

MediReason

Accuracy In Healthcare

December 6, 2011



Mantra: Better healthcare, every step of the way.

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Executive Summary

As an industry, healthcare information technology (IT) is projected to have a worldwide market capitalization of \$162 billion by 2015 [1]. Despite this, the healthcare industry has been on the trailing end of IT adoption. The saturation and use of IT toward improving patient care are minimal, but steadily improving [1, 2]. This is not surprising: new medical IT must be vetted and physicians are hesitant to invest in new and often expensive technologies [3]. Those that have invested in IT are often left to fend for themselves in a heterogeneous environment [B.5.4] with manual processes that do not inter-operate well [B.5.4], thus adding unnecessary challenges to an already complex workflow.

Despite its apparent challenges, there is good reason to adopt medical IT: decision support software can help physicians make better diagnostic decisions [4–6]. Better diagnostic decisions are sorely needed: approximately 56% of patients suffer from misdiagnoses [4]. Clearly, IT has its place in medical practice, and the slow but increasing rates of IT adoption [1] are evidence that an innovative solution is needed. The healthcare industry needs a solution, which is stand-alone, intuitive, interactive, expands with usage, and fits into existing medical workflows. The key success factors for such a solution are its ability to increase administrative and clinical efficiencies, reduce operational costs, and improve the quality of healthcare [Problem Description, Business Case].

While preventing bad diagnostic decisions is a challenge, this does not solve the whole problem. Misdiagnoses are a specific instance of a more general problem: correctly routing patients to the right tests, specialized physicians (hereafter specialists), and treatments, and ensuring that stakeholders along a patient's treatment path are communicating. There are several large organizations that are already helping physicians to make better diagnostic decisions; however, their products are not in widespread use [6.2] and do not address all aspects of the patient routing problem [Competition, Competitor Breakdowns].

Large organizations like Nuance, Siemens, GE healthcare, and Philips are trying to solve the patient routing problem. Their products impose a workflow on specialists and provide the specialists with guidance, advice, and medical best practices to support their diagnosis of a patient. These organizations are well-established and dominant market players that provide enterprise-level solutions to large hospitals. Medicalis, on the other hand, is a relatively new player in the market and targets medium-sized healthcare providers. Clearly, these organizations do not address the needs of small healthcare providers and family physicians (FPs), and so there is an under-served customer segment in the marketplace for decision support tools. For example, in Ontario alone, the healthcare system is heavily dependent on FPs and requisition-based diagnoses. This highlights an opportunity to use decision support and feedback from specialists to help FPs and nurses make better decisions in terms of requesting patient diagnostics tests and routing patients to specialists [Competition, Competitor Breakdowns].

The Patient Diagnostic Support system (PDS) runs as stand-alone software or as an Internet-based application [2.4] that requires minimal existing IT infrastructure. PDS provides FPs, residents, and nurses with guidance, advice, and medical best practices to support their diagnosis of a patient. PDS records the decisions made by caregivers and allows for later parties, such as specialists, to update a patient's record and contribute to the decision database of and communicate with the original caregivers [Product Description].

PDS targets small- to medium- scale operations in organizations of any size ¹ [4.2]. For small-scale operations, PDS is primarily an intelligent diagnosis support tool used by FPs to make better diagnostic decisions when treating patients. For medium- to large-size organizations, PDS is used primarily by nurses and/or residents and offers the same level of decision support but focuses on addressing the problem of communication and patient routing between nurses and specialists. Specialists are incidental users of the system: they have access to patient records regardless of if the specialists are associated with paying customers. PDS is an affordable, non-enterprise decision support solution for FPs, clinics, and hospitals that connects "front-line"

¹The scale of an operation is distinct from organization size insofar as PDS for a small-sized organization operates at that organization's scale (i.e. small-scale), but the scale of operations for a large-sized organization such as a hospital is proportional to the number of nurses admitting new patients (i.e. medium-scale).

caregivers with later stage specialists for validation and feedback for use in future diagnostic decisions [[Product Description](#)].

Our primary customers are FPs, average- to large-sized urban hospitals, and clinics. In the first stages of operation, PDS will be marketed and sold directly to FPs and clinics operating in Toronto [[4.2.1, Marketing Strategy](#)]. Toronto FPs are usually self-employed, are partnered with a group of FPs, belong to clinics, or operate out of hospitals. Our secondary customers are Toronto hospitals. These customers are influenced by insurance companies, the Ontario government, and their CIOs/IT steering committees [[4.3.1](#)]. The next scale of operations include expansions to the rest of Canada and after that, North America. In this scale of operations, our primary customers are North American hospitals and our primary influencers are large insurance companies [[4.3.4](#)].

In the first six months of operations, we will develop a minimum viable product (MVP) at a cost of approximately \$170,000. The development costs of the MVP includes programmer effort, user experience research, user interface design, amalgamation of a database of illnesses by independent researchers, assessment of our database by specialists, and product testing and research. After initial development is completed, early adopters will be offered a two-month free trial period of the PDS MVP. In this time, we will gain valuable feedback toward improving the product offering. As our business expands and more revenue streams become available, the product will be translated into multiple languages, expanded, and we will seek out key partnerships with medical research organizations such as Elsevier. Similar to our phased approach with our customer segments, we will engage in a research and development cycle that makes PDS ready for use by hospital nurses [[Product Development Roadmap and Plan](#)].

We will seek four different types of investment: sweat equity, owner's investment, angel investment, and government investment. In the first four quarters, the founding members will invest their time and skills in the form of sweat equity. At the end of the fourth quarter, the founding members will earn their first (reduced) salaries. During this time period, the founding members will personally invest \$65,000 of seed funding toward the development of the MVP. Government funding through the NRC-IRAP program will provide further funding for R&D, which is projected to exceed \$850,000 in the first five years of operations. Angel seed investments will be required beginning from the second quarter of year one in order to maintain a positive cash flow. This funding will total to \$215,000 and will be distributed over a period of four quarters in tranches of \$105,000, \$70,000, \$30,000, and \$10,000, respectively. The return on investment for angel investors will be ten times their initial investment amounts and is subject to liquidation by the end of the fourth year in business. We hope to exit by merging with or being acquired by a competitor. Should this prove infeasible, our fall-back strategy would be to file an initial public offering [[Investment Types](#)].

Our target users are FPs, hospital nurses admitting new patients, residents, and specialists. We expect that PDS will make FPs and hospital nurses more productive and misdiagnose fewer patients. As a result, PDS has the potential to save FPs \$14,000 per year in lost productivity and hospitals \$1,600,000 per year in under-utilization of assets, inefficient routing and communications, and medical malpractice lawsuits [7] [[Business Case](#)]. Our standard annual fee per FP is \$2,000 and for an average-sized hospitals is \$50,000, saving each \$4,000 and \$110,000 per year, respectively. With the expectation of a 5% to 10% market share in each stage of expansion, and by targeting Toronto-based FPs first, we forecast revenues of approximately \$200,000 in our first year of operations [[Customer Segments, Financial Plan](#)]. Further expansions in the medium- to long-run will include FPs and major hospitals in Ontario, Canada, and then in North America, projecting annual revenues of approximately \$100 million in our fifth year of operations.

PDS is an affordable, stand-alone product that provides the aforementioned users with much-needed decision support tools and new communication channels. PDS saves FPs and hospitals money by reducing the number of misdiagnoses through intelligent decision support and by reducing the number of recurring misdiagnoses caused by communication failures. The intuitive and adaptive interface of PDS, as well as its opt-in policy of usage, allows it to seamlessly fit into the workflows of FPs, residents, and nurses. By virtue of being easily accessible, PDS reports spread by means of direct FP referrals, by inclusion in patient medical records, or by patients themselves to all caregivers along a patient's treatment path. All of these stakeholders can benefit from the information provided by PDS and its reports, thus reducing administrative inefficiencies and operational costs, and improving patient care.

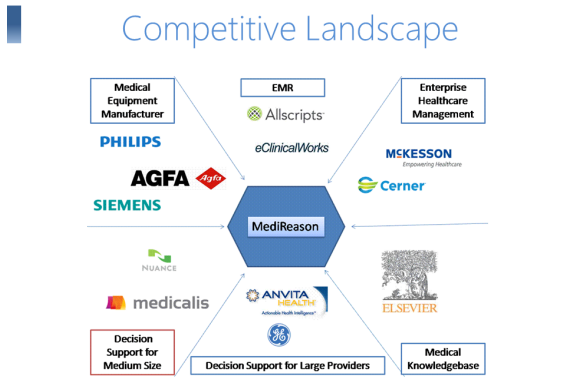
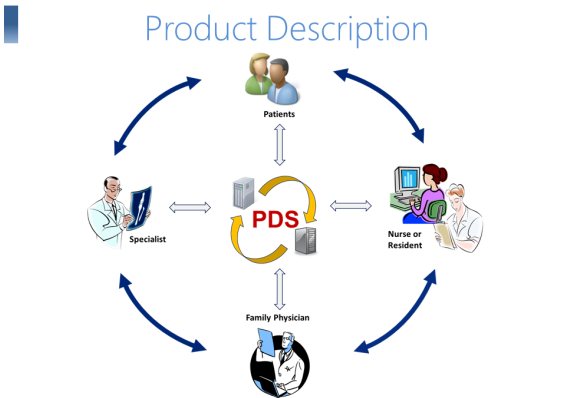
Presentation Slides

APPROXIMATELY 56% OF PATIENTS ARE MISDIAGNOSED

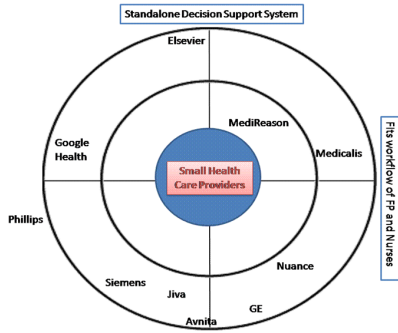
TECHNOLOGY CAN SOLVE THIS PROBLEM

ONLY 21% OF HEALTHCARE PROVIDERS USE TECHNOLOGY

OPPORTUNITY TO LEAD IN A MARKET WORTH \$20B



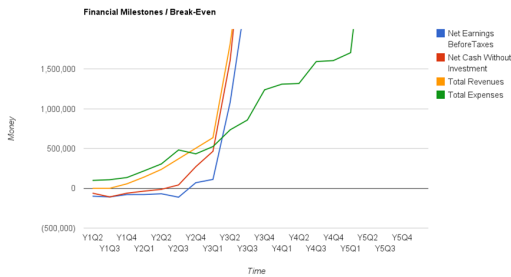
Product Differentiation



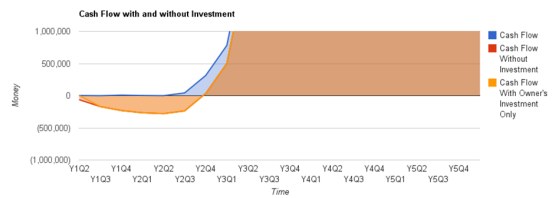
Revenue Model

- Doctors pay ≈ \$2,000 / year
- Hospitals pay ≈ \$50,000 / year
- Founding members will collectively invest \$65,000
- Angel investors will seed a total of \$215,000 over four quarters in tranches of \$105,000, \$70,000, \$30,000 and \$10,000.
- The return on the investment is tenfold and to be paid out in the fourth year in business

Financial Projections



Cash Flow



What We Need

- Offering 6% equity for investment of \$1 million
- Investment covers R&D costs

Who Are We

- Ashish Kaila
- Adnan Hoque
- Edy Garfinkel
- Peter Goodman
- Javed Siddique
- Utkarsh Roy

Who Are We Looking For










- Person of influence
- Researchers
- Medical consultants
- Legal consultants

Summary

- There is a need
- We have a solution
- Strong team
- Your expertise

Business Model Canvas

The Business Model Canvas

<p>Key Partners</p>  <p>Strong relationships are built with product champions and early adopters who will be proponents of the product. Such individuals will be FPs who have a vested interest in the use of the product. Further relationships with hospital CIOs and steering committees who have the power to affect change. Future partnerships with Elsevier.</p>	<p>Key Activities</p>  <p>Strong focus on the needs of customers in order to refine the products, maintaining high rank contacts in the medical field to further build the product information base thus ensuring proper maintenance of the information server for effective and timely results.</p>	<p>Value Proposition</p>  <p>To leverage new and existing information technology in order to best make use of the immense pool of medical knowledge to aid in the decrease of misdiagnoses in patients, increase exchange of information efficiency and to allow storage of patient diagnoses decision history. With decreased misdiagnoses, more patients can be given quality healthcare while reducing costs associated to inefficiencies in routing patients incorrectly. Hospitals, doctors, patients and the healthcare system will greatly benefit as a whole while increasing efficiencies and accuracy in medical care.</p>	<p>Customer Relationships</p>  <p>Research and development is performed continuously while receiving feedback on the product from regular users in order to ensure satisfaction is met. With feedback received, the product will go into various phases of evolution to ensure it meets the demands of our users.</p>	<p>Customer Segments</p>  <p>Short term customers are publicly and privately remunerated physicians in Toronto with a credible certification. Interest is directed towards those that employ traditional paper-based record keeping solutions and those also working in treating hospital inpatients. Aim is set to a demographic more accustomed to technology. Medium-term customers include physicians in Ontario and the rest of Canada along with major hospitals, targeting nurses and front-line caregivers. Long-run customers include physicians and hospitals in North America.</p>
<p>Key Resources</p>  <p>User interface designers, computer programmers, influential director, panel of researchers, marketing team.</p>	<p>Channels</p>  <p>Market maker: Internet domain hosting sites as sellers/resellers to customers. Transporter: DSL/wireless networks backbone of distribution.</p>	<p>Revenue Streams</p>  <p>Doctors and hospitals are charged a flat annual rate for subscriptions. Major improvements to the core framework will involve a charge to customers. Steady increase in price over years to keep up with inflation.</p>	<p>Cost Structure</p>  <p>The values of the company are reflected in a value-driven cost structure by providing the best possible results for healthcare providers, frontline caregivers and patients.</p>	

1 Problem Description

1.1 Background

Currently the Canadian healthcare system does not employ patient diagnostic feedback and decision support systems on a non-enterprise level. As well, all existing decision support systems are only used by specialists, not nurses. Nurses and FPs who work in smaller scale organizations cannot afford such expensive enterprise level systems. Big companies such as GE and Siemens are indirect competitors to PDS as indicated in the competitive analysis section, however, their products are enterprise solutions, which strictly dependent on EHS systems.

1.2 Problem and Solution

Small to medium-sized healthcare organizations are under-served by decision support systems providers such as Nuance, Philips and GE. We will serve this market segment by providing an affordable decision support system (PDS), which does not require large scale enterprise medical solutions to its FPs and nurses. PDS fits well into health care organizations' diagnostic workflow. The system enables faster, more accurate diagnosis and it helps clinics and hospitals best optimize their resources.

