

Business Financial Modelling

Framework for Structuring Financial Models

Executive Summary

- Investments are made in the expectation of earning sufficient (risk-adjusted) returns
- Business investment is the direct investment in enterprises that manage resources and assets to produce assets, goods or services
- Business investing can be acquiring an existing business (private equity) or developing a new business (venture capital); it can also be acquiring or developing real estate assets
- The sponsors behind a business investment decision can be an ad-hoc team of entrepreneurs or business developers in a large corporation; the investment decision discipline is similar
- Business investment decisions need to be based on a robust due diligence process carried out by a due diligence team led by a project leader
- A financial model can empower the due diligence process and serve as a tool for a manager's decision making
- A financial modeller should act as a gatekeeper between the due diligence process and the financial model
- Two types of drivers are inputs into models: data and assumptions; an input log keeps track of sources responsible for inputs
- Financial model should be adaptable and user-friendly
- Financial model should be built in modules: input sheets, working sheets (also broken down into three blocks) and output sheets
- Models should allow running different scenarios and sensitivity analysis
- Financial model outputs need to cater to different end-users and be easily used in presentations and reports; good visualization of outputs helps present a project
- Financial modelling skills are developed with experience and an open mind

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1. Introduction

Financial investment is driven by the search for satisfactory returns

A simple definition of a financial investment is to acquire an asset and obtain the future returns associated with that asset. The key is that a rational investor is exchanging cash or assets in the expectation of obtaining in the future sufficient (risk-adjusted) returns as compensation.

Financial investment horizons fluctuate from very short to very long timespans

There are many different types of financial investments and investment horizons. An investor in publicly traded shares may pursue long-term dividend income or look to sell shares at a higher price in the short term. A day trader will seek to sell shares in the same trading session. On the other hand, an investor in a plot of land some distance away from a growing urban sprawl may have a decades-long investment horizon and will see little cash flow if any during the holding period.

Business investment includes developing new businesses or acquiring companies or assets

Some financial investments involve the acquisition or development of a business; managing a mix of assets and resources to produce marketable goods or services. Investing in businesses includes developing innovative new products or services (typically categorized as venture capital), acquiring an existing company where an opportunity for improvement is identified (typically categorized as private equity where the target is a non-publicly traded company or is a publicly traded company that is taken private), or developing or acquiring real estate assets (typically categorized as real estate). Business investing can be driven by an ad-hoc grouping of sponsors or principals or it can be an activity initiated by a multinational corporation that seeks to develop internally or acquire externally a new product or service line. In the case of the multinational, the business will be a division or unit amongst many others in the corporation, but will still need to “stand alone”; that is to justify the resources invested in the business with the returns it generates.

Business investment can be driven by principals who unite for a specific project or it can be initiated by an established company; the principle of sufficient return is the same

Some businesses are created with a known end user, other businesses target a market with the hope of attracting a customer base

Some businesses are developed with a known buyer or end user for the product or asset before a significant investment is made, such as in energy projects where a power purchase agreement is executed upfront or a real estate development where a contract is in place with a future sole or anchor tenant. In these cases the focus is on execution and final delivery of the product as per the specified terms. In other cases the business plan has identified a target market which should find the product or service attractive, but there is uncertainty on the final marketability. An example would be the development of a hotel. Adaptability to the target market is essential in these types of businesses.

A financial model is a feasibility tool and a catalyst for due diligence

When acquiring or developing a business, a good financial model is an essential tool for assessing the financial feasibility of an investment and acts as a catalyst to improve due diligence before deciding on the go-ahead of an investment.

Isthmus Partners has worked closely with clients to develop financial models in many different sectors in order to evaluate business investment opportunities. After many projects we have adopted some consistent modelling practices which we believe add value during the business opportunity vetting process.

This report will be useful for professionals involved in the evaluation of business opportunities in the business development function within

This report is useful for anyone involved in business investing or financing

corporates, in the investment function within private equity or venture capital funds, or as providers of non-equity private capital (debt, mezzanine) to businesses. It will also be useful for entrepreneurs seeking to engage investors and private capital for the development of their business plans.

This report complements previous reports published by Isthmus Partners, available on our website www.isthmuspartners.ae:

Venture Capital. A Pragmatic Approach. January 2010

Modelling and Simulation. World Cup Simulator. April 2010

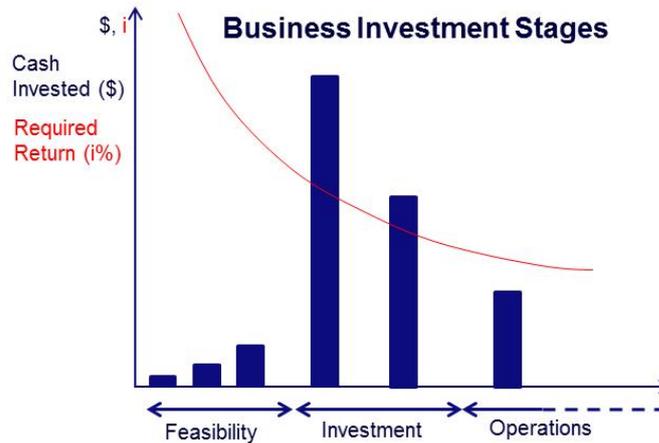
Restructuring in the MENA Region. A Practical Approach. February 2011

2. Business Development Stages

Three stages are a simplification of the investment process

- Feasibility
- Investment
- Operations

The graph below is a simplification of the different stages involved in business development or in the acquisition of a business. The blue columns depict the cash invested in the project at a particular stage, while the red curve depicts that the risk and therefore the required return of the project falls as the project progresses through different stages.



