INSEAD

Recognising the True Value of Software Assets

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Executives today are faced with the difficult challenge of continuously improving the business value of the unit or company they are managing. It is no longer sufficient for managers to produce "good" performance most of the time. They must deliver outstanding performance levels and they must do so all the time; there is less and less patience for weak results. This challenge is all the more daunting since the competitive environment that managers are facing is becoming increasingly demanding along multiple dimensions.

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Creating Business Value:
A Continuous Quest

Executives today are faced with the difficult challenge of continuously improving the business value of the unit or company they are managing. It is no longer sufficient for managers to produce "good" performance most of the time. They must deliver outstanding performance levels and they must do so all the time; there is less and less patience for weak results. This challenge is all the more daunting since the competitive environment that managers are facing is becoming increasingly demanding along multiple dimensions:

- Cost pressures are relentless. Oil prices are at record highs and show no signs of a long term decrease. New competitors from emerging economies are continuously driving costs downwards in both manufacturing and services.
- Customers have become more demanding in their needs. Customer needs are changing rapidly across generations (the young and the old) and across markets (developed and emerging).
- The pressure to reduce time to market has increased across sectors. Being first on the market often means the difference between success and failure.
- Sustaining a rapid pace of innovation has become critical. Progress in technology is enabling many innovative products and services.
- The notion of risk has been redefined and taken on increased importance in the context of business performance. Business can no longer be isolated from risks in the global macro-economic, political and social contexts

The challenges for businesses have only increased in the second half of 2007. A looming housing loans crisis in the USA exploded in late summer, creating repercussions for all on the global stage. It has also shown that we are interconnected globally in deep and lasting ways. Technology has enabled much of these inter-connections and these links will only grow stronger in the future. The ensuing credit crunch has not only served to bring back a much needed dose of sobriety in many businesses but has also highlighted the importance of creating value. An executive described it as follows, "It has become an imperative for top management to focus on creating value for the business. Value that is real. Value that is deeply embedded in the capabilities of the firm. Value that will last."

Physical assets such as plants and machinery have long been seen as one of the corner stones of value creation in companies. As the global economy has migrated from an agricultural and manufacturing base to a services-based knowledge economy, the value of intangible assets has been on the rise. Intangible assets, while not physical in nature, come in a variety of

shapes and sizes. They range from specific rights (e.g., leases, distribution agreements, franchises etc.) and relationships (customer relationships, employee teams etc.) to intellectual property (IP) (trademarks, copyrights, patents etc.). Intangible assets are fast becoming important sources of value creation for firms. A firm such as IBM earns more than $2bn annually from licensing its patents. Nearly 40% of the market capitalization of a firm such as Coca Cola is estimated by experts to arise from its brand value. Thus it is not surprising to note that in recent years firms have started giving greater thought to managing the value of their brand and IP.

There is a need to pay more attention to another important type of intangible assets – the organisation's core software assets. Deep knowledge about the firm's products, services and its processes are embedded in its core software assets[1]. The core software assets capture how the firm conducts most of its operations and interacts with its customers and suppliers. While firms have focused on creating value from intangible assets such as patents and the brand, they have, for the most part, managed their core software assets not as an asset for value creation but as an expense item to be minimized. Rather than focus on value, an organisation's core software assets have been managed by costs. An executive described it thus, "We have been doing ourselves a great disservice. We have created an enormous base of intangible assets [our software systems] and then we have largely elected to ignore it. We have under-invested in extracting value from our software assets. I think that this will change as the performance pressures on firms increase."

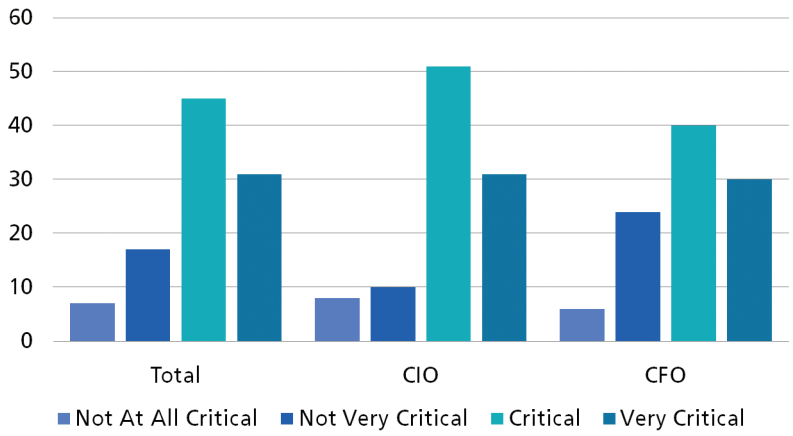
This research conducted by INSEAD in collaboration with Micro Focus calls for a change in this attitude. The organisation's core software assets are an important source of value creation for companies. Executives have to believe this and they have to manage their software assets as such. However, this research has also identified a lack of adequate tools and techniques for assessing the business value of a firm's core software assets. This research identifies the strengths and weaknesses of existing approaches, looks at approaches used for the valuation of other intangible assets and propose some new directions to explore. The ideas presented in this paper are based upon a quantitative survey and original research at INSEAD. The quantitative survey was carried out in partnership with the research organisation Vanson Bourne who surveyed 250 respondents across France, Germany, Italy, UK and US, comprising 50% CFOs & 50% CIOs at companies with revenues from $100m up to over $1bn. Respondents surveyed included CIOs & CFOs from manufacturing, financial services, and retail sectors amongst others. The original research at INSEAD was conducted by Professor Soumitra Dutta and included semi-structured interviews and discussions with more than thirty CIOs and CFOs from Europe and North America.

Firms have managed their core software assets not as an asset for value creation but as an expense item to be minimized. This has to change.

[1] The term "core software assets" is being used in this paper to refer to the entire set of existing software systems in operation in the firm without any specific limits on the age of these systems. The term legacy assets is commonly used in the literature to refer to software systems which have been in use in firms for some years (usually more than seven to ten years). The term core software assets refer to legacy systems and also more recent systems in use within the firm.

