

TOWARDS AN ADAPTED PERFORMANCE MEASUREMENT MODEL FOR HEALTH IT ENTERPRISES

MOHAMMADI RÉZA¹ & GUERRERO ISABELLE¹

¹ University of Montpellier, MRM Montpellier Research Management, Montpellier, France, e-mail: reza.mohammadi@umontpellier.fr, isabelle.guerrero@umontpellier.fr

Abstract With advances in technology and public access to health IT innovations, a prosperous market of e-health products and services is created which attracts a lot of investments. However, the success rate of so many startups is low and they do not survive in this competitive and highly-regulated market. There should be a strategic performance measurement model to guide health IT SMEs and startups because the models applied in other fields do not necessarily work to measure strategic performance of health IT enterprises.

By reviewing previous evaluations in the existing literature which have been applied to this field such as balanced scorecard and IS success model, this paper intends to develop a strategic performance model adaptable to the context and complications of health IT taking into account all the stakeholders involved.

Ključne besede:

e-health,
health
IT,
startup,
evaluation,
balanced
scorecard,
IS
success
model.

1 Introduction

The expansion of digital tools has created a transformation in healthcare systems (Agarwal, Gao, DesRoches, & Jha, 2010; Kohli & Tan, 2016; Tian et al., 2014) and public accessibility to internet and health IT systems has resulted in a great change in the way healthcare is delivered (Reardon & Davidson, 2007). The popularity of health applications for smartphones and connected objects is the reason for a great amount of investment in this dynamic sector. This trend has resulted in a huge investment in all health IT domains and creation of a prosperous market for SMEs and startups to commercialize their technological innovations in form of services and products (Kelley, Chiasson, Downey, & Pacaud, 2011; Reardon & Davidson, 2007).

Despite increasing prosperity of this market with investments in billions of dollars, there is no consent among public authorities, industrialists, representatives of patients and health experts about long-term success of enterprises involved in technologies of health (Hardiker & Grant, 2011; Kohli & Tan, 2016; Lapointe, Mignerat, & Vedel, 2011; Lemire, 2010). There are so many startups created each year in this competitive market with low survival rates of less than three years. The reason behind uncertainty of success could come from the multitude of stakeholders in the market of health technology with different and often contradictory requirements (Kohli & Tan, 2016) and the satisfaction of all different needs is very challenging. Due to these complications, the rate of success in this market is quite low and new startups and SMEs show up rapidly in the market and provide the patients with lots of applications, connected objects and services; whereas, with the same rapidity, they fade away and their products and services are abandoned (N. Connell & T. Young, 2007; Lorden, Coustasse, & Singh, 2008; Maiga & Jacobs, 2003).

Although developing a comprehensive and accurate assessment tool for health IT is important to have a good understanding of dynamics of market, the creation of this evaluation tool is very challenging. Firstly, the speed of change, evolution and transformation in health technology is very considerable. New SMEs and startups are constantly created and they immediately launch many health IT projects, products and interventions in the market (N. A. D. Connell & T. P. Young, 2007) which is too fast for researchers to evaluate their potential risks and dangers. Thus, a good measurement tool should be able to catch up with rapid evolution of

technological innovations in health. Secondly, a good evaluation tool should take all stakeholders into consideration. There are patients as the final users of the products and services along with their family members or caretakers who serve as a proxy (Kohli & Tan, 2016). Providers are another part of stakeholders including hospitals, physicians, and others who assist in direct patient care such as nurses. Purveyors, defined as custodians or keepers of health data (N. A. D. Connell & T. P. Young, 2007; Hardiker & Grant, 2011) constitute the third party of stakeholders. Providers and patients frequently serve as data source of purveyors and health IT startups and SMEs which deal with patient data are considered to be in this category. Each stakeholder has unique concerns and goals that are often in conflict with others. (Kohli & Tan, 2016).

2 Research Question

The importance of development of a comprehensive evaluation tool to assess the performance of enterprises which supply and launch health IT projects, objects and services is clear. Prior research includes several evaluations in health IT entrepreneurship, but none of the studies in existing literature provides a comprehensive model of performance measurement to take into account all stakeholders involved; therefore, the problematic of this research will be

How a strategic performance measurement could be created to evaluate the performance of health IT startups to take into account the context, complications and all involved stakeholders of health IT innovations, services and products?