Current requisition-based diagnosis system do not communicate feedback from specialists back to FPs and nurses to help them make better future diagnostic decisions. PDS fills this gap by recording any discrepancies between the recorded diagnosis and the correct diagnosis as per the specialist's opinion. PDS feeds this information back to the specialist's referring base's private PDS knowledge base, thereby making the system a dynamic self-learning tool.

This rich knowledge base can then assist clinics and hospitals to improve their efficiency in the following aspects:

- Nurses at clinics can not only record objective and subjective patient data, but also infer possible diagnosis information prior to patients' interaction with FPs.
- FPs can improve the efficiency of their interactions with patients by analyzing the narrowed down list of possible diagnosis suggestions rather than re-observing previously recorded patient data.
- Nurses in hospitals can also follow the same workflow as clinical nurses to obtain diagnosis support information for patients. This is useful toward making better patient routing decisions, i.e. sending a patient to the correct department or specialist for treatment.
- Specialists can validate the diagnosis and send this information back to the FPs, nurses, and the PDS knowledge base to help FPs and nurses make better decisions in the future.
- FPs can see more patients due to the reduced number of unnecessary patient revisits resulting from misdiagnoses.

1.3 A View of the Future

From 1993/1994 to 2001/2002, the absolute number of FPs has stayed relatively constant, but an increasing population has led to a decline in the number of physicians per capita [8]. For example, the number of licensed physicians in Ontario has increased by 20% since 2000 [9]; however, the number of doctors per person in Ontario has remained relatively constant [10].

This situation requires that FPs and specialists must either increase their efficiency or get more assistance in order to cope with the increasing number of patients. Approximately one-quarter to one-third of all visits to FPs are of low-acuity and can potentially be dealt with by a non-physician healthcare provider, such as a nurse practitioner [8]. A shift toward increasing nurses' roles in making diagnostic decisions will help alleviate this situation. Nevertheless, we still need to increase the productivity and efficiency of FPs and specialists in order to handle the increasing number of patients. By targeting both FPs and nurses early on we think that we will be positioned as a key player in future of healthcare.

The quality of FP practice has been and is project to continue to be in decline. Decreased participation in emergency room, obstetrics, and inpatient care suggests that FPs are becoming increasingly disconnected from the hospital environment. Clearly, more communication and better tools are needed to keep FPs in touch with best practices and with specialists.

2 Product Description

2.1 Description

PDS is a web-based application that provides physicians, nurses, and residents guidance, advice, and medical best practices to support their diagnoses of patients. Its also acts as a communication medium that increases information sharing between FPs/nurses and specialists, thus contributing to both better patient care and the product's knowledge base and capabilities.

PDS will use a medical database, data analytics algorithms (illustrated below), and feedback from specialists to validate the appropriateness of a FP's/nurse's diagnosis of a patient. Users of PDS will be able to contribute to the product's knowledge base by identifying and inputting key medical questions or answers to medical questions if not already suggested by PDS. This user input allows the product to grow, but more importantly, it ensures that PDS reports are comprehensive and outline the full thought process that led to a patient's diagnosis. As such, a PDS report acts as a justification for why a patient was referred to a specialist.

The value added is two-fold. First, the specialist is able to offer better patient care through the comprehensive report. Second, if the specialist determines the patient was misdiagnosed, then the he/she can identify the error more quickly and fill in the missing "thought" component that the referring base can use in future to not make the same mistake.

Overall this is a technology product but also a service, offering diagnosis data analytics support and workflow support towards providing appropriate triaging of patients with supporting medical content.

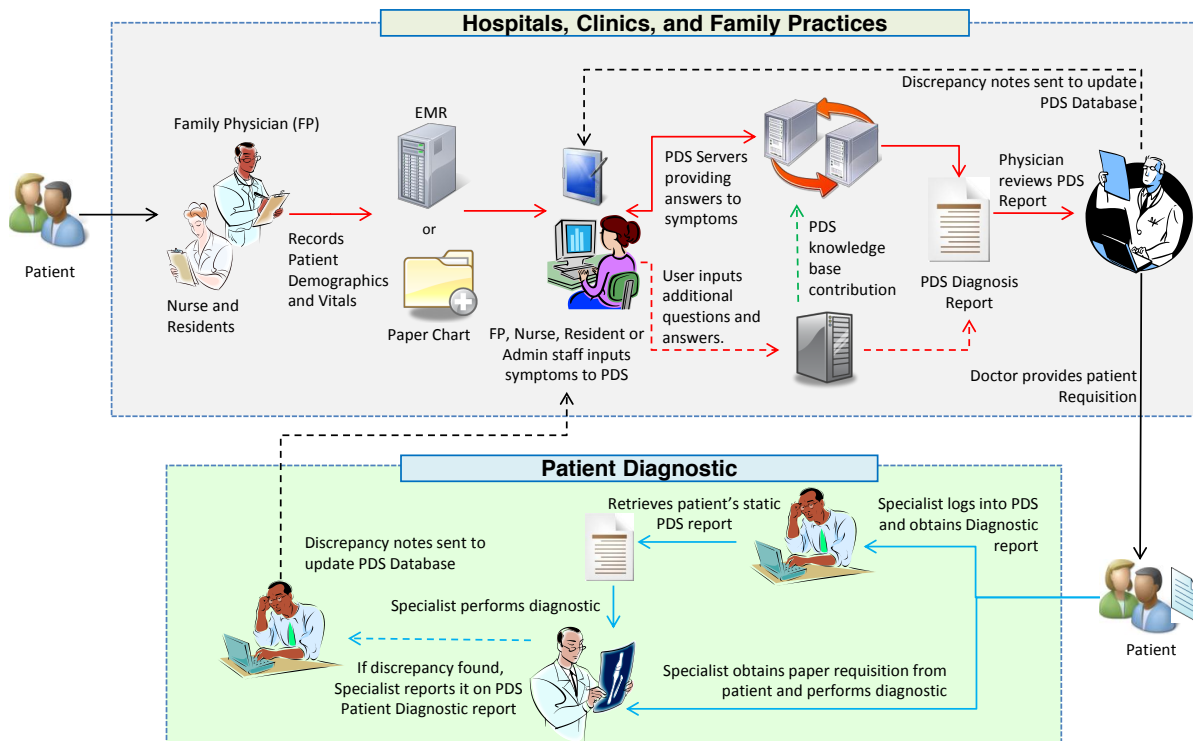
2.2 Users

PDS is primarily used by FPs, nurses, and residents when diagnosing new patients and incidentally used by specialists. As the first points of contact for patients, FPs, and residents and/or nurses are seen in family practices/clinics and hospitals, respectively. As later points of contact, specialists/hospital physicians have access to view and append to the PDS reports and PDS database, but not change any of the original information. Specialists need not be associated with paying customers of MediReason.

2.3 Workflow

The following diagram shows a patient centric workflow and the usability of PDS by the aforementioned users:

Figure 1: PDS Product Usability Workflow



After supplying the PDS system with a patient's demographics and symptoms, PDS will present its users with a series of questions and known answers to those questions (solid red line). If a question is missing and if that question is relevant to the diagnosis then the user can add in that question to a "mirror" of PDS database specific to the user and supply one or more "known" answers to that question (dotted red line, dotted green line). The user then engages in a dialogue with the patient, asking them questions, and selecting/inserting their answers in the PDS system. Through this process, PDS will attempt to predict valid diagnoses and supply the FP with questions whose answers would either validate or invalidate PDS's predictions.

If PDS detects that a user is diagnosing a patient in a similar way to a previous patient, and if that previous patient was misdiagnosed and that misdiagnosis was caught by a specialist, then the user will be made aware of this so that they are less likely to repeat the same misdiagnosis (dotted black line).

If PDS detects that a user is diagnosing many patients in a similar way, e.g. a FP often treats the flu, then PDS will provide a "fast path" for diagnosing patients of this type. This feature is meant to incentivize the

use of PDS for cases where a diagnosis might be “trivial” but the extra cost of using PDS is tiny compared to its benefit.

Once the PDS Diagnostics Report is provided by the system, there are two physician specific workflows based on the domain the patient visited: Family Practice/Clinic: the FP verifies his own diagnosis of the patient against the PDS report. Walk-in Clinic and/or Hospital: the Nurse or Resident will retain the report on the computer or provide a paper copy to the physician for validation and/or review.

Upon review by a physician, two actions may occur: The physician provides the diagnostic requisition to the patient to perform relevant tests and visit a specialist. The requisition form will also contain an ‘Encounter ID’ which uniquely identifies the patient’s encounter with the user who created the report. This allows any later updates to the report to be visible by the creator of the report. The physician identifies a discrepancy in the PDS diagnostic report and makes a PDS knowledge base contribution (dotted black line). The physician may also choose to perform action 1 above.

If/when patient visits a specialist then the specialist can access the PDS report by means of the report’s Encounter ID. This encounter ID can come from the patient, from an EMR/EHR, or by telephone/email from the referring base. If the specialist, upon review of the report, concludes that the patient was correctly referred to them then the specialist can validate the report with a single click. If the patient was incorrectly referred to them then the specialist can submit comments/questions back to the referring base. This would trigger the appropriate action by the user to have the patient come back for re-examination and/or contribute the specialist comments to the PDS knowledge base.

The process of specialists validating the diagnoses/decisions of their referring users, and of users using the feedback from specialists provides increased confidence over time for the user-generated input to the PDS database. When a certain level of confidence for user-generated content is reached then that content is formally reviewed by experts for proper inclusion into the base PDS database (converting a dotted red line into a solid red line).

In summary, the described usability workflow offers the physicians diagnosis support and the ability to contribute to the product growth. In a hospital or walk-in clinic setting, physicians further benefit by having nurses and residents perform the diagnosis and have the report ready beforehand allowing the physician to provide a quick evaluation rather than a comprehensive one, which promotes efficiency. The physician will further benefit by obtaining support for better patient care leading to reduced patient visits and hence reduced operational costs. Furthermore, the sharing of information amongst nurses, residents, physicians, and specialists through PDS for each patient promotes a common communication medium and encourages the growth of the medical knowledge base community while also improving the product’s effectiveness and exposure.

2.4 Technical Description and Design

PDS will be provided both as a thin layer of software communication with a web-based back-end or as a standalone and secure web-based application accessible using an Internet browser. The product will not require integration into a proprietary system; however, future implementations will have the option to integrate into an EMR/EHR if present.

Each user will be provided with unique log-in credentials to access the system. Users do not need to re-log-in to the system each time that they see a patient. The user interface will be self-explanatory and simple to use.

The core PDS platform will operate on MediReason-owned or leased servers. The specific technology platform for each server will be determined at a later time. The goal, however, is to ensure that the product is developed based on established standards and is interoperable with other technologies as to allow for future integration with EHR systems.

3 Product Development Roadmap and Plan

3.1 Product Development Strategy

Software development will follow the agile methodology. Groups of developers will take ownership of tasks (features, maintenance, bugs, etc.), develop/finalize those tasks, and then demo them to product stakeholders. The demos will allow for feedback, potentially resulting in a change in an existing task or new tasks. Several iterations of this process will result in the completion of milestones, where the software will be ready for alpha and beta testers. When all milestones have been reached, a new version of the software will be released. The following outlines milestones that must be reached in order to release a new version of the software:

Requirements Product managers and market researchers will engage customers and identify a product's requirements. A product's specifications and scope will be defined in terms of the requirements, and must be agreed upon by managers, developers, and testers in order to move forward.

Prototyping Developers will prototype the product from its specifications as a means of measuring the feasibility of the different aspects of the product. Prototypes will motivate the design, architecture, and testability of the final product.

Quality Prototypes will be updated or remade as necessary in order to meet the product's specifications. Various different testing methodologies will be used in order to ensure the quality and robustness of the final implementations.

Release A final version of the product will be compiled after rigorous internal and stakeholder testing. Once a release is published, all further feature requests and bugs will be formally recorded and associated with the latest product version. The release milestone will be followed by alpha and beta releases of the software for testing in the field.

3.2 Product Development Roadmap

The PDS product roadmap is defined in terms of short- and long-term market segments and the scale of those markets. The following table outlines the deliverables for each market segment.

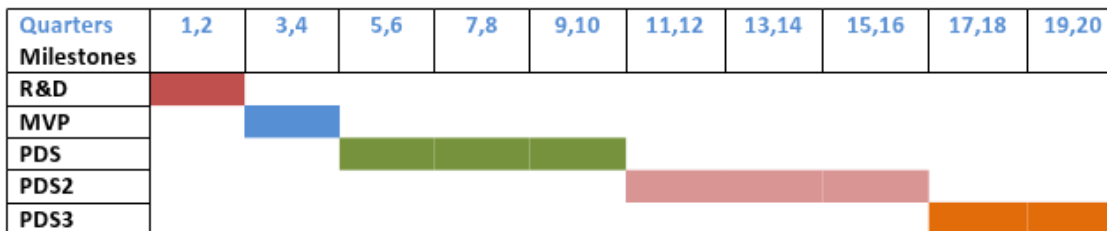
Deliverables	Market	Goals
R&D	N/A (Y1Q1)	<ul style="list-style-type: none"> • Employ independent researchers to compile static decision database of 200 to 500 common illnesses/diseases. • Employ physicians and consultants to guide product development and verify illness decisions. • Begin development of the MVP which makes use of the static decision database. • Find low-cost storage and server solutions. • Pursue universities, medical associations, and research groups as potential partners.

Deliverables	Market	Goals
MVP	Toronto FPs (Y1Q3)	<ul style="list-style-type: none"> • Release MVP for beta testing and early adopters. • Pursue marketing channels.
PDS	Toronto FPs, Hospitals (Y2Q1) All Fps and Hospitals in Ontario (Y2Q2)	<ul style="list-style-type: none"> • Extend static decision trees by introducing AI and machine learning concepts. • Perform side-by-side comparison and analysis of static decision tree servers and AI powered decision tree servers. • Channel specialists' feedback from hospitals and clinics into the knowledge-base. • Beta release of PDS in Y2Q2. • Stabilization period followed full release of version 1.0.
PDS2	All FPs and Hospitals in Canada (Y3Q3)	<ul style="list-style-type: none"> • Country wide sales and marketing push. • Complete migration from static to AI decision trees. • Engineering enhancements for service scalability. • Beta website with new user experience and role based security. • Stabilization period followed full release of version 2.0.

Deliverables	Market	Goals
PDS3	All FPs and Hospitals in Canada and U.S. (Y5Q1)	<ul style="list-style-type: none"> • Expansion of operations into the U.S. • Establish partnerships with insurance companies, major health networks, medical associations, medical equipment / diagnostic machinery manufacturers, and EMR/EHR manufacturers. • Release native PDS apps on tablets and mobile devices. • Developer API to be released for custom system integration. • Distributed/decentralized decision servers to store partial decision trees. • Query enhancements leveraging map-reduce or similar distributed algorithms for result set integration. • Stabilization period followed by full release of version 3.0.