Value from Software:
An Intangible Asset to be Leveraged

Software forms the "back-bone" of most industry sectors, including banking, airlines and publishing, and is an increasingly important value-adding component of consumer products such as television sets, cameras, cars and mobile phone sets. Software is today a dominant force in enabling companies to exploit new distribution channels, create new products and deliver differentiated value-added services to customers. In reality, there is often little difference between an organisation's software strategy and its business strategy. This is reflected in our survey of 250 CIOs and CFOs – nearly 77% of them said that their core software assets were critical or very critical for their business strategy. The proportional responses were highest for the USA (86%) and Germany (84%) and comparatively lower for Italy (69%) and France (68%).



77% of CIOs and CFOs said that their core software assets were critical or very critical for their business strategy

Businesses are increasingly seen as a set of inter-related "processes" that are logically and continuously evolving to satisfy a set of common customer oriented objectives. These business processes are usually embedded in software systems and represent an important component of the value of the intangible asset represented by the software. Any innovation in a business process typically entails corresponding changes in the supporting software systems. For example, customers interact with banks through multiple channels and many of these interactions happen online or via telephone-based systems. Launching a new product will demand changes to the software governing these customer-interaction channels. Customers expect a seamless integration of the product or service experience across these channels - this is enabled by customer relationship management systems. Innovations in new products and services need to integrate changes in the supporting software systems.

Software is also increasingly embedded in consumer electronics and objects of daily use. An advanced mobile phone today contains more than a million lines of software code and a new motor vehicle contains more software than the first spacecraft that landed on the moon. The increased distribution of software in our daily lives is being accelerated by the spread of the Internet and the availability of cheap hardware. This year, the world will make more transistors than grains of rice and at a lower cost! New versions of the Internet protocol and the diffusion of Radio Frequency Identification (RFID) tags are adding intelligence and connectivity to all objects of daily use. While the amount and pervasiveness of software in our daily lives is impressive, it is important to note that the most valuable features of these products are also being enabled by the embedded software systems.

The direction is clear. Software is transforming our lives and is enabling new innovative products and services. Software is an important intangible asset that is a common vehicle for value creation in businesses today.

Software assets capture knowledge about business processes, about how we collaborate with each other and our partners. This is a vital intangible asset.

Managing the Software Asset:
Problems and challenges linger on

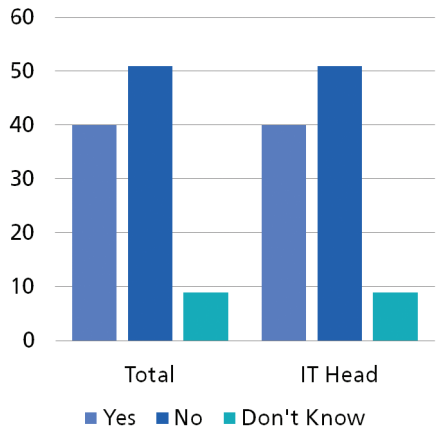
Despite the overwhelming dependence of organisations on their software assets, these systems do not usually get the praise that they deserve. If they do get attention, it is usually for the wrong reasons.

Software projects are notorious for being late and going over-budget. Stories of cost and time over-runs with software projects form the staple diet of managerial complaints about technology. Industry observers note that for every six new large-scale software systems that are put into operation, two others are cancelled and that the average software project overshoots its schedule by half. Occasionally, massive failures in large public sector projects (such as the NHS in the UK recently) hit the front pages of newspapers, appalling readers and testing the limits of their understanding of why such disasters still take place in today's modern and hi-tech world.

Few comprehend or appreciate the enormous complexity of large scale software projects today – from both organisational and technological points of view. Large software projects – such as those resulting from the implementation of an enterprise resource planning (ERP) system for a global company or from the merger of technology platforms across two banks – usually span the globe, affect how thousands of people find information, do their work and collaborate. Their influence also spans organisational boundaries as they enable interactions of the firm with partners and customers. All in all, they represent horrendously complex undertakings that test even the best minds today.

There is another important challenge with the management of software assets in organisations. The problem is simple yet profound. Most executives do not know how much software is around in their organisations! Our research of 250 CIOs and CFOs shows that nearly two thirds (60%) of the surveyed CFOs & CIOs do not know the size of their core software assets. German respondents have more knowledge of their software assets than any other region. 60% of CIOs and CFOs in Germany say they know the size of their core software assets compared with 52% of US respondents, 40% of Italians, 36% of French and only 12% in the UK sample.

Organisations are scrambling to cope with the pressures of developing and managing software systems which are not only a couple of orders of magnitude bigger and more complex than those from a few years ago, but also which need to meet ever-increasing demands for higher quality and superior performance.



nearly two thirds (60%) of CFOs & CIOs do not know the size of their core software assets

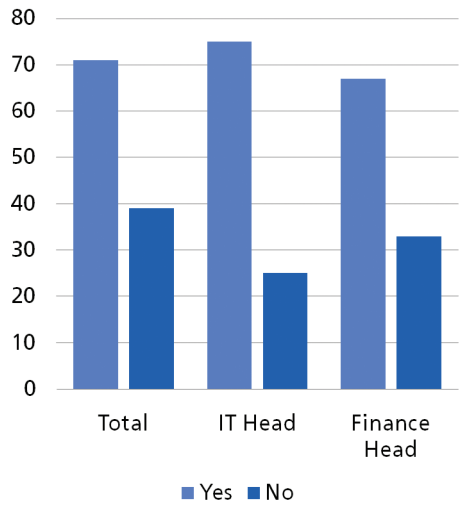
This may seem surprising at first, but it is really not that strange when you consider the fact that organisations have been continuously adding layers and layers of software in their core operations over the last several decades. This increase is being driven by multiple factors. One, there are continuously increasing demands from business units for new products, new services and innovative business models – most of which are enabled by software systems. Two, the spread of the Internet has created a global information infrastructure that is unique in terms of both richness (of media and information exchanged) and reach (extent of global connectivity). This is creating new opportunities and also placing new software-related demands on firms – such as moving their processes online. Finally, the underlying hardware technology has also been progressing at a blistering pace – enabling the possibility of creating complex software assets in organisations – such as the use of large data warehouses for advanced analytics and decision support.