Answering this question can contribute to the existing literature by creating a strategic performance measurement adaptable to health IT as a new emergent market with high failure rate of startups and SMEs.

3 Conceptual Background and Prior Research

Kaplan and Norton developed a comprehensive research model in 1990s which inherently makes use of strategic and operational considerations (Aidemark, 2010; Cleven, Mettler, Rohner, & Winter, 2016; R. S. Kaplan & Norton, 2004a). They argued that previous models were majorly based on financial accounting measures

and that caused an incomplete measurement of a business performance (Aidemark, 2010; Demartini & Trucco, 2017; R. S. Kaplan & Norton, 2004b; Messegheem, Bakkali, Sammut, & Swalhi, 2018; Schalm, 2008). They developed a multidimensional framework for measuring and managing organizational performance with comprehensive criteria to assess customer, internal process and learning. (R. S. Kaplan & Norton, 2004a, 2004b). In this line, BSC complements financial measures with operational measures on three dimensions: customer satisfaction, internal processes, and organization's innovation and learning (Chow, Ganulin, Haddad, & Williamson, 1998; Lorden et al., 2008; Naranjo-Gil, 2009). Therefore, BSC is considered a management system rather than a simple measurement system because it provides strategic guidance toward strategy implementation (R. S. Kaplan & Norton, 2004b; Naranjo-Gil, 2009; Wu & Chang, 2012; Zelman, Pink, & Matthias, 2003).

Having been largely applied and adapted in so many sectors, BSC gradually found its place in healthcare domain and it is now adopted by a broad range of health care organizations, including national health care organizations. (Gurd & Gao, 2008; Zelman et al., 2003). In spite of extensive applications of BSC in healthcare, there are complications to adapt BSC to this field. Firstly, BSC is a conceptual tool (Sasse, 2005), and its four perspectives are not always adaptable to all domains (M. Kaplan, 1988). In particular, due to unique characteristics of healthcare industry, BSC is difficult to get adapted to this field. (Gurd & Gao, 2008) For example, physicians, as major stakeholders, regard for themselves an absolute authority and superiority in the whole healthcare process (Lapointe et al., 2011; Zelman et al., 2003). The patients' access to health IT devices and services has empowered them to learn more about their health conditions, take more responsibilities to manage their health, communicate more effectively and efficiently between visits, and ultimately be an actor in the healthcare process (Kohli & Tan, 2016; Lemire, 2010). However, physicians tend to stick to traditional models which regard patients as subordinate and passive which makes it difficult to substitute the patient with customer in BSC. (Gurd & Gao, 2008; Niven, 2008).

Secondly, the most important defect of BSC is its framework which shows a cause-and-effect relationships among the four perspectives. (Cleven et al., 2016; Wu & Chang, 2012). In this hierarchical structure learning and growth perspective is defined in bottom and financial perspective at the top. This is not adapted to health

IT entrepreneurship because in this field the quality of care is as important as financial outcomes and they should be evaluated at the same level to measure performance. Additionally, different stakeholders are involved in health IT innovations with complicated relationships and sometimes contradictory needs and an antecedent to this model should be taken into account to discover these relationships.

Since the context of this study is health IT entrepreneurship, two constructs should be taken into consideration along with financial perspectives and both these constructs are ignored in BSC. Firstly, health results or *quality of care* as the context is healthcare and secondly, *IS effectiveness* as information technology is the core of health technological innovations. We intend to measure *IS effectiveness* construct (adopted from DeLone & McLean IS success model) as an antecedent of competitiveness and *quality of care* along with financial outcome at performance level. To do this, we should overcome the cause-and-effect nature of BSC with some modifications and our proposed research model is shown in Figure 1:

