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The introduction of a new biomedical technology: A system dynamics approach to the business plan

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ABSTRACT

Technologically orientated companies may have directors and board members who have engineering training but limited financial training. Clearly, it is essential for the functioning of such a company, that these individuals have a clear grasp of the financial processes. Engineers generally have a thought process that is guided by a systems approach to problem solving. This project explores the possibility of using system dynamics methodology to present the financial statements in parallel with the traditional spreadsheet approach typically used by people with financial training. The study is performed by examining the business case for a South African biomedical start-up company which is in the process of developing a device to locate a healthy vein for venepuncture. Extensive data obtained from market research, as well as a business plan in spreadsheet format is available and has been utilised in this project.

A system dynamics model of the business plan is developed. First it is shown that the system dynamics model is accurate and produces output that corresponds with the financial statements on the spreadsheet – a minimum requirement. Following this, simulations are run in which sales projections are varied with the goal of finding the minimum viable number of sales that need to be made in order to keep cash flows positive. The effects of optimising stock production are analysed and a sensitivity simulation is performed in which 49 variations of different local and international sales projections are calculated and their results analysed.

It is argued, based on the findings, that a system dynamics model of the financial statements is valuable not only because of the ability to do multiple simulations and sensitivity analysis, but also because it provides a visual perspective of the financial statements in a format that is familiar to engineers with systems training. This enables a more intuitive understanding of the relationship between the income statement, cash flow statement and balance sheet, which is invaluable for technical, but non-financially trained managers and staff.

Finally it is shown that the system dynamics model displays the dependencies of elements in the model that are hidden from the eye in a spreadsheet. This facilitates an enhanced understanding of the model and more importantly, ensures that when the model is edited, these dependencies are kept in mind thereby ensuring that the changes made maintain the veracity of the model.

This work demonstrates that the functionality of the system dynamics environment is able to capture all the relevant features that are present in the spreadsheet model, while achieving the representational advantages discussed above. It is anticipated that this approach will facilitate mutual understanding between people trained in engineering and technology and those with a purely financial background, thus facilitating the business processes in technologically orientated companies.