Figure 2 illustrates the timeline of the above product milestones.

Figure 2: Product Milestones



3.3 Resource Requirements

The following sections outline how resource requirements will change with new product milestones.

3.3.1 Technological Resources

Common server infrastructure During the first year of operations, little infrastructure will be required. However, as we target new markets and release new products, we will require an increasingly complex server infrastructure. This infrastructure must be able to handle such things as load-balancing, redundancy, analytics, decision support, etc. When our needs exceed our internal capacity, we will seek the services of programs such as Amazon EC2 or Rackspace because of their ability to provide more hardware on short notice.

PDS decision service The PDS MVP will depend on a static decision database. However, this approach is necessarily limited. As such, our decision service will require upgrades as we reach new milestones. These upgrades coincide with increases in the number of back-end developers and medical researchers that will be employed by MediReason.

PDS knowledge-base The PDS knowledge-base must always be growing. We expect that we will eventually need to partner with Elsevier in order to further expand our knowledge-base.

3.3.2 Human Resources

Influential Director We will employ an influential director from the beginning, and another two for when we enter the U.S. market. The role of the influential director is to attract media attention, potential investors, potential customers, and medical associations. Influential directors will be persons of authority in the medical community. We will align with such people as a means of legitimizing our products and services.

IT Professionals IT Professionals will be responsible for setting up and maintaining the IT infrastructure of the company. IT professionals must have strong systems and networking backgrounds. One of the founding members of MediReason will be an IT professional. Each time a new market is entered, we will employ two additional IT professionals, with the exception that we will employ eight additional IT professionals when we enter the U.S. market.

Back-end Developers Back-end developers will work closely with IT professionals and will be responsible for developing and maintaining MediReason's decision support software, databases, and tools. Two of MediReason's founders will be back-end developers. Each time a product is release, we will hire an additional two back-end developers. Typical additional back-end developers will be graduate and Ph.D students with expertise in AI and machine learning.

Front-end Developers Front-end developers will sometimes work with back-end developers and will be responsible for developing and maintaining MediReason's website, along with the user-facing side of the PDS software. One of MediReason's founders will be a front-end developer, and a new front-end developer will be hired when we enter the U.S. market.

Marketing Manager Marketing managers will be responsible for developing and enacting MediReason's marketing strategy and for pursuing strategic partnerships. One of MediReason's founders will be a Canadian marketing manager. Each time a new market is entered, we will employ two additional Canadian marketing managers. When a new product is launched, we will employ an additional Canadian marketing manager. When we enter the U.S. market, we will employ four additional marketing managers specifically for targeting the U.S. market. Marketing managers will be hired for their ability to market our product to one specific market (e.g. FPs/hospitals in Toronto, Ontario, Eastern Canada, Western Canada, U.S., etc.).

Product Manager The product manager will collaborate with the marketing managers and development teams to determine product scopes and to prepare product specifications based on market research. The product manager will also be responsible for coordination between development, IT, and testing groups. One of the founding members will be MediReason's sole product manager.

Sales Representative Sales representatives (sales reps) and will be responsible for generating sales leads, following up with potential customers, and collaborating with marketing managers to close deals with the customers. On entering new markets, we will employ two additional Canadian sales reps. When entering the U.S. market, we will employ four sales reps specific to the U.S.. Sales representatives will be hired for their ability to sell our product to one specific market.

Consulting Researchers Consulting researchers will populate the PDS knowledge-base with medical diagnostic decision trees. Typical consulting researchers include medical grad students, medical residents, and nurse practitioners. We will employ ten researchers for two weeks each year. As we move from

static to dynamic decision support, their roles will shift from that of populating a database to rigorously testing the AI and reviewing specialist feedback for inclusion into the primary database.

Consulting Physicians Consulting physicians will validate the diagnostic decision trees of the consulting researchers, provide mock diagnoses for developers to work with for prototyping the database, and consult on the workflow of PDS. We will employ two consulting physicians for two working weeks each year.

3.3.3 External Resources

IT Ticketing Manages the lifetime of IT issues filed by customers, internal staff, and operations. The IT team shall collaborate with ticket filers to resolve issues and mark them appropriately within the system. Frequent issues will motivate the (re)allocation of personnel to mitigate risk factors in the software.

Payroll With an increased workforce, a payroll system is necessary to automate payroll.

E-Commerce Allows receipt of online payments by customers for service subscriptions.

CRM Help in the management and response to customer queries and act as a first point of contact for troubleshooting issues related to the PDS service, subscription, billing, and other related issues.

IP Lawyers PDS will require assistance of a legal team to ensure protection of its intellectual property. A contract shall be extended to an outside council for this purpose, which will interact with developers to identify product novelties and file appropriate IDF drafts and patents.

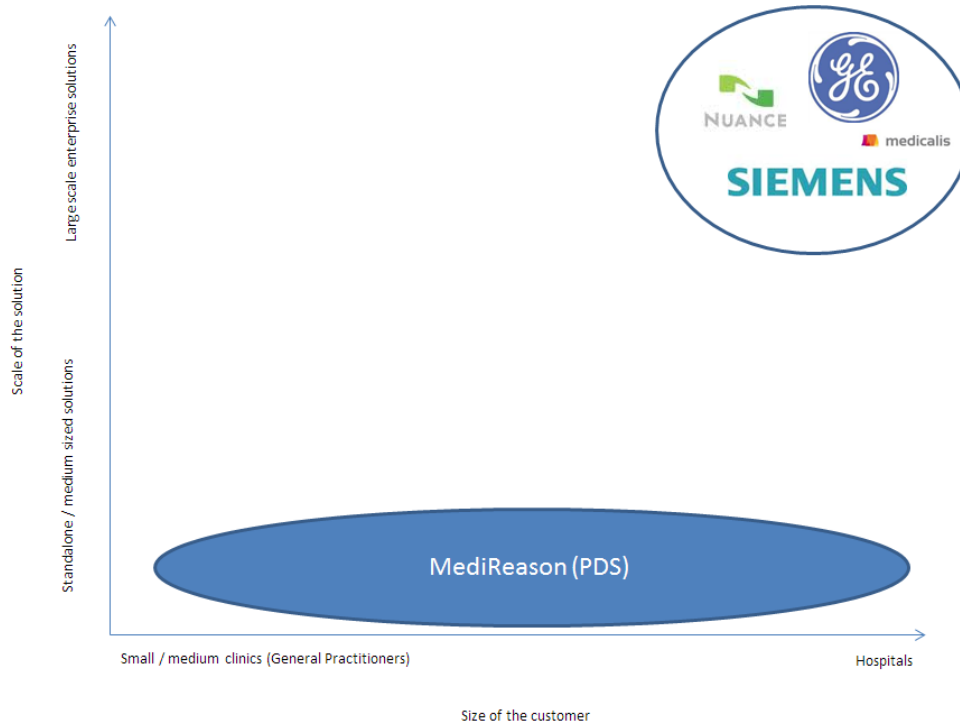
Medical Lawyers PDS will require assistance of a legal team to ensure protection against medical malpractice lawsuits. A contract shall be extended to an outside council for this purpose.

Lobbyists In the long-run, it might be favorable to employ lobbyists to influence political decisions in our favor.

4 Customer Segments

4.1 Marketplace

Figure 3: Map of Marketplace



The figure above highlights the map of the marketplace where the key differentiating factors include:

- the size of the customer.
- the scale of the solution.

In the short-term, PDS targets small- to medium-sized clinics and practices. These are where FPs operate. In the medium- to long-term, PDS targets urban hospitals, first in Toronto, then in Ontario, then in Canada, and finally in North America. This phased expansion is outlined below.

4.2 Short-term Customer Segments

Our immediate short-term market comprises of clinics owned by independent physicians and various medical groups providing healthcare services. This market segment is comprised of the following customer segments.

4.2.1 Family Physicians in Toronto

This customer segment is comprised of publicly and privately remunerated medical physicians in Toronto. They practice family medicine, maintain a Certification in the College of FPs of Canada (CCFP) or CCFP Emergency Medicine (CCFP(EM)). Many of them also hold part-time positions caring for inpatients in local hospitals receptive to advances in medical IT.

Toronto contains 10,034 active physicians, 2,551 of which are FPs. We expect these FPs to be more receptive to technology and to PDS as a result of their exposure to technology in the hospital environment.

Canada continues to lag behind other industrialized nations with respect to the number of physicians per capita [11]. An FP sees an average of 117 to 124 patients per week during regular hours [11–13]. Including on-call hours, FPs typically work between 70 and 80 hours per week [11, 13]. More than 70% of FPs provide some type of on-call service in addition to regular hours. As a result of their busy schedules:

- Approximately 60% of FPs said they are routinely not accepting new patients.
- 42% of FPs said they were only accepting new patients under certain circumstances, such as friends or relatives of current patients or referrals from another doctor.
- 18.2% of FPs said they are not accepting any new patients.
- 20.2% of FPs said that their practices were accepting new patients without any restrictions.

PDS can potentially decrease the patient wait times by about one third if utilized by nurse practitioners [8] in family clinics who are the first point of contact for patients. Time saved from such optimization can be directed at new patients.

A key partner toward convincing FPs of our reliability will be knowledge organizations such as Elsevier.

4.2.2 Toronto Medical Health Groups

Toronto's medical health groups are health delivery networks that own and operate family/walk-in clinics. They constitute another customer segment in this market as their business objectives include improving overall efficiency of their clinics. The pain-points and value proposition mentioned in the previous customer segment obviously translates to this customer segments. However there are additional challenges that medical health groups face as they are essentially the employers of FPs and nurse practitioners.

Physicians are looking for a better balance between their personal and professional lives [11]. Providing a more focused environment and enriched physician/patient interaction may improve employee retention rate for medical health groups.

The median yearly salary of an FP is approximately \$243,433 [14] and the average yearly salary is approximately \$202,000 [15]. For a two-FP clinic, this amounts to approximately \$400,000 of fixed costs. Discounting on-call hours and time spent on administrative/non-patient-treatment tasks [16], this amounts to approximately each patient costing the clinic \$17 of FP salary [11–13]. Since the billing rate is relatively flat, these clinics can improve their revenues by increasing patient volumes using PDS and even by employing nurse practitioners (PDS users) instead of additional physicians.

4.3 Long-term Customer Segments

Our long term market is targeted at PDS adoption in the hospitals within North America starting with Toronto, then Ontario, then Canada, and finally to the U.S. This market segment comprises of following customer segments:

4.3.1 Toronto Hospitals

We will target individual hospitals in the greater Toronto area. In this phase, our customer segment consists of the Chief Information Officers (CIOs) of Toronto's 25 major hospitals over technology adoption in their hospitals [17]. We will target only CIOs of hospitals in which we have first phase FPs operating; we expect first phase FPs to act as both evidence and partners toward making connections with these CIOs.

4.3.2 Ontario Hospitals and Family Physicians

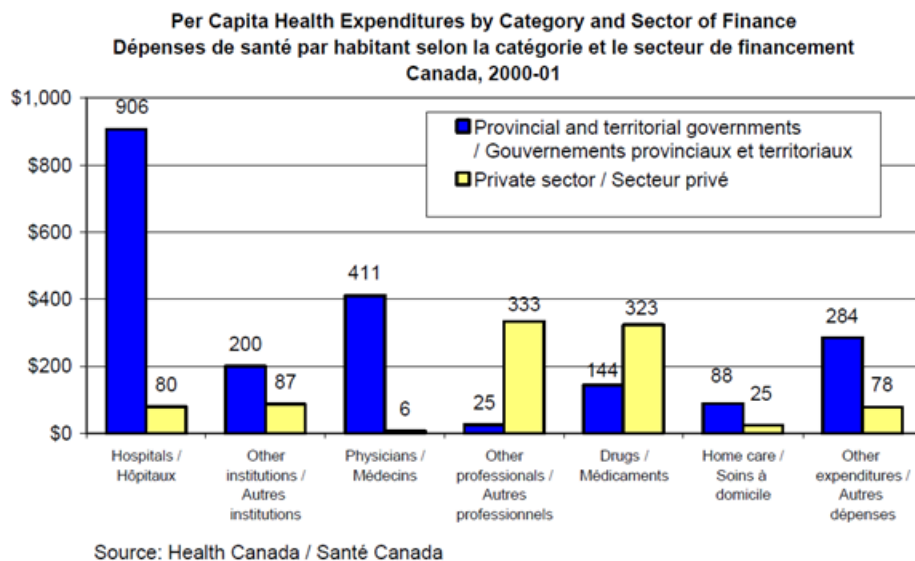
In Ontario there are 825 nurses per 100,000 patients. Compared to this figure, the number of physicians per 100,000 patients in Ontario is just 127 [18]. Hence for every doctor in Ontario, there are about six nurses [10] serving the patients as the primary healthcare providers in hospitals. These front line medical professionals can effectively follow the same workflow as the clinical nurses and leverage the same data analytics provided by PDS. Specialists can then interact in a much richer fashion with the patients and can provide useful feedback communicated back to the FP for future diagnostics requests.

We feel that there is compelling evidence that hospitals need tools like PDS. The CIOs of Ontario hospitals will be targeted as customers. Insurance companies and health organizations such as eHealth Ontario represent key partners in this phase.

Ontario hospitals and FPs will be targeted in a similar way as in Toronto.

4.3.3 Canadian Hospitals and Family Physicians

Figure 4: Canadian Healthcare Expenditures



The follows is the state of Canada's healthcare system:

- Total healthcare expenditures constitute 11.7% of gross GDP, which is an increase from 1975 when it constituted 7% of gross GDP [19].
- In 2010, publicly funded healthcare expenditures accounted 70% of healthcare spending [19].
- In 2000/2001, physician expenditures represented 20% of total provincial and territorial government health expenditures, amounting to \$411 per capita [20].
- Canada loses 200 to 250 physicians (primarily specialists) to the U.S each year [11].
- Canada's population is increasing while the number of physicians is staying relatively constant [9,10].

We feel that there is compelling evidence that a shift toward increased IT adoption in Canada's healthcare industry can have a positive impact on the quality of patient care, especially if the technology is available at a low cost.

Canadian hospitals and FPs will be targeted in a similar manner as in Ontario.

4.3.4 North American Hospitals and Family Physicians

Our final expansion will target all public and private hospitals in North America. There are approximately 6,013 hospitals in the U.S., with an average of 184 beds per hospital [21,22]. U.S. hospitals waste over \$12 billion annually as a result of communication inefficiencies among care providers. Increase in length of stay accounts for 53% of the annual economic burden. A 500 bed hospital loses over \$4 million annually as a result of communication inefficiencies. Clearly, there is room for improvement.

North American hospitals and FPs will be targeted in a similar way to those in Canada.