The problem gets exacerbated by the fact that software is not visible and has a tendency to live for ever. Businesses have allowed complexity to permeate their operations and in the absence of a determined and deliberate strategy to simplify business processes and product lines, software systems tend to be continued to be supported for a very long time. A CIO commented as follows, "They say that a cat has nine lives. Software for sure has more. Whenever you think that you are ready to retire a piece of software, you always hear voices asking for it to be spared. There are always good reasons given with the plea. Customers need it, old products need to be serviced, workers are too busy to be trained on the new system, etc., etc. You have to be strong and disciplined to retire software."

They say that a cat has nine lives. Software for sure has more…
You have to be strong and disciplined to retire software.

Taken together, the volume of software assets in organisations is continuously increasing. Industry experts estimate that the amount of software in organisations is doubling every five to seven years. Most of the software is also distributed across the corporation and it becomes difficult for even dedicated professionals to get a complete handle on total amount of software within the firm's boundaries.

As software assets are spread across the organisation and are usually not precisely quantified, it is not surprising to note that a significant proportion of firms do not know how much they spend on software. Research has shown that a third (29%) of the 250 surveyed CIOs and CFOs do not know what they spend on their core software assets each year. 56% of French businesses and 44% of Italian businesses don't know their spending on software as compared with 16% of UK businesses and 10% of US businesses. Even amongst those respondents who say that they know how much they spend on their core software assets, only 21% on average report to be very confident in their knowledge of total spend. The figures are highest for Germany (32%) and USA (24%) but lowest for UK (14%) and Italy (12%).



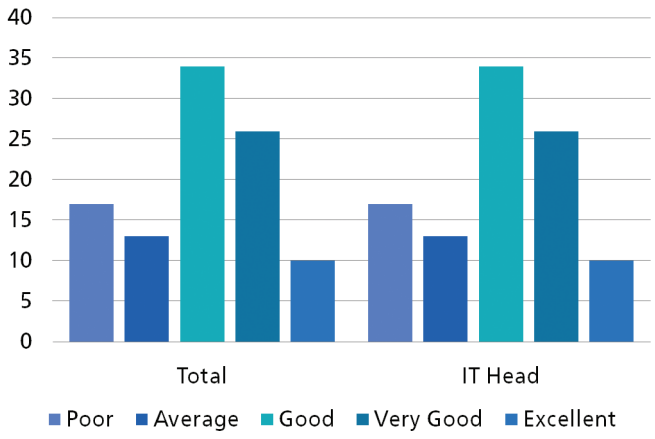
a third (29%) of CIOs and CFOs do not know what they spend on their core software assets each year

Measuring software costs are complicated by the fact that they include much more than just the cost of software purchase/maintenance and the underlying hardware. Due to the deep linkages between the organisation's business processes and software systems, there are significant costs associated with business users and customers interacting with software systems. These costs can range from simpler education and training costs to more complex organisational change costs when process changes have to be implemented with new software systems.

Costs for implementing new software systems are often easier to document and manage. After all, new systems imply the purchase (or development) of a specific software package, the availability of a suitable hardware platform and the formation of a project team for implementation. However, the bulk of the software assets in organisations are "older" systems. As the amount of software keeps on increasing, so does the volume and importance of these software assets which are distributed all over the firm. The inner workings of many of these software assets are often poorly understood but they represent years of accumulated experience and power the core business operations of most firms today. Take away these assets and the organisation will most likely be brought to its knees, unable to close customer negotiations, book revenues or even provide even the most mundane after-sales services to its customers. A CIO commented as follows, "The long tail of the older software assets consume a significant portion of the total resources that my firm spends on technology today. These software assets are the hardest to grapple with in terms of identifying total spend. Most of this spending does not even appear on my [central] budgets."

Business value of Software:
Identifying the Benefits

Given that a large proportion of companies do not how much software they own and how much they spend on it, it is not surprising to note that there are significant deficiencies in communicating the business value of core software assets to Boards. Only 10% of the 250 surveyed CIOs and CFOs rated as excellent their team's efforts to communicate the business value of their core software assets to their boards. Another 26% of the surveyed respondents rated their efforts to communicate business value to their boards as very good. The % of respondents rating their efforts as excellent or very good ranged from a high of 52% for the UK and 44% in Germany to 32% in the USA and 19% in Italy.



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The above results are partially explained by the challenges associated with identifying the costs of software. After all business value is a function of costs and benefits. However, there are also significant hurdles in identifying the business benefits from software. If a firm is unable to define the boundaries and quantity of its software assets it becomes difficult for it to articulate the benefits being generated from those assets. Even for specific software assets, articulating all benefits may not be easily possible as explained below (see Table).

Type of Software Asset	Description	Measurement of Business Benefits
Transactional	High volume systems related to the core business transactions of a firm.	Relatively easy – linked to benefits of each transaction.
Informational	Extract and aggregate data from internal (and external to the firm) systems for decision support.	Difficult – as business outcome linked to final decision of human expert.
Transformational	Transform the way knowledge workers interact with each other and with their customers and partners.	Very difficult – business outcome dependent upon culture, incentives and leadership styles.

Even for specific software assets, articulating all benefits may not be easily possible

Software assets in organisations can be categorized to fall into one of three categories: Transactional, Informational and Transformational. Transactional software systems are typically high volume systems that are related to the core business transactions of a firm. For example the core transaction processing system of a large bank may process millions of updates to customer accounts any one day. Informational systems serve to support the information needs of managers and decision makers by extracting and aggregating data from internal (and external to the firm) systems, processing them with specific analytical tools and displaying them in a user-friendly manner to decision makers. Transformational systems seek to transform the way knowledge workers interact with each other and with their customers and partners. In doing so, they support new ways of working, new business practices and ultimately innovative new business models. Examples of systems in this category include collaborative workflow systems, customer relationship management systems and social or Wiki-based networking tools.