Source: Isthmus Partners

The three stages are:

Feasibility entails cost, analysis and high risk

- (i) **Feasibility.** This stage is the initial assessment of a business opportunity. It can include several sub-stages. Generally the principals start with a concept of a business plan or identify a business target that survives internal decision filters and criteria. With additional time and studies the business opportunity is further defined and developed. Dedicating internal resources and mandating external studies and consultants can imply increasing costs with each sub-stage before the go-ahead decision is made. For new ventures in this stage, the capital that will finance these activities is seed capital, which will require a very high return to compensate for the high risk assumed. For acquisition of existing businesses, the principals must believe in any synergies identified, or marketing economies of scope that will be accretive to the current portfolio of business units.

Investment entails capex or acquiring the business

- (ii) **Investment.** In this stage the go-ahead has been decided and the business is implemented or acquired. Significant capital expenditure can be incurred to acquire assets and operating costs run-up in order to prepare the business for operations.

Operations requires investment in working capital to ramp up the business

- (iii) **Operations.** The business is up and running. The cash invested in this stage depicts the typical working capital effort that is required at the ramp-up of operations. Ideally during operations the business will be self-sustaining but in practice many businesses require further capital injections during the first years of existence until becoming self-sufficient.

Acquisitions also require a feasibility stage and may also require post-acquisition investment

In the case of a straightforward acquisition of an existing company, the investment stage may just be the closing of the acquisition. However, even in an acquisition there is a feasibility stage as the target is identified and vetted through due diligence and the acquisition is formalised. And in many cases the acquisition is complemented with an investment programme that is deemed necessary to fully achieve the business' potential.

Focus on one opportunity means other opportunities lack attention

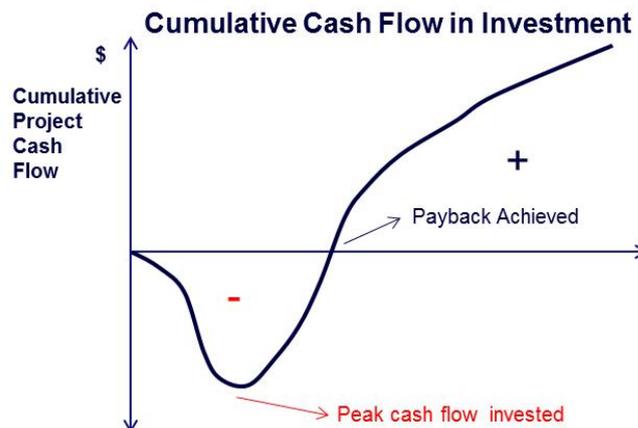
We are focusing here on the financial resources that are employed in the investment process, but in practice the opportunity cost of management's time is a factor to consider. While developing a business opportunity there is limited time to evaluate other opportunities.

The early stages of business development is very risky; as the project is proven, risk diminishes

The idealized declining required return curve depicts the intuitive idea that as a business project progresses through milestones it is less risky. For example, in a mining project first an interesting geological area is identified and a concession is sought. Afterwards, investment in a series of geological surveys and in costly exploratory drilling can confirm whether a mining resource initially appraised as an inferred resource can be re-appraised as a probable or measured reserve, leading to a decision on whether a mine is worth developing and whether to invest large amounts of capex. If there are different equity investors, intuitively the investors in the early seed capital who bear a lot of risk should get a better return than later stage investors. In practice the amount of equity interest that different stage equity investors obtain will depend on each investor's relative bargaining position and ability to negotiate, the evolution of the transaction, the urgency for cash to continue business development (opportunities can expire), etc. It is easy to represent in an idealized curve what in the real world is actually a very complex dynamic.

The returns of different providers of capital depend on a myriad of factors

The following graph is an idealized depiction of the cumulative cash flow invested in a business development project.



Source: Isthmus Partners

As the feasibility, investment and operations stages progress, the investor will have a peak of maximum cash out-of-pocket generally after the start of operations, as operations will need time to ramp up, and customers are attracted to the product or service. Once operations have stabilised and customers have reached a critical mass, the business should start returning cash to the investor until payback is obtained; this is the point in

Decision makers want to know how much total cash will be absorbed by business and how long before payback

The financial model should be built in the feasibility stage and is a tool used throughout the investment process

time when nominal cumulative cash flow in the project is zero. In our experience decision makers pay a lot of attention to the peak negative cash flow (“how much will we be out of pocket?”) and to the time to payback (“when do we get our money back?”).

The financial model should be built during the feasibility stage. If designed and managed correctly the financial model will detail the remaining feasibility, investment and operating stages and will be a useful tool for decision making at successive stages. The financial model will evolve with the business development process and adapt to the lessons emerging from due diligence and execution. Eventually, it will aid budgeting and treasury forecasting at the investor’s CFO level and finally can be employed to monitor the performance of the investment.

3. Integration of Financial Modelling and Due Diligence

A financial model empowers due diligence and is a decision-making tool

A thorough due diligence process should be undertaken when evaluating the decision to pursue the development or acquisition of a business. A financial model if employed correctly is a tool that allows more insightful due diligence and that facilitates key management's decision-making.

Due diligence is a process of questioning and verification

Due diligence is an iterative process of questioning, verification and substantiation of a business opportunity. It is not just about satisfying a list of documents or rubber stamping a previously taken resolution. It is a process, as it involves a sequence of interconnected steps. It is iterative, as the process has to adapt to the on-going discovery and certain issues require constant revisions. It is an art, as there are no fixed rules or manuals about how it is implemented.

There is no "how-to" manual for due diligence

The inputs that are fed into a financial model will, to a varying degree, be subjective or dependent on human judgment. However a sturdy due diligence process can ensure that the inputs are determined in the most objective manner possible.

Financial model specification improves design

Before developing a financial model it is important to specify its purpose. Specification will improve model design: the types of inputs we would be expected to obtain, test and use, and the types of outputs the model is expected to produce. Of course, through the due diligence process, the model's purpose will change and adapt to new information discovered. However, if the purpose of the financial model is to agree with an already taken business decision, then the methodology that we discuss in this report will be superfluous.