5 Marketing Strategy

Our major marketing strategy aims to create awareness and exposure of PDS by leveraging customer relationships and social presence within the medical community and medical institutions. This will serve as the foundation of our secondary marketing strategy, which is to use the existing healthcare landscape and leverage established communication and social mediums to market PDS. Our final marketing strategy is the product itself: by virtue of being accessible by everyone (e.g. specialists being able to validate FP decisions), we expect that various stakeholders along a patient's diagnostic path will become aware of PDS.

5.1 Chosen Market Segment

MediReason's chosen market segment are the under-served small healthcare providers (clinics) and FPs. FPs are predominantly self-employed and they maintain close affiliations, e.g. FPs partner with other FPs to form clinics, or FPs operate on a part-time basis within hospitals. FPs belong to and are influenced by colleges of physicians. Our secondary customers are hospitals, which are influenced and affiliated by insurance companies, their respective governments, and their CIOs/IT steering committees. There is a clear indication that healthcare providers have connections to various institutional and governing bodies of healthcare [23].

We will leverage the increasing trend of medical IT adoption in the healthcare industry [1] to serve our customers in three ways:

1. To add value to our customers in the following ways:

FPs, Clinics

- Reduce patient misdiagnosis rate.
- Increase patient throughput.
- Increase communication with and validation by specialists.
- Give customers access to up-to-date medical knowledge-base.
- No hassles with large enterprise systems.

Hospitals

- Increase asset utilization.
- Increase productivity, especially for nurses.
- Increase clinical efficiency and reduce operational costs by having nurses more effectively route patients and by having specialists waste less time on improperly routed patients.
- Fewer medical malpractice lawsuits.
- Improve learning environment (for nurses).
- Increase quality of care.

2. To provide simplicity to our clients. PDS will be designed and marketed as simple-to-use. Simple-to-use means that PDS will have an intuitive user interface, it will follow the principle of least surprise, and most importantly, it will fit into an FP's or nurse's workflow.
3. To be cost effective for our clients. For pricing strategy for FPs, we have interviewed FPs to find out about the appropriate price point for them. Our pricing strategy for hospitals is based on our expected productivity gains, improved asset utilization, and economic gains.

The following table outlines our target markets during various phases of expansion.

Market	Total Size	Reachable Size
Family Physicians		
Toronto	2,551	255
Ontario	14,299	1,430
Canada	26,000	2,600
U.S. and Canada	126,300	6,315
Hospitals		
Toronto	25	3
Ontario	151	15
Canada	850	85
U.S. and Canada	6,863	343

5.2 Distribution Channels

"Champions" will be our major distribution channel that brings PDS to market.

Champions Amongst the first phase of target customers, MediReason will distinguish specific individuals who are proponents of the PDS product and who demonstrate a genuine interest for PDS's expansion on usability and features. Furthermore, the company will note the customer profiles and external relationships with the medical community and institutions. The strategy is to depict such customers or users as partners

of MediReason with the intent that they will be advocates of PDS. These product 'champions' will be requested to contribute to the growth of the product and further, refer/promote the product by actively providing exposure to colleagues and the various institutions or medical practices they are in association with. In return, the company will strategically provide incentives and reduce purchase and/or licensing costs. The goal is to obtain a referral based marketing channel, which utilizes the client's medical profile and personal or business relationships within their healthcare community. This will create exposure of the product at a peer level and will lead to sale opportunities.

5.3 Promotional Approach

MediReason faces two challenges in terms of promoting PDS: building product awareness and reaching the target audience.

Product awareness is established primarily by strong capabilities of the product in addressing a client's need and to add value with minimal costs. PDS is an affordable, stand-alone product that provides customers with much-needed decision support to reduce the misdiagnoses rate. PDS also serves as a communication channel to reduce operational inefficiencies. Therefore, PDS has the potential for early adopters to implement which will lead to increased visibility for the product. This is also a key driving force for technology adoption in healthcare. Following are some of the methods that we intend to use to promote product awareness:

5.3.1 Early Adopters

MediReason will recognize customers who demonstrate trust in PDS and who can easily assimilate it as part of their daily practice. Similar to champions, these customers will be targeted to be advocates of PDS but unlike champions, they will not be requested to actively promote the product to peers or belonging institutions. Early Adopter customers will instead be living examples of 'success stories', which in turn increase the exposure of PDS. Early Adopters may be provided incentives for their time and effort, however this will not be a recurring expense or commitment.

5.3.2 Word-of-Mouth

The medical industry is a collaborative community where peer-to-peer interactions are common. Providers share their knowledge base with the overall intent to improve patient care. Through Early Adopters and through leveraging relationships and the knowledge exchange culture amongst providers, another promotion method for PDS is to gain exposure by word-of-mouth. With PDS being an innovative technology solution that addresses a gap in patient care, we can gain exposure for the product through success stories, peer references and recommendations.

The healthcare industry publishes various journals and newsletters, and the industry hosts a wide array of exhibitions, conferences, and trade shows in order to showcase and expose various technology innovations and product offerings to all members of the healthcare community. These communication mediums and events provide significant exposure to potential clients who may not be conveniently accessible, or who are situated in different geographies/markets, or who are simply not aware of product offerings that may enhance their patient care and/or operations. The aforementioned events provide technology vendors the opportunity to network with prospective clients and establish business partnerships with vendors or institutions. Factored with building product awareness through client-peer relationships, the target market/chosen target segment could be further reached by the following means:

5.3.3 Advertisement

MediReason will advertise PDS via online news journals. With hospitals providing Internet access [24], online advertising is accessible by the target audience. A short list of online advertising mediums, which will reach our target client base are the following:

Can health A reputed magazine that provides information to medical professionals. Having a reporter or expert to write a column would certainly be an advantage for MediReason.

Online Focuses on increasing brand awareness among small care providers. This type of sponsorship includes targeted keywords in searches and advertising/support of medical journal/publication/conference websites.

American Medical News This will be useful when we make our move into the U.S..

5.3.4 Trade Shows

Trade shows are efficient methods for reaching and conversing with potential customers. They also allow the building of strategic alliances, carrying out corporate intelligence operations and building customer awareness of the company.

IT Healthcare This trade show specifically focuses on IT in healthcare. Many healthcare industry participants of this trade show include Canada health Infoway, Dell, Netmotion etc.

Health Achieve 2012 This trade show focuses on staying abreast with the the latest technology, education and information in healthcare. Most participants of this trade show have an interest in better technologies.

e-Health Conference 2012 This can be considered for both a trade show and conference. This event will be good for promotion, especially in MediReason's first year.

5.3.5 Conferences

We will target conferences relate to health informatics and advancements in healthcare. Depending on the size and type of different conferences, we will promote PDS by means of independent research, which shows PDS's applicability to the domain of healthcare and its positive effects. We will display this research through the use of posters, booths, or speakers. We will also show videos of product demonstration, allow attendees to demo our system on the spot, and give attendees take-home information booklets/pamphlets.

Advances in Health Informatics Conference This conference will be the best conference in the near future for MediReason to increase its awareness and reputation in the healthcare sector. Delegates in this conference will be looking for advancements and MediReason will fill in the gap of accuracy and speed in healthcare. A demonstration video along with the opportunity for doctors to use PDS in the conference will be the best way to gather leads.

Health Information Management Conference This conference will be attended by top leaders in health informatics industry. As an integral part to the health providers, doctors are important for MediReason, since they can promote PDS in hospitals.

11th International Congress on Nursing technologies This conference focuses on technologies used by nurses in healthcare. Nurses are PDS's users instead of direct customers. Therefore, this conference can initiate a bottom up lead and it can even generate feedback loop.

Canadian Health Informatics Award This award honors the contributions and commitment to the health Informatics industry. We can find potential competitors as well as get an idea of the market from the award.

EHealth Innovation Summit This is a platform that hosts the innovations in health industry. It specifically focuses on the technology side of health industry.

Mobile Health Summit We may not need to participate in this event in the first year of operations, but this event will help us penetrate the mobile healthcare industry.

5.4 Marketing Plan

We will implement a dynamic marketing strategy that fuels the continuous growth of MediReason. As well, we will constantly monitor, revisit, and evaluate our marketing strategies/efforts to ensure that they have yielded their desired results. We will design systematic and periodic progress reports, which contain evaluation items such as success metrics, goals, leads/referrals, analytics, and conversions.

The following schedule outlines our expected participation in terms of trade shows, conferences, and online promotions.

Target Segment	Promotional Method	Success Metric / Goals	Period	Link	Costs	Resources
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Online Marketing Through Blogs / Website / Forums

Blogs can raise awareness to the users and customers about our product.

All segments	Wordpress, Google and blog.	200 followers 20 leads from the readers	April 2012		\$0	1 Marketing person moderating the blog.
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Advertising

Advertise in leading health technology magazines in Canada.

Toronto / Canadian FPs / Hospitals	Advertise on can-health.com and other leading Health IT magazines.	140-200 leads out of which 40-80 high quality leads.	April 2012	Link	\$1,500 per month	2 marketing people
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Conferences

Allow us to network with researchers, decision makers, and keep up with the medical field.

Toronto FPs / Hospitals	2 nd Advances in Health Informatics Conference	20 qualified leads 1-2 leads from opinion leaders	April 2012	Link	\$600	2 marketing people
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Target Segment	Promotional Method	Success Metric / Goals	Period	Link	Costs	Resources
Toronto Nurses / Hospitals	11 th international congress on nursing informatics.	10 qualified leads 1-2 leads from opinion leaders	June 2012	Link	\$500	1 marketing person
Canadian FPs / Hospitals	17 th IFHIMA Congress	30 qualified leads 2-4 leads from opinion leaders	May 2013	Link	\$1,000	1 marketing person
Canadian FP	Canadian Health Informatics Awards Gala	20 qualified leads	Nov 2012	Link	\$400	1 marketing person

Trade Shows

Allow us to pursue with leads and communicate with competitors.

Canadian FPs and Hospitals	e-Health 2012	50-60 qualified leads from the booth 5-6 customer leads	May 2012	Link	\$5,000	2 marketing person
Toronto / Canadian FPs and Hospitals	Health Achieve	150-180 qualified leads from the booth 15-20 customer leads	Nov 2012	Link	\$4,000	2 marketing person
Toronto / Canadian FPs and Hospitals	IT Healthcare Canada	50-60 qualified leads from the booth 5-6 customer leads	Oct 2012	Link	\$3,000	

Figure 5: Marketing Timeline

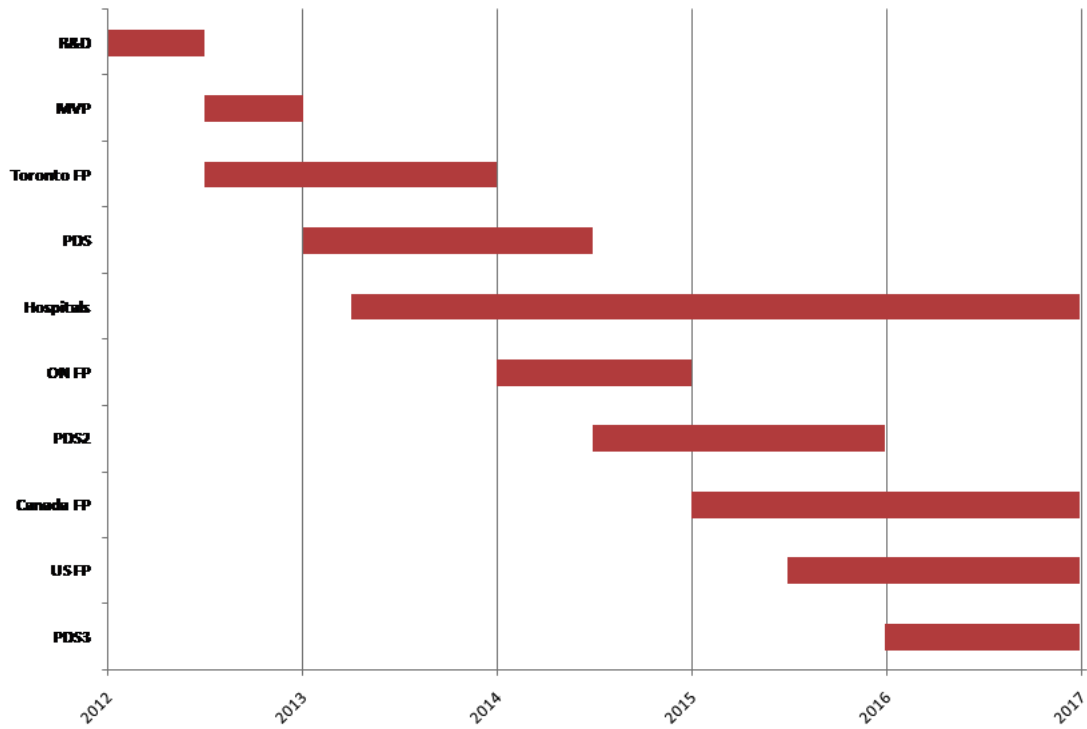


Figure 5 shows the marketing milestones for PDS. When the MVP is ready, we will market PDS to Toronto FPs. We will market the first (full-featured) version of PDS to hospitals and Ontario FPs. Our long-term goal is to make newer versions of PDS and market them to the Canadian and U.S. healthcare industries.

Figure 6: Sources of Leads

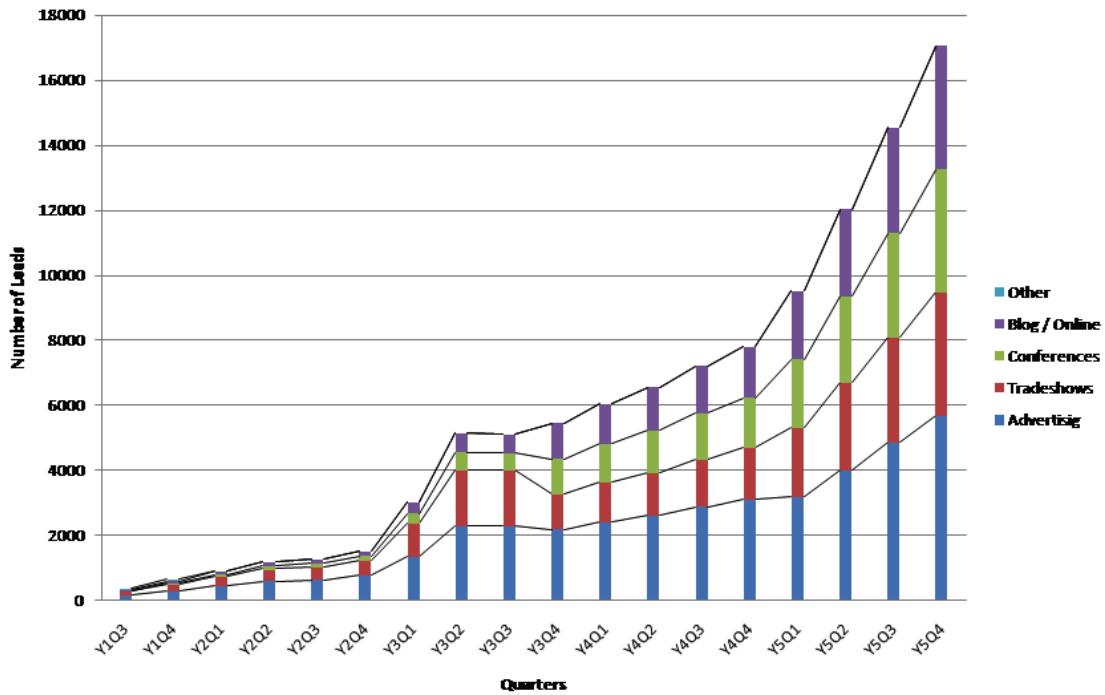


Figure 6 shows the sources of our leads over time. At the beginning, we expect that most of our sales and leads will come from advertisement and trade shows. As our reputation grows, we expect to have more customers from our online campaign, blogs and conferences. We assume that as our reputation grows over time, we will have higher quality leads who will consider purchasing our product, thereby increasing our sales. Please refer to our sales forecast spreadsheet for more details.