Identifying the value of transactional systems is often straightforward if the benefits associated with each transaction can be quantified. For example if each update to an account saves a few minutes of employee time, that figure can be aggregated over the total number of transactions conducted daily or monthly. Doing the same for informational systems

becomes harder and it only gets more difficult for transformational systems. An important part of this challenge is linked to the fact that, with informational and transformational systems, business value is generated by a combination of people and technology and not by technology alone. To understand this, try a simple experiment. Try to write down the benefits of email for your organisation. True, you can identify specific savings associated with using email – savings in postage, faster delivery of documents etc. However, how do you identify the business value of being able to share information widely? Having technology to share informati on between the research and marketing departments will only help if the management incentives and culture are in place to support such collaboration. How do you quantify the business value of being in touch with your customers more easily? Having technology to sense customer problems will only help if the internal processes of the organisation are seamless and have the right customer orientation.

Further, identifying business value takes time and this is often in short supply for CIOs and their staff who are constantly buffeted by two fast moving forces of change. On one hand, business requirements are changing constantly whether in terms of new customer demands to be met or new markets to be entered or new security constraints to be complied with. All of these demands stretch the workload of technology specialists to the limit. Simultaneously, technology continues to progress at a hectic pace. Developments such as the emergence of Web 2.0 and Service Orientated Architectures (SOA) continue to demand new skills development in IT staff and the careful management of transitions in the core software systems. Caught in-between these two fast moving cycles of change, CIOs are hard-pressed to make assessing the value of software assets a priority for themselves and their teams. The costs and complexities of determining the business value of software assets, especially older systems, is seen as giving little return to CIOs and their teams on the use of their precious time.

For informational and transformational software assets, business value is generated by a combination of people and technology, not by technology alone. This makes it harder to quantify precisely.

Measuring Value of Software Assets:
Current Best Practices

The measurement of business value from software assets is most developed in methodology and also most widely practiced for new systems. There are of course always exceptions where new systems are mandatory – typically for reasons related to security or regulatory compliance. In these cases, many organisations dispense with detailed computations of business value and focus instead on executing the projects as efficiently as possible. However, most new projects aim to support novel business initiatives, need new capital expenditure and their value needs to be justified to the board and/or top management of the firm. They can replace older systems in some cases but, mostly, they are patched onto the older systems already existing in the corporation.

There is no one standard approach to measuring the value of new software systems. This is not surprising because there are different types of software assets and the benefits of some are easier to measure than others. However, three best practices have developed over the years in assessing the business value of new software systems:

1. **Financial benefits:** Whenever and to whatever degree possible, the benefits of a project in terms of cash flows are measured and discounted back using an appropriate rate (cost of capital or risk premium). Examples of cash flows include increased sales to current and new customers, reduced transaction costs, labor hours saved etc.

2. **Non-financial benefits:** When financial cash flows cannot be measured, the non-financial benefits accruing from the deployment of systems is measured or estimated. Examples of non-financial benefits include brand recognition, customer relationships and knowledge management.

3. **Risk assessment:** A detailed risk assessment is done for all new projects which assess both delivery risk (the risk of not delivering the project) and benefits risk (the risk of not obtaining the expected benefits of the project). The risk assessments are frequently converted into an overall investment risk that is used to adjust the hurdle rate used for the project approval.

As new systems are related to novel business initiatives, such projects typically have strong business owners and their justification is driven by joint technology-business teams in terms of identifying both financial and non-financial benefits and in performing the risk assessments. Most surveyed CIOs express satisfaction with their ability to build effective cost

Finance teams have made great strides in measuring IT spending and have brought financial discipline to monitoring where the money goes. Companies are now seeking new ways to measure and manage the business benefit of IT investments
- even when investments are not tied directly to the bottom line"[2] –
CFO Research Services

[2] Randy Myers, IT Moves from Cost Center to Business Contributor: The CFOs view on measuring IT value, CFO Research Services, CFO Sep 2004 (jointly conducted with PriceWaterhouse Coopers)

benefit analyses for new software projects. In the words of one CIO, " We are pretty thorough in computing the business value of new software projects. We work closely with our business units to drill down to precise financial and operational metrics which help us to build a good business case. This is vital for getting approval from the board for the new projects. I cannot say that I have 100% faith in all the numbers we produce, but in general we are not far off from the truth. I believe that we do a pretty good job"

Almost all interviewed CIOs expressed a frustration and admitted a weakness in the post-project monitoring of benefits. Once a project is finished, the attention of both the technology and business teams quickly move on to the next project. The numbers created in the cost benefit analysis at the start are rarely revisited or verified after the implementation, as outlined by the following comment, "I would like to tell you that we verify the benefit numbers we produce at the start of the project. However, the reality is that we rarely go back post-implementation to do an audit of whether or not we reached our numbers and if not, to better understand why not. This is something that we should do, but we are under constant pressure to execute new projects."

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Valuing an Under-Managed Asset:
Making the Right Decision

Most firms under-manage their core software assets.

Boards are constantly challenged to make the right allocation of scarce resources across a variety of technology projects. New projects typically get most of the attention and are often easier to understand for senior executives. They are linked to a new business initiative, have well-defined costs, are sponsored by a business owner and usually have a project team whose members are excited about the new initiative. Older software systems in contrast get the least attention. They are often treated as 'sunk costs'. They often use old technology and contain mature business processes which have been patched up multiple times. They are poorly understood both by the businesses users and by technical staff who do not find it exciting to work on them. Hence, these older software assets tend to get managed by costs. There is a strong focus on reducing the resources allocated to them and questions asked to manage them tend to be cost related. How much are we spending? Can we reduce costs further? This is a paradox because these older systems support the back-bone of the operations of most companies. They are the core software assets of firms. They represent the hidden value in firms.

