

**FUELING INNOVATION FOR MEDICAL DEVICES: AN INTERACTIVE MARKET
VISUALIZATION STUDIO FOR RAPID ASSESSMENT OF HEALTHCARE OPPORTUNITIES**

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ABSTRACT

An essential component of innovation for medical devices is a comprehensive market sizing assessment. This evaluation is useful for creating a solid business case and understanding market potential. This project involves the development of an online medical information dashboard for rapid market sizing assessments using business intelligence tools. A Spotfire front end was paired with a robust SQL database with market information. A visually appealing, simple, and clickable user interface was developed. This tool is designed with the technologist in mind and has value in the early prototyping stages of innovative new medical therapies.

Keywords: market assessment, healthcare, Spotfire, data visualization

1. INTRODUCTION

Innovation in medical devices relies on providing clinical and economic benefit for patients and, most importantly, fulfilling an unmet clinical need. An essential part of the assessment of these opportunities requires a good understanding of the indicated patient pool. This evaluation helps in estimating the market potential for a new business, product, or service. The tool described in this manuscript allows for rapid assessment of a market size in terms of the indicated patient pool. It is designed to be used by a technically oriented audience.

2. MATERIALS AND METHODS

This dashboard was designed by carefully considering the needs of a technical audience. The dashboard was then developed using Spotfire business intelligence tools.

2.1 Voice of Customer Interviews

Four sets of voice of customer (VOC) interviews were conducted with individuals involved with medical device design. These individuals had an average of 18.3 years of experience with scientific research or engineering, and no formal marketing experience. The initial question probed their need for market research and their familiarity with other sources of information for patient populations. An early prototype was shown, and feedback was received.

2.2 Dashboard Development

This dashboard contains 15 years of historical market development data that is housed in a centralized database. The information extracted from an SQL Server database transformed with identifying and understanding business hierarchy (ie the type of therapy, medical indication, etc.), mapping it with the appropriate human body component, and finally labeling the information.

Data transformation was accomplished by extracting data from the SQL server, transforming it using stored procedures, and loading in Spotfire (Tibco Inc., Palo Alto, CA) for data analytics. This dashboard was developed behind a firewall established by a supportive IT department. Hence the Spotfire server is accessible a single sign on (SSO) corporate login to maintain data privacy. Multi-layer security was established using SSO and virtual private networks when appropriate. Thus, this Spotfire server access has been developed for data confidentiality.

In the process of data transformation, data labeling was done using VOC interviews from subject matter experts. Some of the businesses refer to multiple human body parts hence grouping of therapies to label a human body part is most

crucial part of the data mapping. This data mapping step was essential for a clickable interface.

As a part of data cleaning, data has been formatted such as percentages vs. decimals or currency formatting. Missing data has been imputed by nearest neighbor averages, interpolation, or logical business rules (years since launch, market share uptake, market adoption curves, etc.). Since this dashboard has historical data and graphs show data over the time, data was validated using sanity checks that check for reasonable inputs within an expected range.

As a part of data validation, market data is corroborated with external data sources such as World Health Organization disease level data, or comparison of disease indication with overall disease prevalence, or (when available) comparison of industry standard prevalence numbers vs. computed (selling price multiplied by units sold), part of the sanity check. Human body parts mapped with available therapies with market development data such as market penetration, industry revenue, patients served, company share over the time using different graphs have been presented in this dashboard.

3. RESULTS AND DISCUSSION

Multiple sets of interviews with prototype dashboards resulted in prolific feedback about user interface design and the format of the required data. Users preferred an interface that was clean and simple as compared to complex formats with many options for visualization. The utilization of filter panels led to an efficient drill down method for selecting various parameters such as fiscal years of concern, clinical indication, etc.

Through the VOC process, the authors were able to ascertain how technical audiences preferred to visualize data. For example, tabular data with multiple aspects of market information (market penetration, revenue, patients served, geographies, etc.) was preferred over using visualization aides such as dynamic squares or complex color coding. Furthermore, a visually appealing starting image for selecting a disease state (i.e. pancreas/diabetes or heart/cardiac disease) was appreciated.

A clickable, user friendly interface was developed with Spotfire. The human infographic dashboard drives the story telling for interested business. By clicking interested human body components (Figure 1), dashboard will be filtered to required data and visualize the data to represent business revenue, penetration, market revenues and patients served. The line charts show revenues and patient served changes over the time. It is easy to compare changes over the same period. Geographical map (Figure 2) which is a choropleth map where regions are colored in relation to market penetration. This is useful to visualize penetration and how it changes across defined regions.

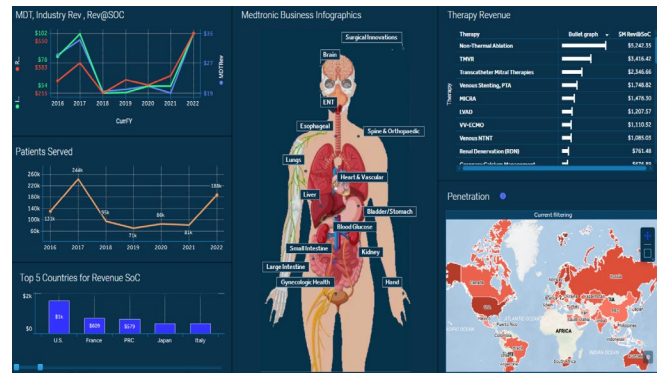


FIGURE 1: MEDICAL INFORMATICS DASHBOARD.

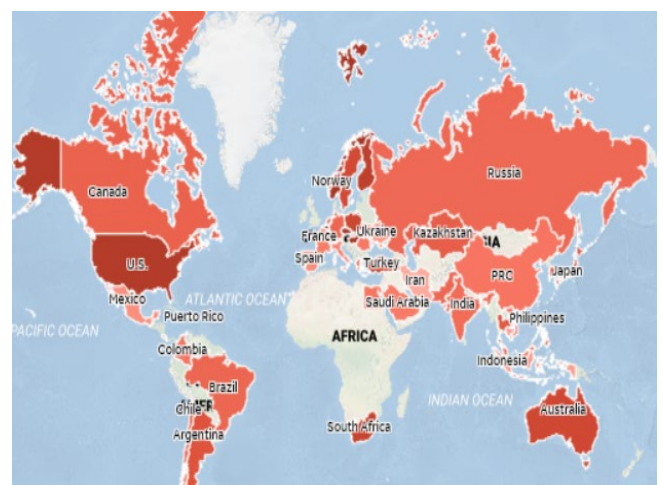


FIGURE 2: COLORIZED VISUALIZATION ON WORLDWIDE MARKET PENETRATION.

Market sizing is a crucial step in building a solid business case for medical innovations. This assessment aides in properly assessing the return that the market can offer.

Sizing is indeed critical, but infographic sizing is takes things to another level. First it allows one to understand who can benefit from a scientific basis--quickly. Often industry yields to the promise of sales numbers or historical treatments instead of identifying those who can truly benefit epidemiologically. The information in this tool's infographic data takes the more scientific, epidemiologic approach. Second, it is important to visualize that benefit. Visualization is tangible and leads teams to a shared sense of reality so that teams may collaborate with more alignment. Finally, that alignment leads to more enhanced actionability where teams often further segment or create action plans to appropriately treat populations in need.

4. CONCLUSION

This dashboard enables a technical user to perform storytelling with data and describe a technical innovation in a compelling manner. This method allows for rapid distillation of market information that marries technical innovation to inspirational ideas.

REFERENCES

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