Figure 7: Marketing Expenditures

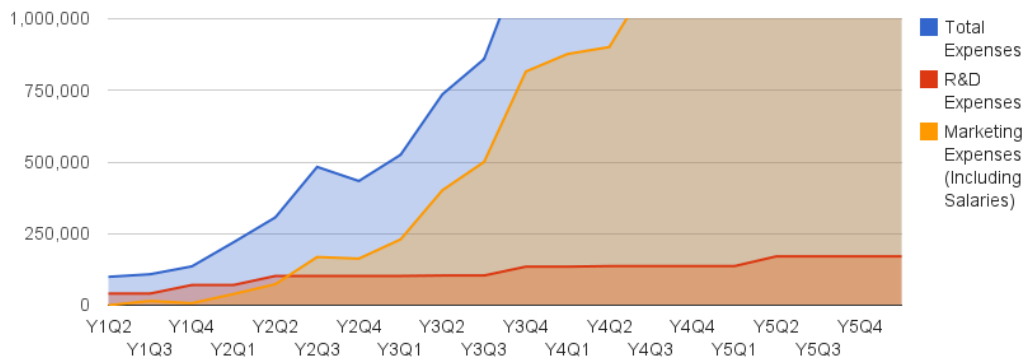


Figure 7 highlights our marketing expenditures in our first five years of operations. The trend of marketing

expenditures over time mirrors that of leads. Please refer to the spreadsheet for a more detailed analysis of our marketing expenditure over time.

5.4.1 Making Sales to Large Hospitals

Our main target segment is FPs; however, hospitals are important customers as well. Selling to a hospital requires a different sales strategy. There are many different key decision makers and influencers from diverse disciplines in a hospital. As such, sales people will have to apply a multi-faceted approach to close deals. We will attempt to understand each hospital's primary interests, its inner workings, its bureaucratic processes, and acquaint ourselves with its decision making process. We plan to advertise our products in popular health technology publications, which are mostly read by hospital administrators, CEOs, and CIOs.

Hospital administrators, CEOs, and CIOs can be reached via trade magazine advertisements and articles, direct mail, custom publications, value-added services, trade show exhibits, and participation in the local chapters of the various medical professional societies and colleges. We also plan to hire consultants who have experience in making sales to hospitals.

Below is a partial list of target hospitals in Toronto, with emphasized hospitals representing our desired early adopters based on their history of IT innovativeness. The effect of making potential sales to hospitals can be found in the spreadsheet.

- Humber River Regional Hospital
- The Hospital for Sick Children
- North York General Hospital
- **Mount Sinai Hospital**
- Orthopaedic and Arthritic Hospital
- Rouge Valley Health System
- The Scarborough Hospital
- **St. Joseph's Health Centre**
- St. John's Rehabilitation Hospital
- St. Michael's Hospital
- Sunnybrook Health Science Centre
- Toronto East General Hospital
- Trillium Health Centre - West Toronto
- **The Toronto Hospital**
- Princess Margaret Hospital
- Toronto Western Hospital
- West Park Hospital
- Women's College Health Science Centre

6 Competition

GE and Siemens are working on building a seamless platform that can be used by any healthcare professional to make informed decision. They have partnered with Elsevier Clinical Decision Support, a publishing company in the medical and scientific domain, to get the data required for analytics. Their future aim is to provide automated real time decision from real time patient data using best practice methods.

Elsevier is working on documenting best practice methods in medical domain. They came up with a platform that can be shared by other partners working on healthcare informatics and decision support. They have already partnered with the GE Healthcare, Microsoft, Allscripts, Epic, McKesson, Quadramed, The Shams Group and Trizetto. All these partners use Elsevier's knowledge base to provide Clinical Decision Support in their products.

Though there is a lot of hype on Clinical Decision Support system, it is not widely used in Canadian healthcare system. Most competitors like GE, Siemens and Avnita has a stringent requirement of having an EHR in

place and works on top of EHR system. For an individual service provider it is costly to implement and maintain EHR. As a result, only large hospitals and healthcare service providers are able to afford expensive Clinical Decision Support (CDS) systems that are currently available in the market. Most competitor focus on CDS, while on the other hand, PDS aims to improve the efficiency by providing physicians guidance, advice, and medical best practices to support their diagnosis of a patient. In addition, PDS leverages the feedback of specialists which has great contribution in improving and knowledge base and the capabilities.

6.1 Future Competition

It is expected that in future we will have intelligent medical assistants or programs that will be able to diagnose illness at an early stage. These intelligent assistants will work on top of hybrid decision support systems to make the right decision and gesture commands and will also be able extract important and valuable information from images, lab data and vast patient databases. They will be able to combine all relevant intelligence to focus on individual patient's diagnosis and will help the physician make accurate and quick decision.

In the year 2016, all healthcare documents will be EHR and we will have an explosion of healthcare data which will create new opportunities and challenges for CDS and PDS systems. Canadian Health Infoway estimates that currently there are 2,000 re “transactions” in Canada every minute, or more than 1 billion transactions each year. Currently, there are 440 million laboratory tests, 382 million drug prescriptions, 332 million visits to physicians' offices, 35 million diagnostic images and 2.8 million in-patient hospitalizations. In future it is expected that we will have healthcare data warehouse storing petabytes of information and the most challenging part will be to come up with scalable analytics algorithms that will be able to harness the information stored in data warehouses and improving the accuracy and efficiency of CDS and PDS systems.

6.2 Breakdown of Competition

In the followings sections we have presented the summary of direct competition, indirect competition and out of category competition.

6.2.1 Direct Competition

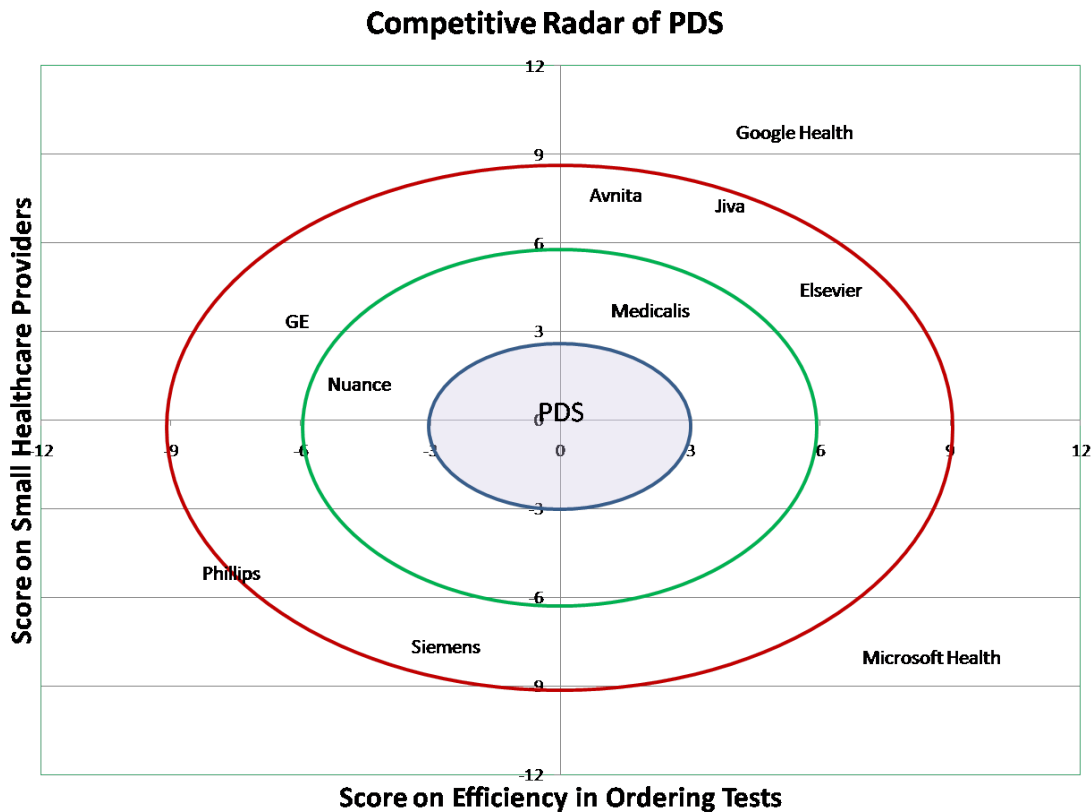
Medicalis and Nuance are leading companies in the area of radiology workflow solutions that increase productivity, utilization and quality. Nuance RadPort and Medicalis use evidence based knowledge to enhance productivity, utilization and ultimately reduces the cost of healthcare. It enables healthcare providers to make best care decisions for their patients. They allow healthcare providers to focus on utilization and productivity and enable them to offer their service to a larger patient base.

Our direct competitors are mainly focused on US healthcare system and do not address the challenges of Canadian healthcare system. In 2006, 70% of Canadian healthcare spending was financed by government, versus 46% in the United States two hours in the emergency room of time spent on ordering imaging study for a patient process which will ultimately increase efficiency. PDS systems are not widely adopted in Canadian healthcare systems because it is relative difficulty to integrate such systems into clinical workflows and computer systems. Most physicians within a clinical or individual practice are often unable to afford large scale software suites offered by large corporations and companies. PDS is cost effective because it is a standalone product and does not require any integration with existing systems nor does it have the stringent requirement of having an EHR system in place.

Nuance and Medicalis are rated medium threats to our business as they do not focus on family physicians. The following figure gives a visualization of the entire competition. The key differentiators are whether or

not the product is appropriate for small healthcare provider. The key benefit is efficiency in ordering tests, X-ray, MRI, and other order entry.

Figure 8: Competitive Radar



6.2.2 Indirect Competition

Elsevier's CDS indirectly competes with our product. Elsevier is a publishing company which publishes medical and scientific literature. The company has one of the largest repositories of medical publications which contains seven million publications and publishes 250,000 articles a year in 2,000 journals. Elsevier has a Clinical Decision Support system that generates actionable knowledge and suggests best practice methods to physicians. Elsevier's knowledge base is used by many other CDS systems and they have successfully partnered with GE Healthcare, Microsoft, Allscripts, Epic, McKesson, Quadramed, The Shams Group and Trizetto. Elsevier's CDS is more like a medical encyclopaedia and users need to do extensive searching to come up with a decision and does not increase the efficiency of the physician.

Avnita Health has a CDS system that takes the meaningful use requirement for an active problem list one step further by using clinical data to corroborate and rank active diagnoses, active medications, and current lab values. Using these it gives a comprehensive at-a-glance view of the patient's medical profile. Avnita CDS systems works on top of patients EHR and its main users are patients and not physicians. They have partnered with Google Health EHR system which is not widely adopted by the industry. Phillips and Siemens provide comprehensive realtime systems that not only give real time clinical decision support but also work on top of realtime patient data and real time monitoring equipment. It monitors trends and patterns of vital

signs and lab report and gives actionable decision based on these. They are indirect competitors because our system does not work directly on realtime monitoring system.

GE's clinical decision support system is designed to monitor dozens of patients independently and does not require substantial input from the physician. The software is designed to monitor dozens of patients, display live data about them, and raise alerts when certain criteria are met. PDS is not a realtime monitoring software and not a direct competitor of GE's clinical decision support system.

Jiva takes clinical intelligence and makes it actionable by applying additional client criteria and automating actions such as sending alerts, generating referrals or generating interventions to address care management opportunities. Jiva is not designed to help physicians make critical decisions and works more like an alert and referrals generating system.

6.2.3 Out-of-Category Competition

Google Health, Microsoft Health, Allscripts are out of category competitors as they mostly focus on EHR and EMR systems. Google Health will discontinue their service because it is not widely adopted. Most out of category competitors provide EHR systems that are suitable for large hospitals and requires several trained staff to maintain the systems.

6.3 Competitive Edge

Our company aims to make a difference in healthcare practice by converting cutting edge data mining and machine learning research into innovation. Our innovative solution will empower the underserved healthcare professionals by giving them tools and solutions that increases transparency, efficiency and accuracy in healthcare. Our team consists of researchers from diverse background including data mining, machine learning, database, systems, graphics and HCI whose aim is to bring the best of academic research into practice. Our strong tie with academia gives us a strong platform to connect with key decision makers and leaders in this field. We aim to promote our solution through Healthcare Information and Management Systems Society (HIMSS) conference that focuses on the betterment of healthcare through information technology. Our future goal is to get our product certified from organizations like Certification Commission for Health Information Technology (CCHIT) and patent our proprietary algorithm and technology to increase our competitive capabilities.

6.4 Strengths and Weaknesses

6.4.1 Competitive Product Landscape

As mentioned earlier in product description section, MediReason PDS systems have the following high level features that make it a distinguishable product in the market. Nuance Radport, Medicalis, GE Qualibria are the main competitive products in the market comparable to PDS systems. GE Qualibria is an enterprise solution that depends on realtime patient data and works on top of GE infrastructure. Though Nuance Radport has a feature where specialists can give feedback but it is not a standalone system and is an enterprise solution that is more suited for large healthcare providers. Medicalis focuses on improving efficiency of radiologists and tries to promote transparency in ordering test in medical imaging. Our product is similar to Medicalis as it also tries to promote transparency but at the same time it can be used for general test and not just focuses on medical imaging

	Nuance RadPort	Medicalis	GE Qualibria	MediReason PDS
Clinical Decision Support	Yes	Yes	Yes	Yes
Computerized Physician Order Entry and Diagnosis	Yes, but mostly focused on medical imaging	Yes but mostly focused on medical imaging	Not Supported	Yes and supports any kind of test
Scale	Large	Large, Medium	Large	Small, Medium
Specialist Feedback	Yes	No	No	Yes
Focuses on Improving Efficiency	Yes	Yes	Yes	Yes
Focuses on saving cost	Yes	Yes	Yes	Yes
Avoids Misdiagnosis	Yes	Yes	Yes	Yes
Stand-alone	No	No	No	Yes
Needs Real-time Patient Information	No	No	No	No
EMR/EHR Requirement	Strict	Strict	Strict	Flexible
Maintenance Cost	High	Medium	High	Low
Other Issues	Related to Medical Imaging and focuses on improving efficiency of specialists	Related to Medical Imaging and focuses on improving efficiency of specialists	Realtime decision support. More autonomous.	Increases efficiency and more suitable for small healthcare providers

6.4.2 Company Threat Analysis

Below we have presented the Strengths, Weaknesses, Opportunity and Threats (SWOT) analysis of our major competitors. Major competitors like GE, Medicalis and Nuance are focused on providing large enterprise solution and already dominant company in the market. Our company's strategy is not to compete directly with our competitors. Instead, we focus on the small healthcare providers who are underserved and not a direct target customer of our competitors.