Due diligence is about asking questions and getting meaningful answers

Asking the right questions in the due diligence process means asking the right people, finding the right primary and secondary sources, and ensuring that lessons are correctly translated into the financial model. If little effort is spent on ensuring that the inputs into a model are reasonable, robust and consistent then the model will be useless.

Due diligence is a team effort led by a project leader

Due diligence is also generally a group or team effort (team size will depend on the size and complexity of a business). As a process, it is important that at the core of a due diligence team a project leader assumes the project management role. Depending on the characteristics of a business there may be an inner core of people who are involved throughout the process, while there will be an outer core of internal and/or external experts that are brought in to focus on certain technical/business areas or issues, such as tax experts, sector experts, engineers, etc.

One person, the financial modeller, should be responsible for the model

Within a due diligence team one person, the financial modeller, will be directly responsible for the financial model. This does not mean that the financial model is a black box and that the financial modeller is a wizard who magically yanks out the final product. The due diligence team leader and the whole team need to ensure the robustness and consistency of the financial model through the due diligence process. A single financial modeller facilitates the consistency and reliability of the financial model.

Drivers: Data and Assumptions

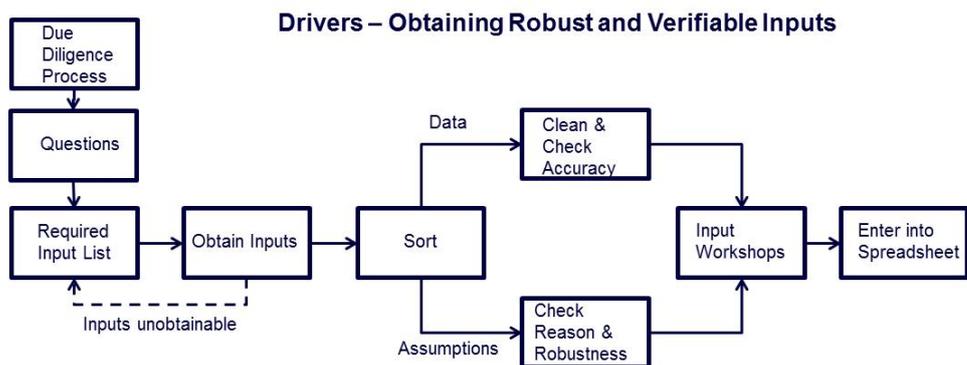
A financial modeller is the gatekeeper between due diligence and the model

Once the due diligence team specifies the financial model, the desired outputs and the required inputs will be assessed. These outputs and inputs will need to adapt to the evolution of the due diligence process. The financial modeller is the gatekeeper between due diligence and the financial model. The modeller is expected to challenge all information providers to ensure the input is reliable, robust and that the source can be verified.

Data are factual inputs; should be checked for accuracy

Drivers can be broken into two broad areas: data and assumptions. Data is a set of information that has a factual base, for example audited accounts that determine beginning balances of ledgers within the model, the tax rate on corporate profits, the number of widgets per hour that a machine is designed to produce or the price list for equipment that will be required for a business. Data should be validated for accuracy. Assumptions are subjective estimates that affect the model, such as forecasted revenue growth rates, market size, the business' market share, marketing budget or the number of employees required. Assumptions should be validated for reasonableness and robustness. The flowchart below depicts the process from due diligence to spreadsheet input.

Assumptions are assumed inputs; should be checked for validity



Source: Isthmus Partners

Workshops on drivers should be held

Data and assumptions testing workshops should be held with relevant internal and/or external experts to fully understand the validity and business logic of the inputs. We recommend the financial modeller maintains an input log confirming the source of data and assumptions. It is good practice that information sources certify their contributions to inputs. Contributors become much more accurate in the data and diligent and conservative in the assumptions when there is a clear audit trail linking them as the source responsible for the inputs.

Build and maintain an input log

Clearly tie inputs to the contributor responsible

4. Structuring the Financial Model

Make the financial model adaptable: use modules

The iterative nature of the due diligence process requires the modeller to adapt a financial model to new circumstances and information. The model should not be built in the quickest way possible. Instead, the modeller should be more concerned about the adaptability of the model, even if that means the model will take longer to initially develop. Adaptability means the model is easy to understand and change, that someone new to the model can easily pick it up. One key way in which this is achieved is to build the model using modules.

Modular programming is used by software developers

Here we can learn from software programmers. Even the simplest software can be incredibly complex programs and run for thousands of lines of code. Without modularity and procedures, programmers would not only be unable to understand other programmers' code, they would most likely forget all the nuances of their own code, making it very difficult to change. To reduce complexity, programmers develop procedures that have specific inputs and outputs and perform certain calculations with those inputs to produce the outputs. In a similar fashion, we can organise financial models to become modular.

Three sheet structure:

- Input
- Working
- Output

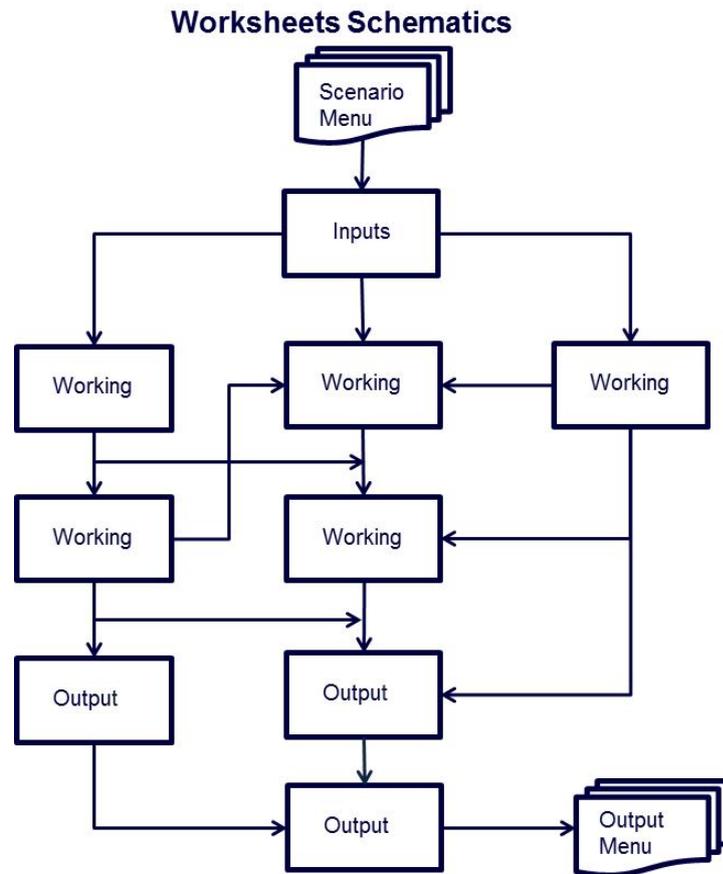
A systematic way to structure the workbook is to divide it into three types of worksheets (we refer to worksheets as "sheets" to make the text easier to follow):

