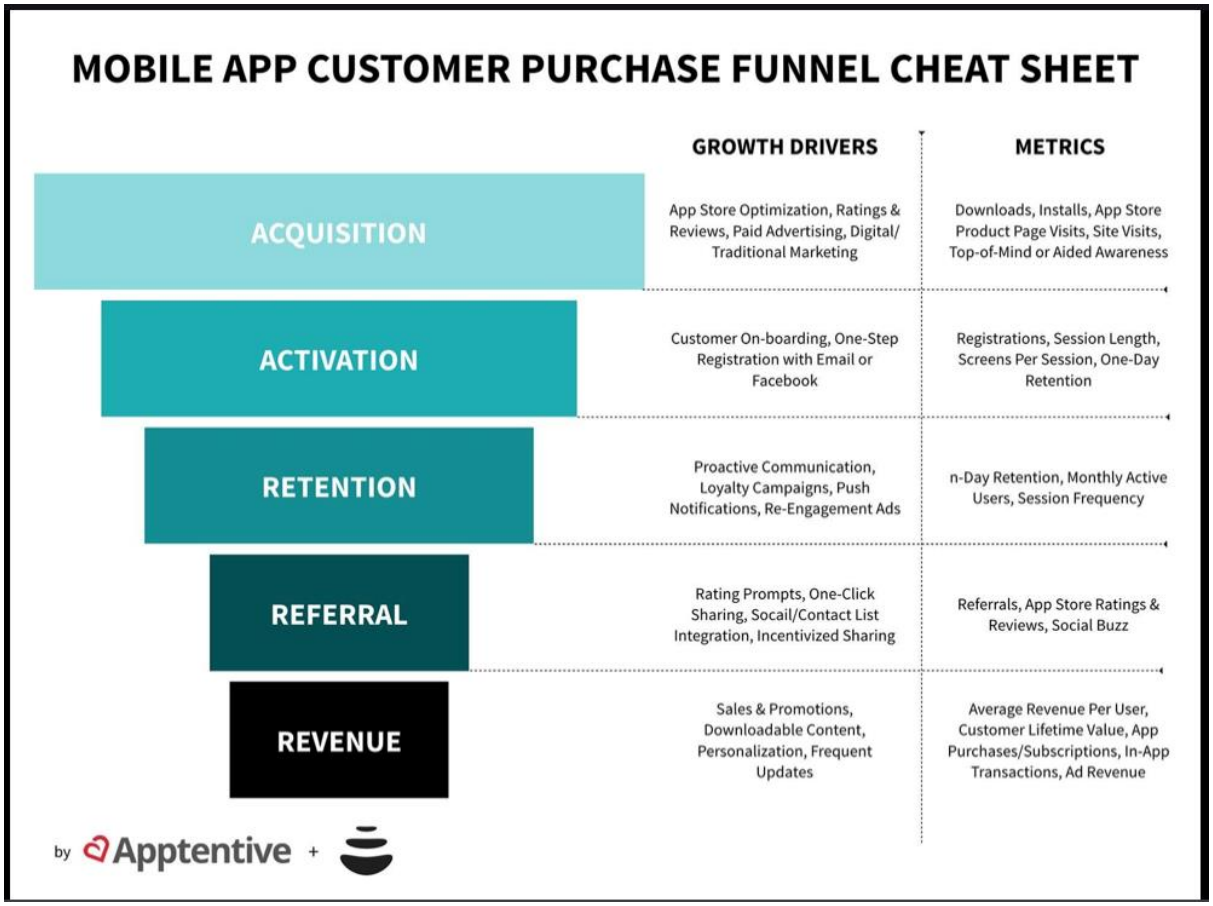
Value Added

The unique insights of the Growth Capital Valuation dashboard are based on our deep understanding of labour productivity and capital productivity in what is now a global economy driven by technology and disruptive innovations. This will bring a cost effective and scalable SaaS solution to a wide range of entrepreneurs across Europe to help them make better investment decisions and grow their firms more effectively, leading to an increase in economic growth in their market sectors and geographic regions.

Over time institutional investors in Europe's leading financial cities will be able to benefit from the Growth Capital Valuation service for the management of their own portfolios. This requires a major paradigm shift by European investors and European HGFs to compete with the US and China.