Is there any value in computing the business value of these older software assets? This research picked up different view points on it. Some CIOs felt that the return on the effort of doing so was not worth it as they were already hard pressed to find the time to executive their normal load of new projects. There was little incentive to add on new tasks which would consume time and yield uncertain benefits, "I am already very busy. I do not see the additional value of having my team spend time assessing the value of legacy systems – I want them to be focused on executing for new business value."

Some CIOs expressed concerns that efforts to capture the value of older software assets and represent them on the books may not be welcome within their firms, "I would be very nervous about assigning any kind of GAP type asset values to legacy systems. These systems have been depreciated off our books. All kinds of terrible things can happen (to return on capital) if we start adding assets to our books."

However, many did feel that there was definite value in computing and being aware of the business value of the core software assets. One, firms had to decide how much of an investment to make in the maintenance and upgrade of these systems. In the words of a CIO, "If you can put a business value on a [older software] system, that is good. If the system generates $1m in business value and you are spending $100K on its

maintenance, which may be fine. If you find that the system generates $10m in business value and you are spending $100K on its maintenance, you may want to rethink this expenditure. On the other hand, if you find that the system is generating $200K in business value and you are spending $100K on its upkeep, then you may have a problem. It is useful to know this."

Some CIOs felt that a better understanding of the business value of core software assets could also be helpful for mergers and acquisitions and for joint venture negotiations, "I have been involved in a number of mergers over the last years. In each case, I had significant challenges in doing the due diligence of the technology systems. If I had a simple way to compute the business value of the software assets, my life would have become much easier."

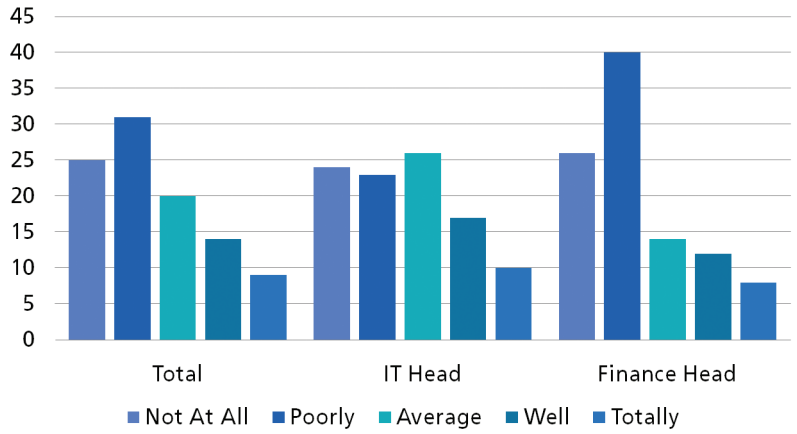
Just because it is hard to articulate business value does not mean that it cannot be done. More importantly, there is a need to determine new tools and methodologies that can be used by CIOs to determine the business value of their core software assets. These methods need to be simple to use and also focus on the business value of the assets. This is indeed the focus of this research.

Why value core software assets?

- For making the right investment decisions
- For balance sheet purposes
- For mergers and acquisitions
- For joint-venture negotiations
- For licensing and franchising
- For investor relations

Valuing Intangible Assets:
Learning from Others

Software is an intangible asset whose business value is difficult to assess precisely, especially for informational and transformational systems. However, there are several other intangibles that businesses have to deal with such as brands and intellectual property (IP). Businesses seem to be doing a better job at valuing these intangibles as compared to software assets. Our survey of 250 CIOs and CFOs revealed that about 56% of all respondents felt that the financial value of the organisation's core software assets were not or poorly assessed as compared to other corporate assets such as brands and intellectual property. This proportion was the highest for Italy (74%) and the USA (58%) and relatively lower for the UK (44%).



56% of all CIOs and CFOs feel that the financial value of the organisation's core software assets were not or poorly assessed as compared to other corporate assets such as brands and intellectual property

Firms value IP for a variety of reasons including equity financing, loan collateralization, bankruptcy proceedings, taxation and transfer pricing, and internal reporting needs. As mentioned earlier, the economic value of IP can be very significant. How do companies value their IP? Before we look at the methods employed, it is useful to note that "IP valuation is part art, part science. IP valuation is science in that the valuation analyst will use well-defined and tested financial formulas and models to capture the quantitative aspects of the IP and combine them to arrive at a value conclusion. IP valuation is art in the ways that the valuation analyst applies these financial formulas and models. The valuation analyst will apply these in meaningful ways based on the qualitative aspects of the IP, the amount of independent research that the valuation analyst performs, and the relative background of the valuation analyst. All of these drive value opinion quality."[3]

[3] M. Pellegrino, Valuing Intellectual Property, Pellegrino & Associates LLC, 2005.

There are generally three approaches employed by firms to value their IP:

1. **Cost approach:** the IP is valued by assessing the costs that the firm incurred in creating the IP. These costs could include aspects like labor, any materials that were used and any capital costs incurred.

2. **Market approach:** the value of the IP is assessed by looking at recent transactions in the open market with similar IP and with comparable attributes (industry sector, size etc.). Value is determined by using the market IP transaction as a proxy for the target IP. Licensing fees paid by firms to holders of IP are often used in market-based approaches.

3. **Income approach:** the value of the IP is estimated by the economic income associated with the IP over the remaining useful lifetime of the IP. There are different methods utilized to determine the economic income associated with a given IP. A popular method is based upon identifying the stream of cash flows generated by the IP, subtracting associated costs and discounting the resulting income stream with an appropriate discount factor.

None of the above approaches are perfect. The cost approach makes an important assumption (value = cost of investment) that is rarely true in the real world. Think about the value of the IP in Google's search algorithms. The cost incurred by the founders of Google to come up with that IP is substantially less than the value of that IP in the commercial world. The market approach while appealing also has its limitations. IP is by definition unique and it is rare to find truly comparable IP in the open market. A number of arbitrary assumptions often have to be made to find comparable IP and use the market approach to valuing IP. The income approach is the most appealing but it requires a high degree of discipline to be rigorous and the process is fraught with multiple challenges such as precisely identifying the cash flow stream from the specific IP and determining the remaining useful life of the IP.