- (i) **Input sheets.** In these sheets all the inputs that impact the model are laid out in a user friendly manner. It is good practice if feasible to only have one input sheet (a master input sheet) and for the input sheet to allow easy selection of different scenarios which are available within that sheet.
- (ii) **Working sheets.** These sheets are also structured into inputs, workings and outputs. Inputs originate from the input sheets and also from direct input blocks within the working sheet (good practice to keep these direct inputs to a minimum).
- (iii) **Output sheets.** These sheets show the results of the modelling in different ways and address the needs of different end users. They should be designed in a format that allows the output to be easily used in presentations and reports on the business. Output sheets pull data from working sheets and other output sheets.

Modular structuring reduces model complexity

Using different types of sheets reduces the complexity of a model. It allows the modeller to concentrate on one part of the business, and ensures that the logic for that part is correctly applied. The complexity in the interconnection will be simplified through the structure itself. It also helps the modeller to build one piece of a model at a time, for instance to focus on PP&E, or financing rather than worry about the financing of the PP&E, whilst building both parts.

The schematic below summarizes the three-sheets-type structure.



Source: Isthmus Partners

Input Sheets

Input sheets feed the inputs into the model

The input sheets contain the inputs that are processed in the workings sheets. If feasible one single master input sheet is preferable, although sometimes the model might be so complex and/or large that it is more manageable to have more than one input sheet.

Input sheets should be user-friendly

The input sheets should be structured in a user-friendly format, as these are the sheets that non-expert end users will most frequently manipulate in order to run different scenarios through the financial model. Headings should be clearly defined and the inputs divided into sections of homogenous areas – sections such as capex, opex, tax, market, debt, etc. Cell commentary and text should be selectively employed to aid the readability of the input sheets.

Divide input sheets into homogeneous sections

It is common practice that the text in input cells is usually formatted with blue font. Avoid using many colours for different cells as this distracts users of the model.

Input sheets should contain all macro-drivers, that is all inputs that the modeller may want to change and of which to understand the impact on the overall model output.

Use the Data Validation and Protect Sheet tools

It is good practice to use the Data Validation tools within Excel to limit the range of values that a particular cell can take or to limit the cell input to a

specified list (overuse of Data Validation tools can lead to slower models). The Protect Sheet tool can be used to ensure the end user can only manipulate specific input cells, while keeping the headings and structure of the inputs intact.

Working Sheets

Working sheets are self-contained units

Each working sheet should be developed in such a way that it is self-contained and that the only linkages from other input or working sheets should be from specially designated input and/or output sections. The working sheets should also be broken into three blocks. Blocks are either designated as input blocks, which we call drivers, blocks in which calculations are performed, which we call working, or output blocks. Each block should be appropriately labelled so any new user can understand straight away the purpose of each block. Generally the driver blocks should be placed with other driver blocks, working blocks with other working blocks and output blocks with other output blocks.

Working sheets should also be broken into three blocks:

- Input
- Working
- Output

Advisable that all inputs flow from input sheets

Drivers can be inputs from the master input sheet, outputs from other working sheets or directly input in the sheet's drivers block. Direct inputs in the working sheets should be used sparsely. For example, the beginning balance of a ledger can be inputted directly if that value is never to change whatever the scenario. We call these direct inputs micro-drivers in contrast with the macro-drivers previously defined.

Working blocks are the engine of the model

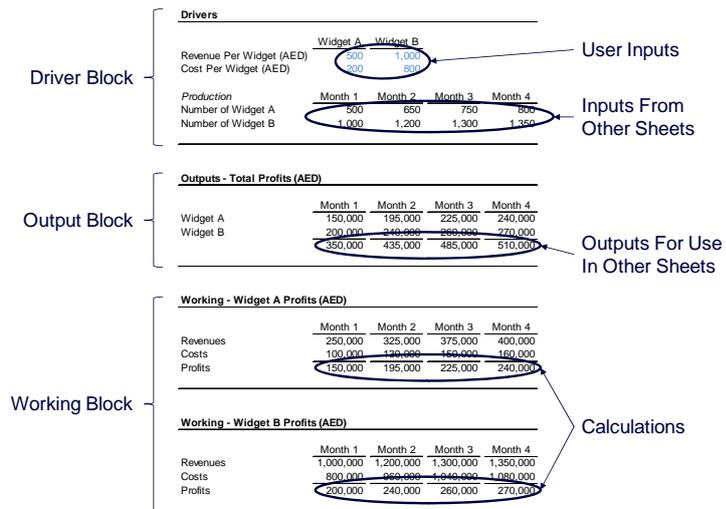
Working blocks use the driver blocks and perform calculations to produce certain outputs. This is much the same as a procedure in a computer program. Inputs to a working block should not come directly from another sheet. They should come via the driver blocks in the same sheet. Amendments to a model will then become much simpler and faster to implement. It is very hard to untangle spreadsheets where formulas in cells within one sheet make reference to cells in other sheets.