Appendix 1. Infrastructure Investment

The funnel chart shown below is representative of many digital businesses. What is important to understand is the investment in each part of the infrastructure. This is likely to be a combination of IT applications, software licences and custom software development. The chart below shows examples of Infrastructure expenditures which are usually classified as OPEX but can make a considerable contribution to growth



Appendix 2 OE, GAR and GCS Applications Positioning

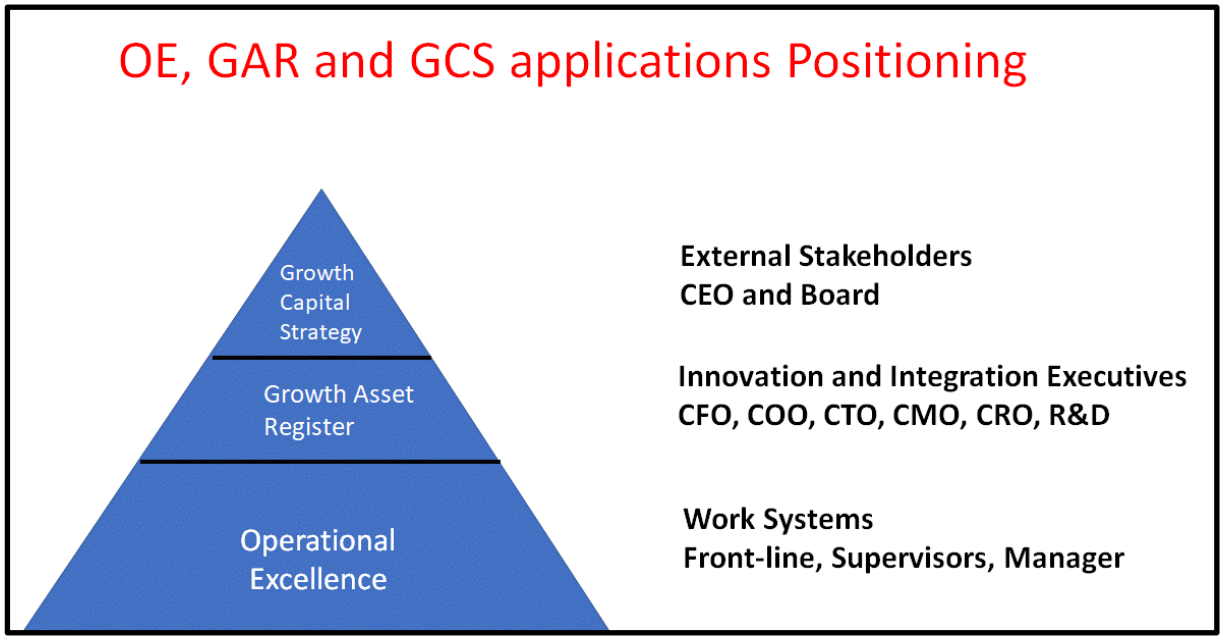
The chart below shows the positioning of the three applications provided by the Opagio SaaS Platform.

Operational Excellence provides Digital Work Systems which support the front-line, first level supervision and work systems management for the Level 3 socio-economic technical systems within which the majority of SME employees are engaged. These Digital Work Systems may encompass a single SME with marketing, sales, operations, manufacturing / service delivery or a multi-location SME, where identical digital work-systems are deployed geographically.

GAR supports the Innovation and Integration work performed by departmental executives, and which is required by Level 4 socio-economic technical systems to deliver high growth

GCS supports the Growth Capital Strategy work performed by the CEO and Board in relation to external stakeholders and supported by Executives and operational Work Systems.

The Opagio platform has been designed to support hierarchical and recursive socio-economic technical systems.



Appendix 3 Haskel's Five Hard Questions and author's notes

Introduction

I read Jonathan Haskel's book very carefully in preparation for a meeting with him in 2018 and prepared these notes for that purpose. The five questions are taken from the book and my notes are shown indented in smaller font.

Intangibles tend to be contested

First, intangibles tend to be contested: it is hard to prove who owns them, and even then their benefits have a tendency to spill over to others. This problem has traditionally been addressed by intellectual property rules and norms. We would expect an economy increasingly dependent on intangibles to put a premium on good intellectual property frameworks. But working out what ''good'' looks like in intangible property is very hard.

- Need to start by classifying them and documenting to include the asset type, the purchase date and the purchase price and the economic depreciation rate. Firms already do this for those assets which can be depreciated, but not those which are currently expensed which is estimated to amount to two thirds of intangible assets
- Once assets are classified and documented they need to be assigned to specific Work Systems. The reason for this is set out in the point below.

Synergies are very important

Second, we saw that in an intangible economy, synergies are very important. Combining different ideas and intangible assets sits at the heart of successful business innovation – and that is what marks out the world's most successful companies, from Google to Disney to Tesla Motors. Creating the conditions for ideas to come together should be an important objective for policy makers. This is partly a matter of solving familiar policy questions like how to encourage effective urban development, and partly about tackling new challenges, such as how to encourage research into new forms of collaboration and communication.