Figure 9: **SWOT: Medicalis**

	Strengths	Weaknesses
<p>Opportunities</p> <ul style="list-style-type: none"> • Technological advancements in medical IT solutions still not mainstream. • Even with Canadian presence, many provinces still lagging in catching on. 	<p>With its solid partnerships and established presence, there is room for acquiring a smaller venture with innovative solutions such as ours.</p>	<p>Medicalis' solution is at an enterprise level with little help for smaller medical practices. Family physicians are unlikely to be able to employ their solutions due to lack of funding. This is an opportunity for innovative entry starting from a lower level in the medical industry (Family physicians) capitalizing on lagging technology in Canada.</p>
<p>Threats</p> <ul style="list-style-type: none"> • Possesses key partners with key resources (R&D). • Established results in hospitals put to practical use. 	<p>With its established solution, partnership and technical expertise they can possibly dedicate part of their works for lower level medical practices such as family physicians creating a threatening competitor. As a result, it may take the market share away.</p>	<p>May not have interest in low level entry due to smaller amounts of revenue along with having to develop a standalone product. This gives way for a level of entry to smaller firms but still is faced by a threatening competitor that may choose otherwise.</p>

Figure 10: **SWOT: Nuance**

	Strengths	Weaknesses
	<ul style="list-style-type: none"> • Leading Brand. • Consumer Loyalty / Relationships. 	<ul style="list-style-type: none"> • Only focusing on large enterprise solutions and not developing solutions for small family physicians.
Opportunities <ul style="list-style-type: none"> • Growing hype on Electronic Health Records and health informatics is motivating healthcare providers to adopt automated diagnostic support. 	Being a leading brand and having loyal customers make Nuance well positioned to capture the growing market.	Not focusing on the growing market of small family physicians and their needs.
Threats <ul style="list-style-type: none"> • Canadian government policy to implement Electronic Health Record by 2016. 	Being a leading brand will help Nuance to capture the new market created by electronic health record.	If Nuance only focuses on large enterprises, then they will lose the large section of family physicians and healthcare providers who are encouraged by the government policy to adopt automated diagnostic system.

Figure 11: SWOT: GE Healthcare

	Strengths	Weaknesses
	<ul style="list-style-type: none"> • Leading Brand. • Consumer Loyalty / Relationships. • Relationships with leading companies • Large R&D expenditures 	<ul style="list-style-type: none"> • Only focusing on large scale enterprise solutions and not addressing the problems of small healthcare providers and family physicians.
Opportunities <ul style="list-style-type: none"> • Growing hype on Electronic Health Records and health informatics has created new demand for innovative systems that is currently nonexistent 	Being a leading brand with huge R&D expenditures will help GE develop innovative CDS solutions that has the potential to capture the emerging market of clinical decision support.	Not focusing on the growing market of small family physicians and their need for innovative solution.
Threats <ul style="list-style-type: none"> • Canadian government policy to implement Electronic Health Record by 2016. 	Being a leading brand with relationship with leading companies will help GE Healthcare to capture the emerging market created by electronic health record.	If GE Healthcare only focuses on large enterprises, then they will lose the large section of family physicians and healthcare providers who are encouraged by the government policy to adopt automated diagnostic system.

7 Business Case

As an industry, healthcare IT is projected to have a worldwide market capitalization of \$162 billion by 2015 [1]. Despite this, healthcare has been on the trailing end of technology [2]. The saturation and use of IT towards improving patient care is minimal, but improving [2].

Healthcare providers face the daunting task of ensuring timely and accurate care for patients. This is especially important for hospitals who, on average, lose \$8,000 per year per bed as a result of communicate inefficiencies and poor asset utilization [7]. This problem is exacerbated by medical malpractice lawsuits which cost the average hospital approximately \$250,000 per year.

Together, Canada and the U.S. lose approximately \$20 billion annually as a result of medical misdiagnoses [25]. Further, \$30 billion is wasted each year on ordering unneeded/unnecessary medical tests [26]. Misdiagnoses also have indirect economic impact in the form of lost productivity. For example, patients being inappropriately sent to see specialists. This wastes the everyone's time and the resources of the healthcare providers.

Decision support systems improve both efficiency and asset utilization [27], that's why we expect that PDS will increase productivity and asset utilization by 7% and 5%, respectively². Further, decision support systems reduce the misdiagnosis rate (56% of all patients) [4] by 16% [4] and unneeded/unnecessary medical imaging requests by 23% [5]. PDS is uniquely positioned at the first point of contact for patients. That is, Fps and nurses use PDS to help them make better initial judgements and better routing decisions. When patients are forwarded on to specialists, their PDS records follow them. We expect PDS to have the following measurable consequences to our customers:

- Save hospitals up to \$1,600,000 per year because of misdiagnoses and misuse of resources.
- Save FPs up to \$14,000 per year because of productivity gains alone.

Further, we expect that PDS will positively affect other stakeholders, including insurance companies and the patients themselves.

8 Financial Plan

8.1 Early Stages in Business

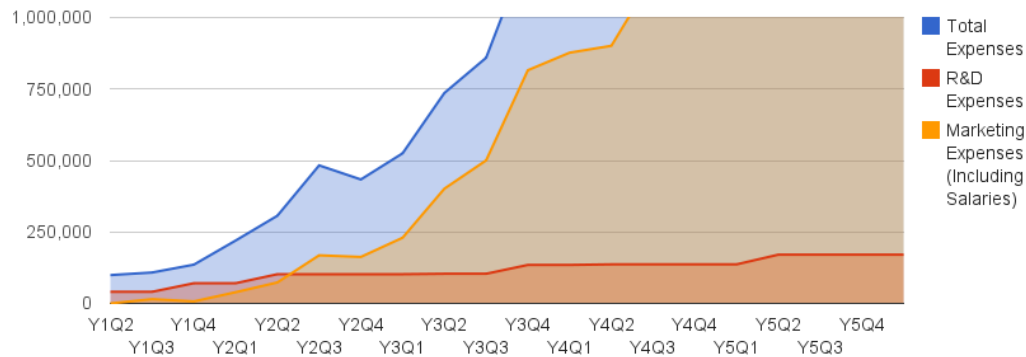
The first two quarters of 2012 will be spent in heavy R&D with the goal of creating a minimum viable product (MVP). The MVP will be ready for use by early adopters by the third quarter of 2012. During the first three quarters of 2012, the six founding members will invest their time and efforts as sweat equity. Members will share the following responsibilities: front- and back-end development, marketing, project management, and IT infrastructure; overlap in duties is expected. During this time, the only external costs will be those of the influential director, consulting physicians, consulting researchers, and equipment/hardware. These costs are estimated at approximately \$100,000.

The majority of expenditures during the first year will be devoted to the R&D needed for the MVP. This will lead naturally into MediReason's flagship product and its subsequent versions: PDS1, PDS2, and PDS3.

²Based on a decreased version of the productivity and asset utilization of Medicalis.

8.2 Government Programs

Figure 12: Total Expenditures



MediReason is eligible for Canada’s Scientific Research and Experimental Development (SR&ED) tax incentive program, which rewards Canadian R&D expenditures. MediReason will qualify for this program for its first four years of operations and will benefit from it for its first five years of operations. Over this period of time, we expect to receive approximately \$850,000 from the SR&ED program based on our R&D expenditures. Figure 12 compares total expected expenditures with R&D expenditures (including sweat equity).

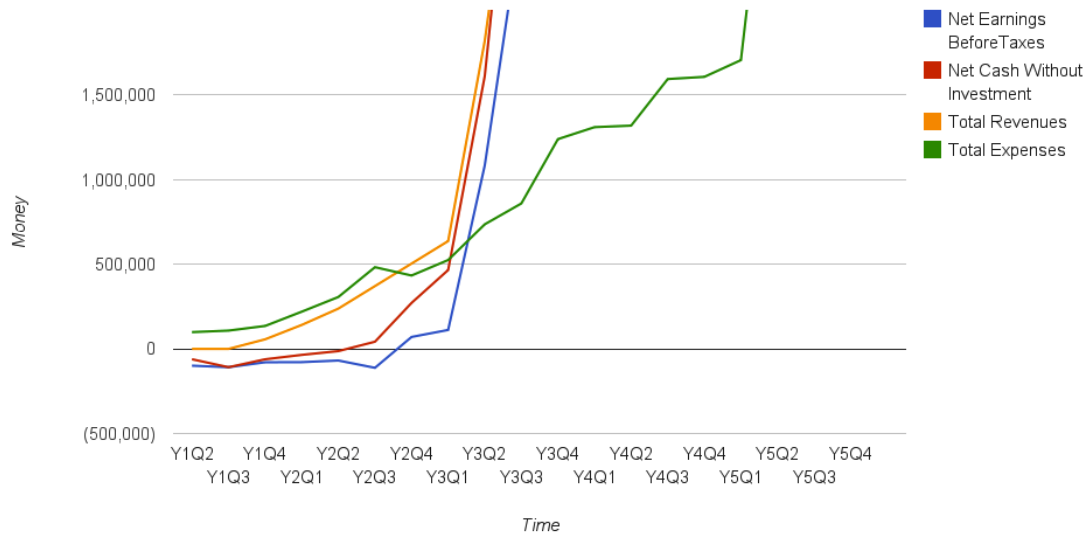
Under operations of less than \$3 million, these costs will be eligible for an investment tax credit (ITC) of 35%. As PDS evolves throughout MediReason’s market expansions into provincial and national levels, there will be major expenditure in the area of R&D in order to refine PDS to better fit our clients. This government aid will be further exploited for such expenditures in the future.

MediReason will seek to benefit from the National Research Council (NRC) Industrial Research Assistance Program (IRAP). As a start up formed by graduate students, MediReason will ensure to provide opportunities to recent graduate students to join the company. As such, MediReason will be able to gain financial assistance through the NRC-IRAP Youth Employment Strategy Program. With plans to become incorporated, this will further allow MediReason to receive additional government funding through the NRC-IRAP Research and Technology Development Activities. This information is only accessible to incorporated companies under the reach of an Industrial Technology Advisor.

8.3 Financial Milestones

8.3.1 Major Milestones

Figure 13: Financial Milestones



Y1Q1 1-Jan-2013: The start of business will devote two full quarter periods for R&D. This period of time will involve the development of the MVP for test-trial release in the third quarter. MediReason will generate no revenues throughout this time.

Y1Q3 1-July-2012: During this period, Toronto FPs will be targeted and by the end of the period MediReason aims for a capture of 5% of FPs, namely 128. New customers will be given a two-month free trial period. This period in business entails refinements of the MVP for the development of PDS to be issued to FPs by Y2Q1. All things being equal, this initial market will generate a total estimated revenue for Y2Q1 of approximately \$238,000.

Y2Q2 1-Apr-2013: MediReason will continue to grow relationships with FPs with the intent to capture a 10% market, namely an additional 127 FPs, as well as expand operations to major Toronto hospitals. New FPs and hospitals will be issued the version of PDS. This period in business entails further refinements to PDS for the development of PDS2, to be utilized in the subsequent planned stages. MediReason anticipates the implementation of the system in three major Toronto hospitals by the end of Y2Q4, progressing to MediReason's next stage: expansion to Ontario. MediReason is projected to have a total estimated revenue for Y2Q4 of approximately \$640,000.

Y3Q1 1-Jan-2014: MediReason will focus its next operations on the expansion of its market share to the rest of Ontario, continuing to target the same categories of FPs and major hospitals. This period in business entails the continuation of development of PDS2, expected for release by Y3Q3 for use by Ontario FPs and hospitals. By the end of this operation, MediReason will aim for a 10% market share of FPs and Ontario hospitals. MediReason is projected to have a total estimated revenue for Y3Q2 of approximately \$3.4 million.

Y3Q3 1-July-2014: This phase of expansion targets Canadian FPs and hospitals with the goal of a 10% market share. This major operation is expected to last until the end of Y4Q4 after which point we begin expanding into the U.S. market. This period marks the beginning of development of MediReason's next

product phase, PDS3, expected to be ready for use by Y5Q1, in preparation for the entry into the U.S. market. MediReason is projected to have a total estimated revenue for Y4Q4 of approximately \$10.3 million.

Y5Q1 1-Jan-2016: The next phase of operations will involve the entry in the US market, taking MediReason's focus to a grand scale of operations into the future. By the end of Y5Q4 with an anticipated capture of a 5% market share across and the U.S., MediReason is projected to have a total estimated revenue for Y5Q4 of approximately \$33.7 million.

8.3.2 Sensitivity

The following table outlines how changes to our projected market penetration and pricing strategies affect the time when MediReason will break even and when MediReason will reach positive cash flows.

Cost (\$)		Market Share (%)		Break-Even	Positive Cash Flow
Doctor	Hospital	Canada	U.S.		
1,000	25,000	5	5	Y3Q1	Y3Q3
2,000	25,000	5	5	Y2Q4	Y3Q2
1,000	50,000	5	5	Y3Q1	Y3Q2
2,000	50,000	5	5	Y2Q4	Y3Q1
1,000	25,000	10	5	Y2Q4	Y3Q2
2,000	25,000	10	5	Y2Q2	Y2Q4
1,000	50,000	10	5	Y2Q4	Y3Q1
2,000	50,000	10	5	Y2Q2	Y2Q3
1,000	25,000	5	10	Y3Q1	Y3Q3
2,000	25,000	5	10	Y2Q4	Y3Q2
1,000	50,000	5	10	Y3Q1	Y3Q2
2,000	50,000	5	10	Y2Q4	Y3Q1
1,000	25,000	10	10	Y2Q4	Y3Q2
2,000	25,000	10	10	Y2Q2	Y2Q3
1,000	50,000	10	10	Y2Q4	Y3Q1
2,000	50,000	10	10	Y2Q2	Y2Q3

8.3.3 Summary

- We expect to be profitable by Y2Q2.
- We expect to reach positive cash flow by Y2Q3 assuming no external investment from angel investors or venture capitalists.
- We expect to reach positive net cash by Y2Q2 assuming no external investment from angel investors or venture capitalists.