Output blocks feed the rest of the model

Output blocks take information from working blocks and display it in an easy to use fashion. This information may serve as an input on other working sheets' driver blocks.

With this system in place, each working sheet is a self-contained unit that can be understood by itself. Sheets can easily be copy/pasted and sent to other due diligence team members for auditing and verification.

Example: Block Structure in Single Sheet



Source: Isthmus Partners

Business logic is contained within the working sheets

The calculations or algorithms of the model are performed in the working sheets. These sheets develop the business logic of the financial model. The complexity of any model derives from the interaction of all the business logic. Some of this business logic drives numbers from one workings sheet to another and then back again. For instance, in the case of a widgets factory, the number of widgets sold may drive the sales, but it will also drive the amount of both human and physical capital required, which in turn drives the amount of financial capital required. The sales people may also be remunerated by the amount of sales they make, so the revenue figures may drive the amount of sales commissions made. In these cases the output from a revenues working sheet will become drivers in certain cost working sheets.

In-built checks should verify the results of the model

The working sheets should be built in order to allow checks to be carried out on the results of the model. There are some natural financial checks, for instance the balance sheet should balance. However, the modeller should put in some other checks that have to be defined and monitored; for instance the cash on the balance sheet should never be negative.

Output Worksheets

Keep the outputs separate from the working sheets

Finally, we have the output sheets. It is tempting to simply tack on the outputs to the end of working sheets, especially as all the information is contained in the working sheets. Nevertheless, there are a number of good reasons not to do this. First, different end users want to see the outputs in different ways. Keeping outputs separate ensures that when a different view of the model's outputs is provided, the workings are left intact. Second, as models become more complex and more rows are used in each working sheet, keeping outputs separate will make it easier to identify the real engine of the model if any changes are to be made later. Third, it ensures that the modular design is held throughout the model.

Many output sheets can be produced

In our experience with clients who discover the usefulness of powerful financial models there is no limit to the number of outputs that may be requested. Once the input and working sheets are put in place many

The outputs should be tailored to different end users

different output sheets can be added to the financial model without hindrance. The format and content of any output sheet will depend on the end user of a particular output. Decision makers may focus on decision criteria such as Net Present Value (NPV), Internal Rate of Returns (IRR), payback period, etc. Mezzanine or senior debt providers will be interested in debt coverage ratios such as Interest Coverage Ratio (ICR), Debt Service Coverage Ratio (DSCR) and the relationships between forecasted EBITDA and debt amounts. Accountants will want to know the projected financial statements of the business. Treasurers will want to be able to forecast treasury requirements of the business.

Allow for modelling the impact of seasonality

In our experience we have usually modelled workings on a month by month basis. This allows a modeller to project the impact of seasonality drivers on business forecasts and to be able to assess the related fluctuations of working capital. For example, in a hotel business there may be peak, mid and low seasons in terms of occupation and average dollars per room (ADR), which would impact RevPAR (revenue per average room). Modelling this hotel business just on a year by year basis would not allow detailed assessment of working capital changes. Some of our output worksheets will also be on a month by month basis, but then it is easy to add output sheets on a year by year basis which are user friendly and useful for presentation purposes.

Outputs can be made on a different calendar basis

Financial Outputs



Source: Isthmus Partners

Financial outputs include standard accounting reports

The chart above depicts the financial outputs that we typically include in financial modelling. The Profit & Loss, Balance Sheet and Cash Flow statements are standard accounting reports familiar to any financial controller. The Cash Flow Statement is useful in understanding the investment requirements during the feasibility, investment and initial operational stages of the project and how the investment is going to be funded. For example if the output shows that senior debt will also be obtained then the end user can start challenging the assumptions on when and how much senior debt would be available. With only a quick review of the output, an end user is able to start asking important questions. In our experience controllers and/or members of the CFO's team at the investor play a crucial role in vetting investment opportunities. With unstructured financial models a lot of time can be spent just on understanding and trusting the model, which delays the investment process. With a concise financial outputs package and a robust financial model these reviewers can quickly overcome their hesitance and delve into understanding the opportunity and the drivers underpinning the

The Cash Flow Statement enables investors to quickly see the cash generative ability of a business

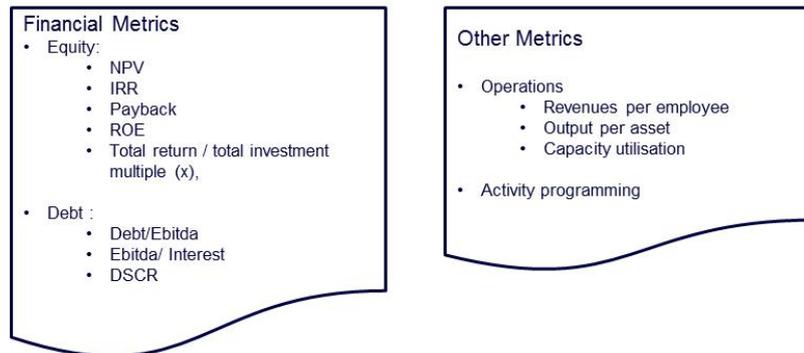
Corporate controllers are a key constituency to address during business vetting

output.

Sources and uses are an intuitive representation of where cash flows are originated and used

The Sources and Uses output is a non-standard accounting report and directly summarizes direct cash inflows (sources) and cash outflows (uses). In our experience the Sources and Uses is a very useful tool for decision makers and certain end users not familiar with accounting.

Output Metrics



Source: Isthmus Partners

Academia focuses on NPV at the “right” discount rate

The chart above is illustrative of other output metrics that may be required depending on the financial model specifications. Financial academic literature focuses on NPV as the relevant decision criterion. From the financial outputs it is straightforward to estimate free cash flow to equity (FCFE) and free cash flow to the firm (FCFF), which should be discounted at the required return for equity and at the WACC, respectively. The discount rate should reflect the risk of the business opportunity and there is raft of techniques to estimate the discount rates. In practice, many end users use the discount rate applicable to the investor rather than the investment opportunity or use a standard internal hurdle rate for all projects. This may lead to underestimating the risk in highly volatile projects and overestimating the risk in conservative projects.