Brands represent another important category of intangible assets in organisations that have received significant attention in recent years. This is not surprising when estimates by independent consultants shows that brands account for more than $43bn of the market capitalization of Coca Cola and $24bn for Google. For Nike and Prada, the brand is estimated to represent 84% and 77% respectively of the total enterprise value for these firms[4].

Intellectual Property valuation is part art, part science.

[4] These estimates are taken from BrandFinance, an independent consultancy that rates the value of global brands annually.

The valuation of brands follows one of the three generic approaches described above for valuing intangibles:

1. **Cost approach:** the cost of creating the brand is used as a measure of the value of the brand.

2. **Market approach:** the value of a specific brand is compared against the recent sales of comparable brands in the market.

3. **Income approach:** the value of the brand is estimated either by the future cash flows arising from the brand or by computing the "relief from royalty"[5] that the firm benefits from by owning the brand.

Similar to the valuation of IP, each of the above approaches has its own pitfalls. The most commonly quoted brand league tables, such as those produced by Interbrand or BrandFinance use a combination of the Market and Income based approaches (see box for the approach used by BrandFinance). It is important to recognize that these approaches while giving an apparent sense of rigor, have a lot of proprietary models and assumptions built into them (e.g., in steps 1, 2 and 3 of Box).

Valuing Brands using the Income Approach

1. Estimate future sales over a five year period
2. Set royalty rate for brand by reviewing comparable licensing arrangements and industry royalty rates.
3. Estimate discount rate specific to brand.
4. Calculate future royalty revenues by applying royalty rate to estimated future sales
5. Discount the future royalty earnings with the rate from step 3. This gives the brand value.

[5] This estimates the relief from the royalty that the firm would be expected to pay to license the use of the brand (assuming that it did not own the brand itself).

An Inexact Science:
Valuing Software Assets Revisited

Can we apply one of more of the three traditional approaches for valuing intangibles – cost, market and income – for valuing core software assets? The cost approach is not very sensible for two reasons. One, the costs for many software systems are difficult to ascertain accurately, especially for systems that were designed and implemented many years ago[6]. The second reason is more complex and makes the use of the cost approach unattractive. The cost of building or replacing a software system rarely is a true measure of the business value being generated by the software asset. Barring exceptional situations where the software has not been designed and/or used properly the value of software is much higher than the cost of producing and maintaining it. As a CIO put it, "Using development and maintenance costs as a proxy for the business value of software assets is a non-starter. I will get fired by my Board if that is all the value that I am creating."

"Although this may seem a paradox, all exact science is based on the idea of approximation. If a man tells you he knows a thing exactly then you can be safe in inferring that you are speaking to an inexact man." – Bertrand Russell

Market based approaches are difficult to apply in general. Rarely are software assets traded on the open market - especially software assets that reflect the DNA of the organisation and are deeply intertwined within its core operational processes. Software assets are difficult to isolate and subject to the market test. There are a few exceptions to this rule however. For (typically small) companies that sell software products and whose revenues are dependent upon that product, the value of the company can be used as a proxy for the value of the software. Further, the development of web-services is creating a market for specific software assets. The market price for a specific service/feature delivered and sold online can be treated as a proxy for the value of the software. Despite the challenges in implementing market based approaches, many firms have tried to adopt this approach by placing their internal technology departments in competition against external providers. CIOs have adopted mechanisms to itemize the charges of their services and charge them back to the business unit users. This system creates the notional sense of a market, but rarely provides an accurate estimate of the business value of core software assets.

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Income-based approaches have the greatest appeal for calculating the business value of core software assets. These approaches are not too different from those applied while computing the cost benefit analyses for new software applications. The approach depends upon the ability to conduct a detailed analysis of the business process(es) touched by the software asset. This analysis leads to the identification of precise cost savings or revenue enhancements that are enabled by the software asset. These future income flows are then discounted and aggregated back.

[6] The cost of replacing an old system by something new can under some conditions be used as a proxy for the cost of the system.

The challenges in implementing such an approach have been highlighted earlier. Not all benefits of software systems can be converted into revenue enhancements or precise savings – especially for informational and transactional systems. Further, as most benefits flow not from technology alone but from a combination of people and technology, intelligent estimates have to be made about the contributions of the software assets to the income streams. The appropriate discount factor to be used has also to be estimated, especially given the business risks embedded in the software asset.

Finally, doing all of this properly takes time and time is a scarce resource for CIOs and their teams. In the words of a CIO, "Unless you are talking about specific transactions, it has proven very difficult to precisely estimate the contributions of a piece of software to the business value being created. There are so many intangibles to be dealt with – people skills, organisational culture, management incentives and leadership styles – to name a few. I think that the best we can do is make intelligent estimates. To do anything more would take more time than what I believe I am able to give today…and I am not sure of the value that I will get back in return."

I think that the best we can do is make intelligent estimates. To do anything more would take more time than what I believe I am able to give today… and I am not sure of the value that I will get back in return

New Thinking on Operational Risks:
An Urgency in Action

Due to the high level of dependence of organisations on their core software assets, CIOs are very concerned about the operational risks inherent in these systems. Previously many CIOs saw risk management as "good managerial practice". The focus on risk management has become higher over the last decade but it is soon becoming more than only good practice. It is becoming essential as agreements such as Basel II force banks to set aside capital to cover the operational risks of internal systems.[7] The Basel II Framework describes a more comprehensive measure and minimum standard for capital adequacy that national supervisory authorities are now working to implement through domestic rule-making and adoption procedures. It seeks to improve on the existing rules by aligning regulatory capital requirements more closely to the underlying risks that banks face.