- In order to fully understand synergies (complementarities) is it not enough to do this at firm level. Complementarities are implemented at the Work System level and this is where they need to be measured.

Finance and Investment

The third challenge relates to finance and investment. As we saw, businesses and financial markets seem to underinvest in scalable sunk intangible investments with a tendency to generate spillovers and synergies. Our system of business finance makes this problem worse. Taken together this leads to lower productivity. So, we would also expect a thriving intangible economy to make significant changes to its financial architecture to make it easier for the country to invest in intangibles.

- One of the major problems with intangibles was first highlighted by Lev which is the difficulty of calculating a resale price and secondly the problem in separating the assets from the firm so that they can be sold separately.
- However, if it were possible to measure the value of the assets in use by comparing the work system TFP before the assets were deployed with the work system TFP after the assets have been deployed it becomes possible to assign a value to these assets.
- For lenders the valuation of the asset is an important step but it is not sufficient. In order for the lender to recoup their investment in the event of a default the assets must be separable so that they can be packaged and sold to other firms. The Work System Blueprint provides a means for assets to be separated from the firm in which they were first deployed. Think of the Blueprint as a recipe which can be recreated with the same components in another firm. The richer the recipe (i.e. the more variables included) the higher the probability of re-use and thereby disposal.

Expanding Government Investment

But even if governments of the future manage to clarify ownership rights over intangibles, create a productive ferment, and spur the development of financial markets which encourages that business investment, a fourth economic challenge is likely to remain. All other things being equal, it is likely that it will be harder for most businesses to appropriate the benefits of capital investment in the economies of the future than in the tangible-rich economies we are familiar with. This is an important change: successful capitalism depends on the idea that private firms have a reasonable expectation of receiving some of the returns from their investments. Where this is not the case, firms have less incentive to invest, and governments may feel obliged to step in. This is already the case with some important intangibles, such as basic research, which in most countries is significantly funded by governments.

- There are strong arguments for governments to increase expenditure which measure and promote increased TFP
- The reason for this is that, unlike profit which benefits only the shareholders of a firm, TFP benefits a wide range of stakeholders.
- The first benefit of increased TFP is that it makes it possible for firms to increase the real wages of their employees. Employees and managers can debate the share of TFP which should accrue to wages versus capital but without increased TFP there can be no increase in real wages.
- Because employees pay tax on their increased earnings the government benefits directly from increased TFP in two ways. First, from employee paid taxation and second from increased consumption much of which is subject to VAT
- Increased real wages, less savings, also drive increased demand for the products and services provided by firms, both domestic and foreign
- Lastly, firms can choose to spend some of the TFP increase on investment in tangible and intangible assets to further increase TFP in future
- From a policy point of view this investment can be delivered at no cost to the government through the use of the Training Levy. A research-based university level programme will be

developed and accredited for use by all firms subject to the Training Levy. To provide the necessary drive Government will mandate quarterly TFP reporting by these firms and all public sector enterprises from 2021 (using the Digital Economy Act).

Increasing Inequality

Finally, governments must work out how to deal with the dilemma of the particular type of inequality that intangibles seem to encourage, One the one hand (as we saw in chapters 5 and 6) the growth of intangible investment seems to increase inequality and social divisions. But as we saw in chapter 8, making the most of the spillovers and synergies of intangibles requires good social institutions and trust.

- There are structural reasons for increased inequality which derive from Company Law which mandates audited annual profit and loss reporting and from stock markets which requires quarterly profit and loss reporting as a condition of listing. These institutional arrangements ensure that as far as possible investors can choose which investments to make based on the fully possible market information available to all.
- TFP reporting from Firms and government enterprises would serve a different purpose. It does not replace profit and loss reporting, but complements it by providing reporting for the other stakeholders of the firm, namely its employees and customers, the wider community and government.
- Stiglitz in his latest book has argued that capitalism is no longer working for the majority of citizens in the USA. Other scholars have argued along similar lines (e.g. Mazzucato). He argues that under the neo-liberal economic paradigm rent seeking behaviour to benefit the few has dominated and crowded out wealth creating behaviour to benefit the wider community.
- In the end private firms and public sector enterprises will be responsible for delivering increased TFP. However, Investors' representatives have already indicated that they are ready, willing and able to reinforce managerial behaviour and investment which deliver increased TFP for the long haul.
- The combination of active investors and committed government can jumpstart the UK economy out of its 10-year TFP slump which has cumulatively resulted in £400 billion of lost growth.
- It is worth pointing out that every one percentage point of TFP growth is worth £20 billion a year which should provide sufficient incentive for all stakeholders. Historically UK has managed to deliver 2% productivity growth so this should be the UK national target.