In practice decision makers focus on IRR, payback and a multiple of the investment made

In our experience most end users focus on IRR (which has to be sufficiently high), payback (time it takes to get nominal cash flows back) and/or a multiple of the original investment. It is best to provide a raft of criteria and let the end users decide, but we insist on NPV as the key criterion.

A key assumption is the exit value of the business – should be scrutinized carefully

An important aspect of these financial metrics is that they reveal the assumptions of the exit value of a business. In most cases, business ownership is not projected to last forever producing a steady stream of cash flows; rather it is very typical to assume an exit after stabilization of the business. Examples of exit assumptions are cap rates (for real estate), multiple of EBITDA (to estimate exit enterprise value) and multiple of profit (to estimate exit equity value). These terminal value assumptions can have a sizeable impact on financial metrics and should be carefully scrutinized and challenged by decision makers.

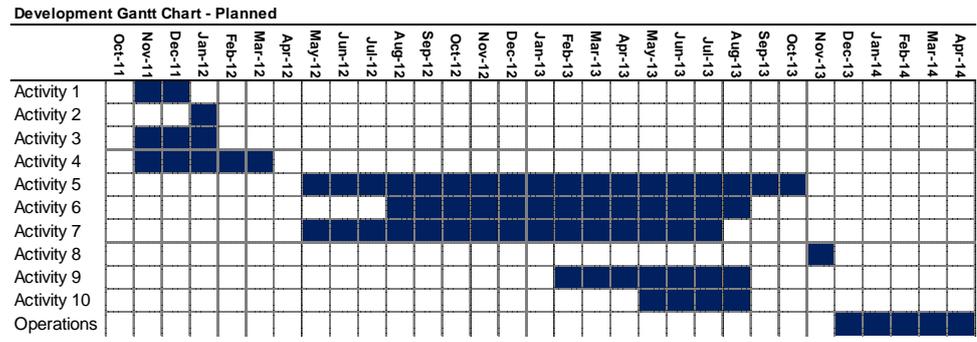
More powerful financial models allow running different scenarios easily

It is recommendable to create a financial model that allows running different scenarios. In this case it is advisable to produce some of the output sheets so that the outputs of different scenarios can easily be compared head to head. In these cases, graphic visualizations are

particularly useful as the output can become cumbersome and hard to decipher.

Making the programming of activities visual through a Gantt chart allows decision makers to test assumptions of timing

Another useful output of the financial model is to depict the Gantt chart for the activities that are assumed to take place during the feasibility and investment stages leading to operations. This is useful for presentation purposes and also allows the decision makers to quickly visualize the assumptions pertaining to the programming of activities. The timings may be too aggressive and/or crucial activities may have been overlooked.



Source: Isthmus Partners

5. Sensitivities and Scenarios

Sensitivity analysis studies the impact of changes of an input variable on outputs

A financial model with well-structured and diverse outputs will hopefully aid in answering the questions asked about the business opportunity. Some of the questions may pertain to the impact on certain outputs of changes in one input variable or of changes on a narrow combination of input variables. This would be sensitivity analysis.

Design sensitivity factors to facilitate sensitivity analysis

To facilitate sensitivity analysis, it is good practice to include in the input sheets a section of sensitivity factors that directly affect other inputs. For ease, these sensitivity factors can be expressed as an index percentage, with a base value of 100%. For example the price at which a product is assumed to be sold is an input. If that price assumption is linked to a sensitivity factor then it is easy to know the impact on IRR (output) of a 10% increase or decrease in the assumed price.

It is not good practice to include sensitivity factors for every input. The modeller should only model the sensitivity of critical inputs that are likely to be scrutinized by end users to understand their impact on outputs.

Data Tables allow one or bi-dimensional sensitivity analysis

The Data Table is a useful tool in Excel for sensitivity analysis. It can be one dimensional, showing the results of a certain output considering a range of different values for one input variable. It can be two dimensional, showing the results of a certain output to different combinations of values of two input variables. Though these sensitivity analyses are very informative, they are also very addictive, and modellers should not start producing sensitivity tables for the sake of it, not least because they slow down spreadsheets.

Use Data Tables wisely as they slow the model down

Scenarios are combinations of inputs

Scenarios are just different combinations of inputs that have associated different outputs. Typically there will be a scenario which is considered by the due diligence team the most likely to occur, referred to as the base scenario. If the input sheet has sensitivity factors, the easiest way to build other scenarios off the base scenario is to change the sensitivity factors and review the updated outputs. For example an end user may want to run a scenario where the market share is 10% larger and the price of the product is 10% higher. In other cases the scenarios may be so different that it is not enough to just change sensitivity factors, as numerous inputs may change.

Frequently a central scenario is the "base scenario"

Scenario analysis is related to sensitivity analysis

Turbo charge the model: make it possible to choose between different scenarios

When developing scenarios, several variables may have various inputs. A combination of these inputs will make up one scenario. Obviously only one scenario can run through a model at a time. This will be the 'live range', which will be selected by the end user. The model will need a mechanism embedded that allows users to move from one scenario to another easily (the 'Choose' function enables this). In the output sheets it is advisable to have some outputs designed to that the outputs of different scenarios can be compared head to head.

Outputs should allow comparison of different scenarios

Typical to have a range of scenarios from pessimistic to optimistic

It is typical to run a base scenario together with pessimistic and optimistic scenarios, or five scenarios running the range from very pessimistic to very optimistic. In our experience, decision makers want to know what kind of scenario is the breakeven scenario, which would be roughly profit (in an accounting sense) neutral.

“What-if” scenario analysis allows preparation for bad outcomes

Scenario analysis enables decisions on maintaining optionality

Scenario analysis allows running stressed scenarios that assume negative combinations of inputs or shocks. This is “what-if” analysis.