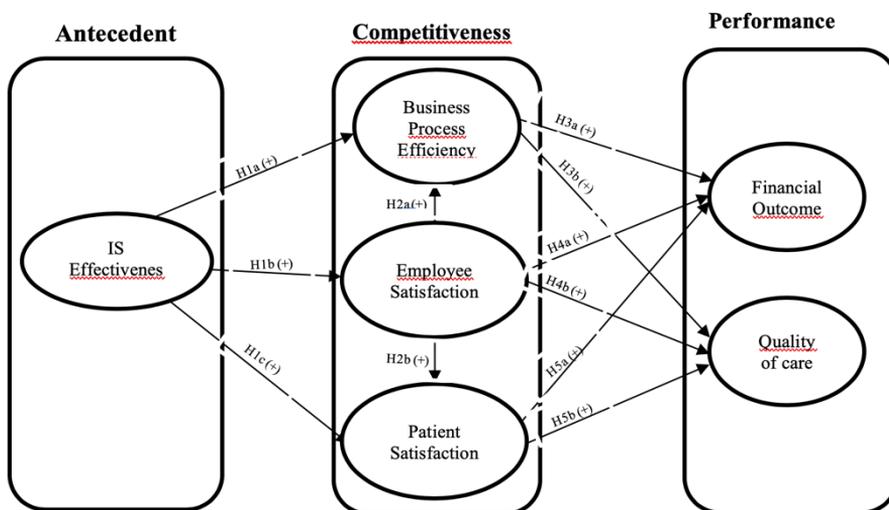


Figure 1: Proposed research model based on BSC

By changing cause-effect-relationship, this proposed model has divided the constructs into three levels of antecedents, competitiveness and performance.

At *competitiveness* level and its antecedent, **IS effectiveness** is supposed to be antecedent of competitiveness, giving health IT startups competitive advantage and value to increase their **patient & employee satisfaction** and improve their **business process efficiency**.

At *performance* level, the impact of each construct of competitiveness is going to be investigated firstly on **financial outcome** constructs, as a vital factor for investor satisfaction as well as startup survival. Secondly, the impact of each construct at *competitiveness* level will be investigated on the **quality of care** construct, as the main objective of health industry.

The definitions of all constructs are given in table 1. and regarding the complexity of stakeholders, each construct represents one party involved.

Table 1: Definitions of model constructs

Construct	Definition
IS effectiveness	IS effectiveness (ISE) construct measures the organizational and individual impact of information systems.
Patient Satisfaction	Patient satisfaction (PS) construct measures the degree to which patients and customers of health IT startups are satisfied, feel adequately treated, and do not complain.
Employee Satisfaction	Employee Satisfaction (ES) construct measures the degree to which a health IT startup's entire workforce is competent and at the same time, satisfied of its working conditions
Financial outcome	Financial outcome (FO) construct reflects the degree to which a health IT startup is able to generate revenues to finance future investments, make its process costs as low as possible and the overall cost level of its products and services competitive
Business process efficiency	Business process efficiency (BPE) construct evaluates the effectiveness of various processes for producing, commercializing and marketing of innovative products.
Quality of care	Quality of care (QC) construct is designed to measure concrete and direct outcomes of health IT innovations on health and well-being of user.

The following hypotheses are going to be tested in this research:

Hypothesis 1a: IS effectiveness is expected to have a positive effect on business process efficiency.

Hypothesis 1b: IS effectiveness is expected to have a positive effect on employee satisfaction.

Hypothesis 1c: IS effectiveness is expected to have a positive effect on patient satisfaction.

Hypothesis 2a: Employee satisfaction is expected to have a positive effect on business process efficiency.

Hypothesis 2b: Employee satisfaction is expected to have a positive effect on patient satisfaction.

Hypothesis 3a: Business process efficiency is expected to have a positive effect on financial outcome.

Hypothesis 3b: Business process efficiency is expected to have a positive effect on quality of care.

Hypothesis 4a: Employee satisfaction is expected to have a positive effect on financial outcome.

Hypothesis 4b: Employee satisfaction is expected to have a positive effect on quality of care.

Hypothesis 5a: Patient satisfaction is expected to have a positive effect on financial outcome.

Hypothesis 5b: Patient satisfaction is expected to have a positive effect on quality of care.

Study Context

Prior to this study, an observatory has been created to track more than 200 health IT enterprises in Occitanie region in South of France. (based on the definition of health IT given earlier). This observatory will serve as the fieldwork of this study and our hypotheses are going to be tested on this specific context; however, we target only health IT startups (based on the definition of startups given earlier) which constitute nearly 45% of Occitanie enterprises.