A significant change in the Basel II Framework is the greater use of assessments of risk provided by banks' internal systems as inputs to capital calculations.[8] Examples of these new and growing risks faced by banks include the greater use of more highly automated technology which has the potential to transform risks from manual processing errors to system failure risks, as greater reliance is placed on globally integrated systems. Growth of e-commerce also brings with it potential risks (e.g., internal and external fraud and system security issues) that are not yet fully understood.

A CIO emphasized the importance of this shift as follows, "The point is that Basel I, implemented 20 years ago was really measuring capital adequacy against market risks. Basel II is making banks put up capital against ALL underlying risks and 'operational risk' is a new one. This is REGULATORY not voluntary! The assessment of risk posed by internal system is a 'significant innovation'. The CIO is forced to evaluate and measure operational risk and the bank is forced to put up capital. Since capital is scarce and limited, then a bank will want to manage down these risks."

The same executive continued, "Basel II is very important for banks. The framework is handed down to the local regulators to implement and set rules. If a bank can get its new risk models approved by the regulators then it can cut its regulatory capital requirements quite significantly. The bank has to be able to demonstrate that it has in place a solid framework and that it can evidence that it really understands its operational risks to qualify. Given the top down pressure to reduce capital, this means that approval is important and hence a good operational risk process is key. The core software systems and their associated risks are at the heart of this."

Basel II is making banks put up capital against ALL underlying risks and 'operational risk' is a new one. This is REGULATORY not voluntary!... The core software systems and their associated risks are at the heart of this.

[7] http://www.bis.org/publ/bcbsca.htm
[8] Sound Practices for the Management and Supervision of Operational Risks, Bank for International Settlements, Feb 2003.

Determining the operational risks associated with core software assets is in many ways the inverse problem of determining their business value as it focuses on answering the question, "What business value do we lose if these assets do not function as expected?" The answer to this question is no longer academic as firms are forced to set aside capital to cover these risks. Answering this question is also not simple. In the words of a CIO, "At one level, if I took away all the PCs on the desks of employees in my organisation, no one would be able to do any work. I could argue that the business value of the PCs is the whole economic activity generated by the organisation. However, you and I know that I cannot sell this to the board. We have to be more sophisticated in analyzing the business risk of our software assets."

Sophisticated risk assessment procedures are based upon a detailed analysis of the relevant business processes. This involves the following steps:

1. **Process mapping:** The key business processes of the organisation are mapped out in terms of tasks performed by people, the role played by software systems and the business outcomes produced (such as customer orders fulfilled etc.).

2. **Value assessment:** The impact of the loss or malfunctioning of a specific software asset on the process outcomes is identified (such as customer orders not fulfilled) and translated into a value measure (such as loss in revenues). Identifying the precise impact of the loss of software on the process outcome can be complex and usually has to be done in close association with the relevant process actors from the business.

A business process analysis-based approach to value assessment is logical and rigorous. However it can be a cumbersome and time consuming task. There is also a range of actions regarding governance and supervisory best practices that have to be implemented in conjunction with the above procedures. A full discussion of these governance-related issues is beyond the scope of this paper.

Using Conjoint Analysis:
A Novel Technique

Research conducted by INSEAD[9] has shown a novel technique has promise in assessing the business value of an organisation's core software assets. The methodology is based upon a time-tested and widely-used robust technique in marketing science known as conjoint analysis.

Conjoint Analysis is a research technique used to measure the trade-offs people make in choosing between products and service providers. It is also used to predict their choices for future products and services. Conjoint Analysis assumes that a product can be "broken down" into its component attributes. For example, a car has attributes such as color, price, size, miles-per-gallon, and model style. Using Conjoint Analysis, the value that individuals place on any product is equivalent to the sum of the utility they derive from all the attributes making up a product. Further, it assumes that the preference for a product and the likelihood to purchase it are in proportion to the utility an individual gains from the product.[10]

There are multiple techniques for conducting conjoint analysis, but in general there are three phases in the analysis of conjoint data: determination of the product attributes and their respective levels, collection of trade-off data through a questionnaire and statistical analysis of the data. In a traditional conjoint analysis application, people make trade-offs across different product attributes. For applying the technique to software assets, the methodology requires people to make trade-offs across different business outcomes associated with the software asset. Let us walk through some parts of the process with a simple example of researching the value of an enterprise resource planning (ERP) software system[11].

Step 1: different business outcome attributes related to the ERP system are identified and different levels are defined for each outcome attribute. For example consider the following three attributes (precise definitions of different levels of Improved Quality and Reduced Errors are not mentioned):

[9] Professors Theodoros Evgeniou and David Weinstein of INSEAD have collaborated on the research on the application of Conjoint Analysis to the assessment of the business value of core software assets.
[10] Description taken from: http://www.populus.com/techpapers/conjoint.php
[11] Example adapted from: http://www.populus.com/techpapers/conjoint.php

	Business Outcome Attributes		
	Expense	Improved Quality	Reduced Errors
Level 1	Low ($1m)	Small	Small
Level 2	Medium ($2m)	Medium	Medium
Level 3	High ($3m)	Large	Large

Step 2: Executives familiar with the software asset and the business outcomes are asked to rank order their preference for different levels within each attribute.

Please rate each of the following aspects of "Reduced Errors" in terms of how desirable they are, assuming that all other aspects are equal.					
	Extremely Undesirable				Extremely Desirable
Small	☐	☐	☐	☐	☐
Medium	☐	☐	☐	☐	☐
Large	☐	☐	☐	☐	☐

Step 3: The same executives are presented with different levels within the same set of business outcome attributes and asked how important the difference in levels is to them.

If two ERP systems were identical in very way, how importance would the difference between the two features shown below be to you?					
Small Reductions in Errors Vs. Large Reductions in Errors					
	Extremely Unimportant				Extremely Important
	☐	☐	☐	☐	☐

Step 4: At this point, data has been collected that indicates which business outcome attributes are more important for the respondents and for each of these attributes, which levels are preferable. In this next step, the responding executives are presented with pairs of ERP profiles (conjoint tasks) and asked to choose amongst them (i.e., reveal their preferences).