Scenarios also provide a practical way to value real options. For instance, building a plant with excess capacity would be a higher cost but may allow investors to quickly benefit from a positive evolution of the business and to avoid more costly future expansions of capacity. Scenario analysis allows the decision makers to consider the business opportunity beyond just the base scenario, to factor in both the potential negative and positive outcomes of the business.

6. Recommended Practices in Financial Modelling

When a person is new to modelling with spreadsheets, there is a temptation to impress colleagues by building models with cells populated by the most complex calculations imaginable. This is linked to the urge to have the shortest model possible and to build the model quickly, to be “efficient”. As the modeller acquires more experience, the emphasis shifts to simplicity, adaptability and end-user friendliness. One of the authors once heard the following from a non-sophisticated reviewer who was disappointed once he understood the underlying simplicity driving the financial model: “this is not a model; this is just a highly glorified spreadsheet.”

We hope that readers of this report understand that simplicity in financial modelling is hard. It requires consistency, discipline, good practice, integration with the due diligence process and time. Financial modelling does not just require spreadsheet skills; it also involves knowledge of accounting, finance, strategy, process, etc.

We recommend modellers to always listen to their clients. In every project that we have undertaken we have internalized valuable lessons from client teams. Financial modelling is a skill that should be continuously improved.

In the table below we lay out some recommended practices in financial modelling that derive from our experience. This list of practices is by no means exhaustive. They are just a sample of practices that we hope readers find useful.

Topic	Description
<ul style="list-style-type: none"> Model Use / Use of Templates 	<ul style="list-style-type: none"> It is very tempting to use a financial model built for another business as a template for a new model Avoid this practice if possible; this will limit the adaptability of the new model and may inherit errors from the template model
<ul style="list-style-type: none"> Model Use / Use of Name Manager 	<ul style="list-style-type: none"> With a well-structured financial model cell naming is not as useful as in an unstructured model Use sparingly when warranted We find naming ranges of outputs to be useful in the manipulation of outputs
<ul style="list-style-type: none"> Model Use / Protect Cells 	<ul style="list-style-type: none"> It is good practice to lock all cells in the workbook except the input cells; locked cells cannot be changed by users This can be done using the Protect Sheet tool in Excel and de-locking the input cells When selecting the tool make sure you allow the users to “Format columns”; this allows users to expand columns which are too narrow to show the value in a cell and avoids annoying the end user Make sure you do not lose the password needed to remove the Protect Sheet facility
<ul style="list-style-type: none"> Model Inputs / Example Inputs 	<ul style="list-style-type: none"> Never release a financial model version with “example” or illustrative inputs just to show how the model works This is tempting when the modeller is waiting for inputs from the due diligence team but wants to show that the financial model is advancing In our experience, this release can take a life of its own; users assume that the inputs have been verified and this can lead to wrong conclusions and mistrust in the model; be careful with “anchoring” of inputs in end users’ minds

Topic	Description
<ul style="list-style-type: none"> ▪ Model Inputs / Input Log 	<ul style="list-style-type: none"> ▪ Prepare and maintain inputs log while the financial model is being developed, otherwise details will be lost ▪ Entries into the inputs log should be confirmed by the relevant internal or external experts ▪ The inputs log should be released to the whole due diligence team for review; this is the most accessible way to present the business logic within the model without having to review the model cell by cell ▪ To aid traceability, the inputs log should be built with the same modules as the model, for example each working sheet should be reflected in the inputs log
<ul style="list-style-type: none"> ▪ Model Inputs / Data and Assumptions Detail 	<ul style="list-style-type: none"> ▪ Data and assumptions should be broken into constituent parts ▪ For example, if an employee's salary is USD 3,000 + 30% benefits, do not input USD 3,900 as the employee cost. Break down the input between salary and benefits; in this manner information that had been obtained during due diligence is not lost in the financial model ▪ Allows easier auditing of inputs
<ul style="list-style-type: none"> ▪ Model Inputs / Data Validation 	<ul style="list-style-type: none"> ▪ The Data Validation tool allows the modeller to narrow the range of values that can be input ▪ It can be implemented through a list of possible values or specifying the range of values ▪ This tool is very useful to avoid input mistakes; an error message can be added to handle users trying to input out-of-range values
<ul style="list-style-type: none"> ▪ Model Workings / Use of VBA 	<ul style="list-style-type: none"> ▪ Avoid VBA when the calculations can be done within the spreadsheet ▪ VBA for most users is difficult to understand ▪ We use VBA to automate procedures that would otherwise be carried out manually; particularly this is linked to the manipulation of outputs
<ul style="list-style-type: none"> ▪ Model Workings / Use of Ledgers 	<ul style="list-style-type: none"> ▪ Use ledgers to formalize calculations of model variables that start each period with a beginning balance, change in the period, and finish with an ending balance <ul style="list-style-type: none"> - Start ledger with beginning balance - Perform all the changes to the model variable clearly set out in the ledger (may interact with other ledgers) - End ledger with ending balance ▪ Example of model variables amenable to ledger modelling are inventory, debt balances, accounts receivables, etc.