8.4 Investment Types

MediReason will receive four types of financial investments, listed in the order of timeline:

1. Sweat equity in the form of no salary to reduced salary payments for founding members.
 - The salary amounts of all founding members totals to \$308,000 per annum. By investing in sweat equity, the first year will see a reduction in salary expenditures of \$270,000
2. Financial investments from the founding members.
 - The six founding members of MediReason will contribute collectively a total sum of \$65,000 for the early development of the MVP to last for the first quarter period in business (Y1Q1).
3. Government programs including SR&ED, NRC and IRAP in the form of tax credits and financial contribution supporting portions of salary costs.
4. Angel Investments to acquire the necessary funds to reach profitability.
 - MediReason will seek Angel seed investments beginning in Y1Q2 for the further development of its MVP and further business operations leading to test trials with initial FPs. The investments will be in several tranches, spread over four quarters totalling to \$215,000. MediReason accepts the seed investment with a tenfold return of investment to be paid by Y4Q3.

8.5 Investment Roadmap

Time Period	Beginning of Quarter	Investment	Investor(s)
Y1Q1	1-Jan-2012	\$65,000	Founding members
Y1Q2	1-Apr-2012	\$105,000	Angel investors
Y1Q3	1-Jul-2012	\$70,000	Angel investors
Y1Q4	1-Oct-2012	\$30,000	Angel investors
Y2Q1	1-Jan-2013	\$10,000	Angel investors

Figure 14: Projected Cash Flow

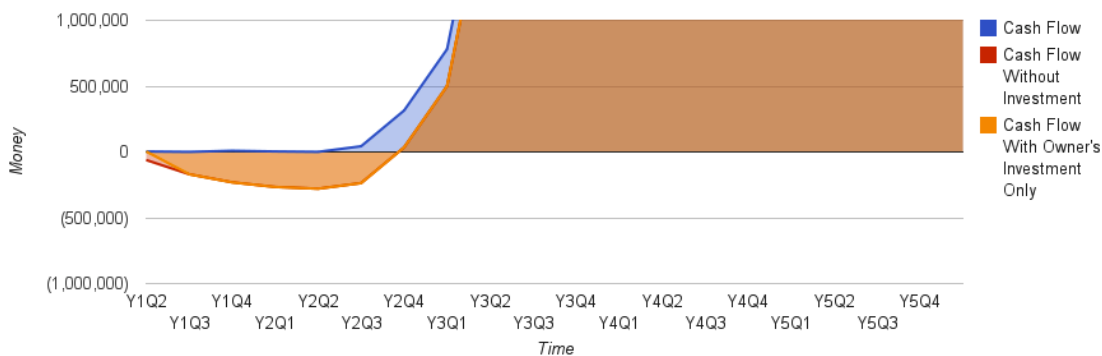


Figure 14 shows the effect of investment on our business. Without investment of any kind, our business will be cash flow positive by the end of 2014. If only the founding members invest money then we will be cash flow positive until the third quarter of 2012, at which point we will require further investment. If sufficient angel investment is found then our business will always have a positive cash flow.

8.6 Exit Strategy

MediReason will continue its business operations as planned, venturing into the rest of Canada and the U.S. Once MediReason has expanded well into the Canadian market, it will begin to look for exit strategies as business operations progress into the U.S. market.

By the end of Y4Q4, the angel investors will have realized their return on investment and MediReason will be in a grounded financial position to achieve a suitable exit strategy in the form of an acquisition by a larger company or by filing an initial public offering. The founders will pursue this exit strategy when MediReason enters the U.S. market (during it into its fifth year of operations).

A Competitors

A.1 Direct Competitor Breakdown

A.1.1 Nuance

Competitor Name: Nuance

Project Name: RadPort Company

Website: <http://nuance.com>

Product Website: [Link](#)

Threat Level: Medium

Value Proposition:

“RadPort™ is an evidence-based clinical decision support system that guides appropriate high-tech diagnostic image order entry. This system evaluates the appropriateness of each exam as it’s ordered, eliminating the need for physicians to spend excessive amounts of time with utilization reviewers. RadPort satisfies pre-certification requirements accepted by major healthcare networks. [28]

“The system offers penalty-free ordering and an intuitive scoring system for evaluating the diagnostic appropriateness of high-tech imaging orders, including MRI, MRA, MR Breast, CT, CTA, PET/CT and Cardiac Stress Testing. Special considerations and indications relevant only to the requested exam are presented in a simple and concise format. [28]

“Implementation of the decision support application requires either a call center approach for fast deployment or direct access via physician logins, or integration with existing Computerized Physician Order Entry (CPOE). Decision support rules are continually updated, revised and edited based upon user feedback, the introduction of new imaging technologies and frequent review by a panel of clinical and radiology experts. [28]

Kind of Competitor: Nuance is a direct competitor as it provides a clinical decision system similar to our proposed solution. It however requires integration with imaging machines and CPOE which is not required by our solution.

Feature Breakdown:

Real-time decision support:	Yes
Needs real time clinical data:	Yes
Suggests best practices and recommendations:	Yes
Real-time monitoring of trends and patterns of vital signs and lab report:	Yes
Gives a checklist based upon best practices:	Yes
Works on top of medical record system:	Yes
Helps with diagnosis:	Yes
Area specific:	Yes

Company Breakdown:

Number of offices:	35
Number of employees:	6,000
Yearly revenue from healthcare activities:	\$498 million
Yearly revenue:	\$950 million
Headquarters:	Burlington, Massachusetts
Year of incorporation:	1992
Public / private:	Public (NASDAQ: NUAN)
Products and services:	Current business products focus on server and embedded speech recognition, telephone call steering systems, automated telephone directory services, medical transcription software & systems, optical character recognition software, and desktop imaging software, evidence-based clinical decision support system.
Brand:	Recognized brand since 1992.
Number of patents:	More than 1000 patents and patent families.
Market presence:	More than 3,000 hospitals in the U.S. use Nuance healthcare solutions. More than 150,000 doctors and caregivers use Dragon Medical.

A.1.2 Medicalis

Competitor Name: Medicalis

Project Name: N/A

Company Website: <http://www.medicalis.com>

Product Website: [Link](#)

Threat Level: Medium

Value Proposition:

“Medicalis’ Collaborative Workflow Solutions give Radiology innovators the tools they need to stay ahead of healthcare transformation. Healthcare providers must now reduce the cost of care while continually improving quality and performance. Today’s status quo does not suffice for tomorrow’s opportunities. [29]

“Medicalis enables organizations to track, monitor, and measure key productivity goals that increase revenue and decrease costs. Medicalis’ focus on quality helps organizations stand out to referring physicians, health plans and, ultimately, the patient. [29]

Kind of Competitor: Direct

Feature Breakdown:

Real-time decision support:	Yes
Needs real time clinical data:	Yes
Suggests best practices and recommendations:	Yes
Real-time monitoring of trends and patterns of vital signs and lab report:	No
Gives a checklist based upon best practices:	No
Works on top of medical record system:	Yes
Helps with diagnosis:	Yes
Area specific:	Yes, radiology imaging.

Company Breakdown:

Number of offices:	2
Number of employees:	16-50
Yearly revenue from healthcare activities:	N/A
Yearly revenue:	N/A
Headquarters:	San Fransico, Calidornia
Year of incorporation:	2002
Public / private:	Private
Products and services:	Business focuses on radiology workflow solutions in order to increase productivity and quality focused to hospitals, imaging centres and radiology groups.
Brand:	N/A
Number of patents:	N/A
Market presence:	Market presence since 2001 with key partnerships(Harvard Medical School, Brigham and Women’s Hospital) along with established solutions to a significant number of hospitals.

A.2 Indirect Competitor Breakdown

A.2.1 GE Healthcare

Competitor Name: GE Healthcare

Project Name: GE’s Clinical Decision Support Software

Company Website: <http://www.gehealthcare.com/caen/>

Product Website: [Link](#)

Threat Level: Low

Value Proposition:

“General Electric is previewing a new clinical decision support software developed with the help of Intermountain Healthcare hospital system from Salt Lake City, UT. Using years of Intermountain’s clinical data from real world situations, the software is designed to monitor dozens of patients, display live data about them, and raise alerts when certain criteria are met. The package would sit on top of an already installed electronic medical record system and would use historical data about each patient to create appropriate alerts and warnings. According to GE, the pilot software will be launched at Intermountain in November and GE will unveil the full solution at the March meeting of the Healthcare Information Management and Systems Society (HIMSS). [30]

Kind of Competitor: Indirect competitor as it gives real-time decision based on best practice methods. Directly connects with Elsevier which is a publishing company that publishes medical and scientific literature

Feature Breakdown:

Real-time decision support:	Yes
Needs real time clinical data:	Yes
Suggests best practices and recommendations:	Yes
Real-time monitoring of trends and patterns of vital signs and lab report:	Yes
Gives a checklist based upon best practices:	Yes
Works on top of medical record system:	Yes
Helps with diagnosis:	Yes
Area specific:	No

Company Breakdown:

Number of offices:	N/A
Number of employees:	46,000
Yearly revenue from healthcare activities:	\$17.3 billion (2008 revenue)
Yearly revenue:	\$150 billion (2010 revenue)
Headquarters:	United Kingdom
Year of incorporation:	2003
Public / private:	Public (NYSE: GE)
Products and services:	GE Healthcare has a range of products and services that include medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, and biopharmaceutical manufacturing technologies.
Brand:	Established brand since 1892.
Number of patents:	2,350 in year 2007
Market presence:	Widely used brand in 100 countries.
Yearly R&D expenditures:	\$1 billion

A.2.2 Siemens**Competitor Name:** Siemens**Project Name:** Enterprise Image and Information Access**Product Website:** [Link](#)**Threat Level:** Low**Value Proposition:**

“Allows web-based viewers for both images and reports. Image access, RIS reports, and DICOM structured report objects bring unique value to the enterprise. The solutions can not only distribute medical images and reports both within and outside the hospital, they also enable to interact with results and findings via the intranet or Internet, or via enabling an existing EHR solution. [31]

Kind of Competitor: Indirect as it works on specific areas and requires EHR.**Feature Breakdown:**

Real-time decision support:	Yes
Needs real time clinical data:	Yes
Suggests best practices and recommendations:	Yes
Real-time monitoring of trends and patterns of vital signs and lab report:	Yes
Gives a checklist based upon best practices:	Yes
Works on top of medical record system:	Yes
Helps with diagnosis:	Yes
Area specific:	No

Company Breakdown:

Number of offices:	N/A
Number of employees:	420,800
Yearly revenue from healthcare activities:	7% of total revenue
Yearly revenue:	€75.98 billion
Headquarters:	Munich, Germany
Year of incorporation:	1847
Public / private:	Public (NYSE: SI)
Products and services:	Engineering Conglomerate working in diverse areas.
Brand:	N/A
Number of patents:	N/A
Market presence:	Popular brand.

A.2.3 Phillips

Competitor Name: Phillips

Project Name: Clinical Decision Support Systems

Product Website: [Link](#)

Threat Level: Low

Value Proposition:

“Built-in intelligence and applications designed to assist healthcare teams with tasks that demand cross referencing, presentation, and analysis of clinical information define Philips Clinical Decision Support Systems. [32]

Kind of Competitor: Indirect as it works on specific areas.

Feature Breakdown:

Real-time decision support:	Yes
Needs real time clinical data:	Yes
Suggests best practices and recommendations:	Yes
Real-time monitoring of trends and patterns of vital signs and lab report:	Yes
Gives a checklist based upon best practices:	Yes
Works on top of medical record system:	Yes
Helps with diagnosis:	Yes
Area specific:	Yes (anesthesia care)

Company Breakdown:

Number of offices:	N/A
Number of employees:	119,000 people (worldwide)
Yearly revenue from healthcare activities:	1% of total revenue
Yearly revenue:	€25.42 billion
Headquarters:	Amsterdam, Netherlands
Year of incorporation:	1891
Public / private:	Public (NYSE: PHG)
Products and services:	Philips is one of the largest electronics companies in the world.
Number of patents:	N/A
Market presence:	Popular brand.

B Customer Interviews

B.1 Interviewees

Category: Potential incidental user

Justification for qualifying as representative(s) of this category: The following are doctors in hospitals who treat patients. They represent incidental users of the system, and are biased against the quality of decisions made by FPs.

- Dr. Vikramaditya Prabhudesai
Interventional Radiologist
Dept. of Medical Imaging, St. Michael's Hospital
- Dr. Hasan Sarwar, MD,
Dept. of Anesthesiology
Bridgeport, CT, USA

Category: Potential direct user

Justification for qualifying as representative(s) of this category: Nurses and Medical Personnel will use the system and then forward generated reports to doctors, so nurses are potential front end users.

- Elena Zakalinskaya, B.Sc N RN
Nurse at Credit Valley Hospital (Cardiology dept)

Category: Potential consultant

Justification for qualifying as representative(s) of this category: Specialists will use the system and assess the findings of FPs and then enter their feed back in the system for family physicians.

- Dr. D. Sarma, M.D.
Asst. Professor, University of Toronto Staff,
Diagnostic & Therapeutic Neuroradiology
Dept. of Medical Imaging, St. Michael's Hospital

B.2 High Level Summary of Interviews

Results from all sources show a surprising degree of similarity, indicating the trends of current healthcare market. Results have been summarized below: Doctors take anywhere from 10 minutes to several hours to treat a single patient. Doctors are usually tech-savvy and use lots of technologies, including: RIS, PACS Systems, CT Scanner, X-Ray systems, workstations, voice recognition software, HMS, etc. Medical technologies are slow, inefficient, non-consolidated, outdated, expensive, and complicated. There is need for better solutions. While hospitals have the funds to afford a lot of technology, many other places don't, and so widespread medical IT adoption has been slow. Physicians regularly depend on colleagues, systems like StatDx, PubMed, online journals and books, medical libraries, and Google searches to support their diagnoses. Physicians are comfortable with new technologies, so long as they increase their efficiency and accuracy. Decision support systems will be adopted provided that they are accurate, up-to-date, fast, and reliable. The monetary value of time saved for each patient is an acceptable unit of measurement for pricing

strategies. The interviews suggested that targeting specialized physicians likely would not work, and that nurses were under-served and eager to learn. This shifted our focus from targeting physicians (including FPs) to targeting only FPs and nurses as the primary users. No technology can ever replace doctors or their accumulated experience. Systems can only act as sources of knowledge and support. Good decisions require human intervention. Doctors would and should have the final say in all matters. This motivated the shift from being solely decision support to supporting and recording the decisions made.

B.3 Analysis of Interviews

We got a generic idea of healthcare industry and the use of technology in healthcare. Although our initial idea that doctors oppose technology proved to be wrong, we are happy to know that a new technology like MediReason PDS can now be more easily introduced in healthcare system. It could be known that there is need for better efficient solutions and we are at the right track of selecting the specific niche for implementing our idea. The interviews helped us bullet proof our ideas. However, our system would be a better solution for a middle level diagnosis between nurses and physicians. Therefore, we improvise our system and focus on having nurses and medical personnel as the potential users of the system instead of family physicians. Thus now, we believe that we have a better, practical solution for a practical solution and there is significant demand for such an affordable and good solution.