If everything else about these two ERP systems were the same, which would you prefer?					
	Low Expense Small Improved Quality Medium Reduced Errors			High Expense Large Improved Quality Medium Reduced Errors	
	Strongly Prefer Left		Indifferent		Strongly Prefer Right
	☐	☐	☐	☐	☐

Step 5: The data collected is processed by special conjoint analysis software. Conjoint analysis applies a complex form of analysis of variance to a respondent's choice task data to calculate a utility for each level of each attribute. These are basically index numbers which measure how valuable or desirable a particular feature is to the respondent. The idea is each respondent's choice tasks reveal something about the relative utility that he or she has for each feature. Features which a respondent is reluctant to give up from one choice task to another are judged to be of higher utility to that respondent than features which are quickly given up. The data output from this step could hypothetically look like the following. The absolute value of the utilities has no inherent meaning. The relative importance of each attribute, for each participant, is determined by calculating the range between the lowest level utility value and the highest level utility value within each attribute. In the following hypothetical example, we can conclude that, on average, there is about five times as much utility to be derived by the difference between the High Expense and Medium Expense as the utility to be derived between Large Improved Quality and Medium Improved Quality.

Expense	Average Utility Value	Utility gain	Improved Quality	Average Utility Value	Utility gain
Low	5		Small	4	
Medium	20	15	Medium	12	8
High	40	20	Large	16	4
	Total	35		Total	12

Step 6: The willingness to pay associated with each business outcome attribute is determined from the relative change in its utility levels as compared to the change in utility levels for the Expense attribute. These figures are then aggregated and processed to yield a figure of the total business value for the ERP system.

Conjoint analysis is the most widely used commercial tool from marketing science. While conjoint analysis has been used typically for deciding between different sets of product attributes (for example, for choosing

between a Lenovo PC with a certain feature set and a Toshiba PC with another feature set), the application of the technique for assessing the business value of software is novel and unique. The success of the application rests upon the conversion of business outcome attributes (such as Reduced Errors) into measures of business value. More research needs to be done on fine tuning Step 6 and validating the results in real business settings. Details of the methodology will be being worked out in the next phase of the research and a tool will be created for use by CIOs and other executives.

Winning with Value:
From Costs to Value

Firms have managed their core software assets by costs alone for far too long. They have taken the easy way out. In the face of relentless business pressures and constant change, top management have focused on new business opportunities and not invested adequate time and effort in assessing and managing a key existing asset – an asset that has been growing over the years and will continue to grow over the next years. This intangible asset, comprising the core software assets of the firm, represents enormous hidden value for the firm. It is time to surface this value. It is time to be aware of and to leverage this value so that the right decisions can be made about managing these assets. It is time to change the language about these assets – from one of cost control to that of value enhancement.

Changing the language about core software assets to one of value will require a change in mindset across the organisation. It will require a different set of questions to be asked about the management of these assets. The relevant questions will be more about how the value of the asset can be enhanced and less so about how can the expenses on them be reduced? Doing so will help the organisation to become more aware of its assets and do the right things to preserve and grow their value. This is very similar to the management of IP or the brand. Once the organisation becomes more aware of its brand value, it can make others (both inside and outside) aware of its value, it can invest more in promoting it and it can ensure that the value does not get degraded by unintended actions.

Enhancing the value of the core software assets will require a strong partnership between line (business) and IT managers. It will increase the support for the technology units from top management. At the same time, it will ratchet up the pressure for performance on CIOs. Technology units will need to possess a good understanding of the business strategy, develop good partnerships with end-users and deliver on promises with the highest level of operational and management excellence. The technology organisation will have to be efficient, responsive and credible in the eyes of the customer – both internal and external.

Being good is no longer good enough. Satisfactory under-performance is not tolerated. Excuses are rarely appreciated. Executives have to deliver results. Organisations have to continuously create value. Doing this is not easy. Costs have to be reduced. Customers have to be delighted. A rapid pace of innovation has to be maintained. People have to be motivated and energized. A focus on value creation has to be sustained on a continuous basis. Doing this is not easy, but it is possible. And this difference separates the winners from the losers.

About the author

Soumitra Dutta is the Roland Berger Chaired Professor of Business and Technology, and Dean of External Relations at INSEAD. He is the faculty director of elab@INSEAD, INSEAD's initiative in building a center of excellence in teaching and research in the digital economy in collaboration with leading international organizations such as Morgan Stanley, SAP, Cisco and Intel.

Prior to joining the faculty of INSEAD in 1989, he was employed with Schlumberger in Japan and General Electric in the USA. Professor Dutta obtained his Ph.D. in computer science and his M.Sc. in business administration from the University of California at Berkeley. He has been a visiting Professor at several international universities including the Haas School of Business (Berkeley) and the Solvay Business School (Brussels).

His current research is on technology strategy and innovation at both corporate and national policy levels. His latest books are "The Global Information Technology Report 2005-2006: Leveraging ICT for Development" (Palgrave, March 2006) and "The Information Society in an Enlarged Europe" (Springer, Feb. 2006). He has authored seven other books including "The Bright Stuff" (Financial Times/Prentice Hall, 2002), "Embracing the Net" (Financial Times, 2001) and "Process Reengineering, Organizational Change and Performance Improvement" (Mc-Graw Hill, 1999). He has won several awards for research and pedagogy including awards for the European Case of the Year from the European Case Clearing House in 1995, 1997, 1998, 2000 and 2002.

He is actively involved in policy development at national and European levels. He is currently a member of the Advisory Committee for ICT for the Government of Qatar and has advised other national governments on ICT policy issues. He is the Chairman of the European Commission's Europe Innova panel on Innovation in the ICT sector and a member of the Steering Committee of eBSN, the European Commission's eBusiness Network initiative for SMEs.

His research has been showcased in the international media such as CNN, CNBC, BBC and international publications. He has taught in and consulted with international corporations across the world. He has directed top management programs for several companies and is a regular contributor to in-house management programs. He is a fellow of the World Economic Forum.

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