Topic	Description
<ul style="list-style-type: none"> ▪ Model Workings / Dividends & Equity 	<ul style="list-style-type: none"> ▪ In a business, earnings are either retained (added to Retained Earnings balance) or paid out as dividends to shareholders; it is common to model dividends as the sole cash flow that is paid to equity investors ▪ Dividends depend not only on earnings but also available cash ▪ Be careful with the “equity trap”; if the only cash flow to equity investors is dividends, and dividends are capped by retained earnings, then for a long term project (for example a project finance transaction) cash will be retained within the business equivalent to the equity invested in the business; the cash will be “trapped” and this will reduce the estimated IRR of the project <ul style="list-style-type: none"> - Make explicit in the model assumptions of return of equity as the business evolves; for instance, maybe it is assumed that excess cash will flow upstream to the parent company as intercompany debt – the key is to make these assumptions explicit so that they can be subject to due diligence - This will tie to due diligence: what will be tax treatment of the equity returned? How will returns of equity be decided and executed? Are these assumptions consistent with debt covenants?
<ul style="list-style-type: none"> ▪ Model Outputs / Output Totals 	<ul style="list-style-type: none"> ▪ In the output sheets include total columns for all the forecasted period
<ul style="list-style-type: none"> ▪ Model Outputs / Visualization 	<ul style="list-style-type: none"> ▪ Many end users have a hard time relating to numbers, but can quickly grasp good visualizations of the output ▪ Visualizations should have clear headings and be easy to understand ▪ Be creative in visualizations; output can be represented in many intuitive ways; a good visualization is worth a thousand words
<ul style="list-style-type: none"> ▪ Model Outputs / Cash Flow Statement 	<ul style="list-style-type: none"> ▪ If the financial model assumes the sale of an asset in the future (for example part of a real estate development), in the Cash Flow Statement, Cash Flow from Investments should include the carried net book value of the disposed assets, while the capital appreciation (or depreciation) of the sale will be accounted for in Cash Flow from Operations ▪ It is a very common error to forget the previous step
<ul style="list-style-type: none"> ▪ Model Outputs / Scenarios 	<ul style="list-style-type: none"> ▪ If the model enables different scenarios make sure the output allows to directly compare the results of different scenarios ▪ Visualization in these comparisons is key ▪ Can be a very powerful tool for decision making
<ul style="list-style-type: none"> ▪ Model Outputs / Output Summary 	<ul style="list-style-type: none"> ▪ For ease of use it is advisable to express outputs in thousands (000's) or millions ▪ When this is done the output tables / graphs should clearly specify the basis of the numbers within the tables

Topic	Description
<ul style="list-style-type: none"> ▪ Model Archiving / Folders 	<ul style="list-style-type: none"> ▪ Use discipline in keeping correct folder structures and processes for archiving and version control ▪ Each model should be kept in its own folder, especially if it is in a shared folder where password protection may also be necessary ▪ Archives of different versions of the model allow modellers to track which changes were made, sections that were either added or deleted; it allows modellers to go back and restarts from a previous version if the model has entered a dead end, or if the model 'refs out' ▪ The financial modeller is responsible for version control and identifying successive versions; if outputs of the model are used in a presentation, a reference in the presentation to the version of the model the outputs are sourced from will enable the modeller to track the historic reasoning behind the numbers ▪ Work with IT Administration to ensure robust archive back-up processes; back-ups are the copies of the model that are kept in case the model is lost, corrupted, accidentally deleted, etc.
<ul style="list-style-type: none"> ▪ Model Archiving / Encryption 	<ul style="list-style-type: none"> ▪ Financial models can contain very sensitive information that the due diligence team will want to protect with encryption ▪ Excel offers the utility of password protection to access a file; this password protection can be broken down by hackers ▪ Work with the IT Administration to ensure robust encryption applications and procedures are employed
<ul style="list-style-type: none"> ▪ Model Formatting / Style 	<ul style="list-style-type: none"> ▪ Formatting style should be kept consistent within the model ▪ Do not use different cell formats to represent inputs, workings and outputs; it can distract users ▪ Standard practice is to use a blue font for inputs and black font for all other cells <ul style="list-style-type: none"> - Exceptions can be made; for instance, to use the Conditional Formatting tool to highlight cell values that have an unacceptable value (such as a negative cash balance) ▪ The use of a cell (input, working, output) should be easily known from clear structuring of the model, not from colour formatting
<ul style="list-style-type: none"> ▪ Model Formatting / Number Formatting 	<ul style="list-style-type: none"> ▪ Numbering format should be consistent throughout the model ▪ Be consistent in the use of decimals, otherwise it can be misleading and distracting ▪ Use the Custom Number Format wisely; it can aid readability of the model and make it appear more professional ▪ Be careful with calculations that use values in cells that use different number formats (for example percentages and whole numbers)
<ul style="list-style-type: none"> ▪ Model Review / Links 	<ul style="list-style-type: none"> ▪ Before releasing a final version, ensure there are no links from the financial model to other workbooks ▪ The financial model should be a standalone unit without connections to external sources
<ul style="list-style-type: none"> ▪ Model Review / Print Ranges 	<ul style="list-style-type: none"> ▪ Before releasing a version make sure all worksheets within the model are printer friendly <ul style="list-style-type: none"> - Print range has been determined - Print setup ensures easy to read print output

Topic	Description
<ul style="list-style-type: none"> ▪ Model Review / Checks 	<ul style="list-style-type: none"> ▪ There are never enough check and balances in the model; build checks that warn if a cell has a value that is out of bounds or if amounts that should balance are imbalanced ▪ Be creative; learn from past errors, they have a habit of repeating themselves
<ul style="list-style-type: none"> ▪ Model Review / Changes Log 	<ul style="list-style-type: none"> ▪ It is recommendable for the financial modeller to keep a change log of substantial changes to the financial model in successive versions ▪ A change log should include relevant information about the change, date of change, rationale for change and the people who authorize the change ▪ Requires discipline and time ▪ During the due diligence process a focus of management is understanding changes to the model; a change log helps reduce time spent on this issue and avoid misunderstandings
<ul style="list-style-type: none"> ▪ Model Review / FAQ Log 	<ul style="list-style-type: none"> ▪ In a complex and long due diligence process the financial modeller will learn that different end users ask similar questions ▪ Maintaining a frequently asked questions log helps the due diligence team with internal reporting of the project and on preparing presentations
<ul style="list-style-type: none"> ▪ Model Review / Show Formulas 	<ul style="list-style-type: none"> ▪ Before releasing the final model use the Show Formulas tool to be able to review the spreadsheet seeing the formulas within each cell instead of the cell's values ▪ This simple review of formulas can reveal discrepancies that have been overlooked

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