B.4 Modifications to PDS based on Interviews

After the interview sessions and internal discussions, we decided to slightly modify the product idea and designs. The new implementation system will focus on: Firstly, at a clinic and nursing home level, now our product would target the patient's first point of contact, i.e. nurses and medical personnel. They would use the system, get an initial differential diagnosis report by using the system. Then the doctor sees the symptoms and the report, validates it, adds his/her own comments and finally confirms the report. The patient then is sent to a hospital for tests and specialised consulting. This saves time and effort in the part of the doctor. Secondly, at a hospital level, specialists and sub-specialists are able to view the validated report prepared by family physicians. They can comment on the report, which can be fed back to the FPs. The feed back system would be web-based and can be used across different doctors and different hospitals.

B.5 Interviews

B.5.1 Vikramaditya Prabhudesai

Q: How do you usually prescribe diagnosis currently? How much time does it usually take for diagnosing 1 patient?

A: We generally diagnose by looking at images of patients' affected areas. It is basically pattern recognition. You see an image and make the findings, then you make a diagnosis. It could take anywhere between 10 mins to a couple of hours depending on what kind it is.

Q: What technologies do you use currently?

A: Everything we do is based on technology. All the scans are acquired by modern imaging machines and we are looking the images/reports at PACS system and even the data manipulation is on the computer, so technology is pretty much into everything. Q: Do you feel, technology in medical field lacking behind in terms of progress?

A: We are doing things based on technologies what are available to us. There are some technologies in other countries like UK or US, but that's not available in Canada due to licensing issues. Here, they do not want to enter into any sort of complications. Sometimes, we do not have access to high end technologies as these things cost a lot of money, maybe in millions of dollars. Technology changes every week, but we cannot have all the new technologies in every few weeks and months. It's not possible to change thousands of hardware in a hospital every year.

[Explaining the concept of MediReason PDS]

Q: Are there any technology currently doing similar tasks? What happens if you are unsure of a specific issue during diagnosis?

Yes, currently there are systems that are doing diagnosis of certain things, but they do not solve all problems. Generally, I ask a colleague or do a Google search and there are lots of researches on our professional body as well. We have PubMed, which is an index of all medical journals, where you can have relevant information, but you have to pay for it.

Q: Do think our idea can possible alleviate any of your problems? What problems do you face?

A: Yes, if can come up with a technological solutions which can put together A+B and direct towards C, then certainly it might be useful. I am sure doctors will be able to use this, if it fits within their budget. There are lots of permutations and combinations in diagnosis; you have to take care of all of those two pages of history of the patient. It would be certainly helpful with family physicians and emergencies, where you can quickly diagnose a condition. You can also have it designed for someone who is computer literate but not necessarily the doctor, then that report is given to the physician, it will reduce his time of asking the question. Like he would already have the report generated by the patients, and he could go through quickly and the doctor just confirms everything, then that could be faster.

Q: If you want to put a cost on our system, what should the ideal cost be? What would our system ideally be worth?

A: We should see how much time it saves for a doctor. If it saves a significant time, that should be the cost of it. For e.g., a physician generally charges \$100-200 an hour, so if it saves them an hour, it should be worth 200 bucks an hour.

Q: Any suggestions or improvements for our idea?

A: You should aim towards nurses or medical personnel who could fill in the questionnaire and the system would automatically come up with a differential diagnosis or a list of tests. Then they can have a physician look at it and validate it. After a diagnosis by the system in an hour or so, the doctor would probably spend five minutes to confirm the report. And if they spend just 5 mins, then the hour what the system has saved would be really worth for them. Otherwise, they would have to spent an hour for diagnosis and now they could cut it down to 5-10 mins.

B.5.2 Dr. Hassan Sarwar

Q: What is your current workflow? Does technology fit into your workflow in any way?

A: I can certainly give you a picture of what kind of environment we have. Most of my work is done on pen and paper. But there are some records about the patient that are available through workstation. We do not have enough workstations that's why I prefer pen and paper. One of the biggest problem we have is not everything is integrated. There are some parts of the patient records that are not available through the

workstation. I write everything by hand. Sometimes the staffs enter the things I have written by hand into the system. But as far as my work goes, I do not use computer much in my work environment.

Medical imaging like radiology and x-rays are available through the workstation. MRI and X-Ray are digitized. We have a radiology department and any order automatically goes to that department. X-Rays are done immediately but MRI may take an hour. Usually all tests can be done within our medical facility and in short time but tests that are done outside our medical facility may take more time.

Q: What are your pain points? Are there any tasks that you feel slow you down or are difficult to do? Can you tell me about them?

Everything is not integrated. You have to go to several places to get information about patient. Some information is in chart, paper or not in computer. Most workstations are busy and we do not have enough of them. If we can use an I pad and WIFI to get these information then it would be nice. But lack of availability of information in my workplace is my main pain point. But you have to comply with HIPAA and privacy of information as US is very strict about patient information. Currently we do not even have WIFI in our work place at least not everywhere.

Q: What type of technology do you interact with on a daily basis? Can you imagine it fitting into your practice/diagnosis in any way?

A: Enterprise softwares related to medical technology contains information on health insurance, physical exam, cardiogram, blood pressure and other necessary info. We have real-time monitoring system that gives real-time patient info but that is not connected with the information system we have.

Q: Healthcare seems to be moving in the direction of integrating technology into patient care. How do you feel about this, and can you comment on the opinions of your peers?

A: Accuracy will be a big problem in any kind of decision support system the final judgement must be taken by the doctor but if you can narrow down the choices then that can be a big help. Any technology that reduces time can be acceptable in the workflow but that kind of technology is not out there yet. Older physicians who are 55 or older are not too comfortable with this kind of technology, but the younger generation of doctors like the use of technology in their workplace and I hope they will be more encouraging with your initiatives.

B.5.3 Elena Zakalinskaya

Q: How does your current diagnostic and prescription system work?

A: Family physicians collect subjective (what patients says) and objective (what doctors observe) data and then send the patient to the lab to obtain different lab values such as X-Rays, blood work, ultra sound, MRI, etc. If the symptoms are obvious then a family physician may skip the tests and just prescribe a medication. Based on all the lab results the patient is then sent to a specialist. In some cases a specialist may require additional lab tests. Based on all the above results, he can diagnose the patient or he may need second opinion if the case is very complicated. They send you to another specialist for second opinion. It can therefore become a collaborative process.

Q: What are the problems faced you face in ordering or prescribing diagnostics?

A: Family physicians may not know what tests you require and they may send you for tests that may not be applicable for your situation. Patients may complain about a problem that may be misconceived to be a different problem. A FP must think critically while connecting points from objective and subjective data in order to request the right diagnosis tests. Some FPs are reluctant to schedule tests such as MRI or CT Scan or other expensive tests as they think that patients do not really need it and it will be an unnecessary

cost to the healthcare. FP have to bill healthcare for the requested tests who may audit the physician if they suspect too many expensive tests being ordered and may even deny payment to the physician for those tests. Secondly a physician may earn miniscule amount for performing certain tests (e.g. Pap smear) therefore they may not even perform them.

Q: How does technology fit into your workflow?

A: While requesting tests a FP fills out an electronic form with pre-filled test request. He then signs the form and fills the patient's information and then faxes it to the lab or the hospital. All the lab results are in digital format. These results are printed and faxed back to the doctor. To measure blood sugar, blood pressure, temperature, oxygen saturation and heart rate digital equipment are being used. Not only this equipment can measure the entities, it can also identify the patient and the person performing the tests via scanning patient bracelet and nurses' punched code and saves the result of the tests digitally.

Q: How do you perceive technology used in diagnosis recommendations?

A: Doctors like to use technological solutions. They agree that diagnostics obtained by digital equipment is far superior and less error prone, paper less, saves time as compared to manual testing. The results are easier to read and comprehend and send via email. For urgent situations technology can really come to aid. Even older generation of physicians are getting tech savvy as they understand the value of technology. While for some doctors learning technology may be a learning curve, once accomplished they clearly love the advantage. Doctors are using more organic way of interacting with computer such as using Dictaphone to transform the results of the tests from speech to electronic text.

[Explaining the concept of MediReason PDS]

Q: Does it alleviate any of the pains? How will other doctors perceive our system?

A: For this system to be effective, the PDS database needs to be a super database of all possible medical conditions. It may take many years and efforts from many doctors with different specialties to create this database and still it may have gaps and may not be precise. While a machine can provide you with some possibilities, it lacks critical thinking that is present in humans. It may be cost exhaustive to create such a database. Moreover the symptoms may overlap with many possible conditions. A good judgment in such a scenario requires human intervention. A doctor may not fully rely on the system and nor can a patient. A simple mistake may cost a life and may cause legal implication for the physician. A wrong medication / diagnosis may cost a life and may cost physician his license never the less. It will be of help if would not be that expensive to create it. It's just massive and too complex to be left for a machine.

Q: How comfortable are you with using this and other technology?

A: I would use it but I would never make any final decision based on this system. If my opinion differs from that of this system, I would trust my opinion as I know how to back it up if I am required to do so. If I am asked in a court on how I arrived to this diagnosis and I say I chose one of the possible recommendations from this system, my license will be revoked and I shall be imprisoned. A doctor uses his critical thinking and ability to connect the dots to come to conclusions which a machine cannot. Many doctors know from objective and subjective data what a condition might be and what to prescribe. They don't need this system to tell them what to do. This system can be used by students who are currently studying medicine. Moreover such a system could be good for nursing science since the database is much less and diagnostics are limited and it is not the final diagnostics for the patients but rather an assessment that a doctor may want to see. Nurses are exposed to a larger surface area of general symptoms that are not narrowed down to a particular problem. Nurses do not base their diagnosis based on lab and cannot extrapolate results to a possible condition. Family doctor may find it unnecessary toy that may bring little or no benefit for the money and effort spent. But for nurses it can be a helpful tool for doing initial assessment.

Q: How much time do you spend with patients? How will it improve by using our system?

A: On an average, from 5 to 15 minutes but with this system it may take longer because they need to punch the information and wait for system to compute and display results. Results may be massive in number or hundreds of diseases may have common symptom so even if there is one symptom it may not be helpful at all.

B.5.4 Dr. D. Sarma

Q: What is the current work flow and does technology fit in the current workflow? What is the duration of per patient? What is the process of seeing the patients?

A: I am a neuro-radiologist. My workflow is reading MRIs and CT scans. I also do interventional neuro-radiology which means, I treat patients with disorders related to brain and spine using minimal invasive method. I see a limited number of patients who have severe conditions like bleeding inside head and aneurysm. I treat the aneurysm with minimal invasive methods called coiling. If a patient has artery blockage, I use angioplasty to treat them. I generally see a referred patient, when they are initially seen by a family physician and then sent to me. When I first see a patient, I require half an hour. Generally the time varies between 10 mins to half an hour.

Q: What technological solutions do you have currently? What are your pain points in terms of technology in treating the patients?

A: We have a RIS system and a PACS system. PACS is patient archival system, where MR, CTs and angiograms are stored. And secondly, there is a RIS system, which is the informatics system where all the patients' records are stored, and where I put in my records, procedures and findings. The doctor stores recordings about a certain patient and diagnosis and differential diagnosis which goes into RIS. That's the most frequent use of technology. A lot of time, I use technology specific to my speciality which would be the MRI machine, the CT scan machine, angiography suite. There are a whole range of instruments. All doctors use the RIS system. The entire patient records are kept in the RIS system, which is a web based secured system. If the system is slow or if it fails, that hampers workflow for sure. In our hospital, we have a very old system which is in process of being replaced in next 1-2 years. Yes, we have difficulties with technology and technology is not perfect as far as I am concerned.

[The doctor showed us the PACS, RIS and voice recognition system and how they work]

Q: We feel that technology is not catching up in healthcare. Is that correct? Do you feel there should be an upgrade of technology?

A: It is certainly correct for my hospital. Each hospital has a separate system and specific systems are not connected to each other. Our system was bought more than 10 years back. So, for my hospital, certainly, but it is different for each hospital province wide.

Q: What happens if the records are needed in different hospitals?

A: Patients requests for records. Physicians send printed records except for MRs, CTs, X-rays which are sent over a CD. Hospitals do not speak to each other.

Q: Are the newest systems available in current times able to solve the problems?

A: In our technology dependant sub-speciality, we are at the cutting edge of technology of what I do. Still, we always have a wish list which we reciprocate to the companies, they go back and in couple of months, they come up with implementations of the ideas. But, that does not apply to most areas of healthcare. We certainly need more and more, but technology hasn't reached there so far as to provide us.

Q: What is the system of management of hospitals in Ontario? How does technology seep in the hospitals?

A: The hospital management are private and are not related to the government. They bill the government based on patient records. Doctors can ask for a certain technology or management can think that a particular technology is beneficial, so it can work over both ways. Even government can implement a technology and provide funds for it.

[Explaining the concept of MediReason PDS]

Q: Do you have a system which supports your decision making? How much does it cost?

A: We do have a system for assistance, where I can search for a specific term like 'Ring Lesion' and then I can search for area affected for e.g.: brain or spine. I can keep searching until I can find what matches. The system is StatDx and the company that produce is Amirsys. The information is just for refreshing certain concepts, but it needs years of experience and knowledge to diagnose a problem, you cannot rely on technology. But yes, technology certainly helps. StatDx costs \$2,000/doctor a year, based on license and secured access. For hospital wide usage, it will cost a way more than that, but will cost less for individual doctor. I also use static online books with search function for referral which is quite convenient. The books are pretty expensive, cost me more than \$2000, but after buying once, they become yours forever. I prefer permanent solution instead of licensing, even though they become obsolete after a couple of years.

[He also showed the array of online books and journals he uses to access support materials]

Q: Do you think our system would solve some of your pains?

A: It is a noble solution. Many of the pharmacists and nurse can treat the patients who do not require advanced medication. If we knew in advance what a patient might be having, it would have been certainly easier to treat them. Technology has a huge role in keeping doctors updated and informed. Technology is a big role in motivating the patients to lead a healthier lifestyle. Clinical sense of doctors is very very important. You cannot rely on technology to do the diagnosis as it not easy to diagnose. There are lots of symptoms which overlap. You cannot replace a well trained doctor with a technological system, but surely, for assisting doctors, your system could play a big role.

Q: How much do you think our system would worth be?

A: If it can focus on information and it shows relevant information to my technology and is very comprehensive, then I am sure people would be willing to pay more than that (\$2000 a yr).

Q: Any suggestions/amendments/improvements you would like to suggest?

A: I think the whole point would be to provide quality content, number one. Content has to 100% reliable and very accurate. If doctors are using it, they would have 25 years of knowledge already, so on top of that, if they are using the system, it has to be something very good. Number two: the system should have an efficient search function so that you could quickly get to it. It should be very focussed on the target audience, i.e. family physicians.

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