Among different types of enterprises in our fieldwork, we choose to concentrate on startups. The first reason for this choice is the great capacity of startups to be created quickly and use the capabilities of technological innovation to satisfy the needs of a growing market. (Beaulieu & Lehoux, 2017; Muhos, Saarela, Foit, & Rasochova, 2019; Wagrell & Baraldi, 2019). Startups, thanks to their structure, have a great potential to challenge the traditional healthcare service industry by introducing radical and sustainable innovations of technology. (Filson & Oweis, 2010; Muhos et al., 2019; Russell, 2015; Wagrell & Baraldi, 2019). The second reason for our choice of startups is obtaining a homogeneous sample to obtain generalizable results and thereby increase the external validity of this research.

Health IT startups of our fieldwork are involved in launching different technological innovations in form of health IT objects products and services which are categorized in appendix 1 as mobile applications, connected objects, clouds for health data, robots, online services like telemedicine. The users of the health IT startups are classified as all public (looking for improvement of health status and health indicators) general patients, patients of one specific disease, healthcare professionals, pharmacists, physicians, pharmaceutical laboratories and hospitals. As investors are important concerns of startups, we identified different investors at national and regional levels for health IT startups of Occitanie region in South of France such as Business Angels, the funds of capital risk, banks, venture capital mutual funds (FCPR) etc.

References

- Agarwal, R., Gao, G., DesRoches, C., & Jha, A. K. (2010). Research commentary—The digital transformation of healthcare: Current status and the road ahead. *Information Systems Research*, 21(4), 796-809.
- Aidemark, L. G. (2010). Cooperation and competition: balanced scorecard and hospital privatization. *International journal of health care quality assurance*.
- Beaulieu, M., & Lehoux, P. (2017). The emergence of health technology firms through their sensegiving activities and competitive actions. *International Journal of Innovation Management*, 21(06), 1750043.
- Chow, C. W., Ganulin, D., Haddad, K., & Williamson, J. (1998). The balanced scorecard: a potent tool for energizing and focusing healthcare organization management. *Journal of Healthcare Management*, 43(3), 263.
- Cleven, A., Mettler, T., Rohner, P., & Winter, R. (2016). Healthcare quality innovation and performance through process orientation: Evidence from general hospitals in Switzerland. *Technological Forecasting and Social Change*, 113, 386-395.
- Connell, N., & Young, T. (2007). Evaluating healthcare information systems through an "enterprise" perspective. *Information & Management*, 44(4), 433-440.
- Connell, N. A. D., & Young, T. P. (2007). Evaluating healthcare information systems through an "enterprise" perspective. *Information & Management*, 44(4), 433-440. doi:10.1016/j.im.2007.04.002
- Demartini, C., & Trucco, S. (2017). Are performance measurement systems useful? Perceptions from health care. *BMC health services research*, 17(1), 96.
- Filson, D., & Oweis, A. (2010). The impacts of the rise of Paragraph IV challenges on startup alliance formation and firm value in the pharmaceutical industry. *Journal of health economics*, 29(4), 575-584.
- Gurd, B., & Gao, T. (2008). Lives in the balance: an analysis of the balanced scorecard (BSC) in healthcare organizations. *International Journal of Productivity and Performance Management*.
- Hardiker, N. R., & Grant, M. J. (2011). Factors that influence public engagement with eHealth: A literature review. *International Journal of Medical Informatics*, 80(1), 1-12. doi:10.1016/j.ijmedinf.2010.10.017
- Kaplan, M. (1988). *M Performance*.
- Kaplan, R. S., & Norton, D. P. (2004a). Measuring the strategic readiness of intangible assets. *Harvard business review*, 82(2), 52-63.
- Kaplan, R. S., & Norton, D. P. (2004b). The strategy map: guide to aligning intangible assets. *Strategy & leadership*.
- Kelley, H., Chiasson, M., Downey, A., & Pacaud, D. (2011). The Clinical Impact of eHealth on the Self-Management of Diabetes: A Double Adoption Perspective. *Journal of the Association for Information Systems*, 12(3), 208-234. Retrieved from <Go to ISI>://WOS:000294993500001
- Kohli, R., & Tan, S. S.-L. (2016). Electronic health records: how can IS researchers contribute to transforming healthcare? *Mis Quarterly*, 40(3), 553-573.
- Lapointe, L., Mignerat, M., & Vedel, I. (2011). The IT productivity paradox in health: A stakeholder's perspective. *International Journal of Medical Informatics*, 80(2), 102-115. doi:10.1016/j.ijmedinf.2010.11.004
- Lemire, M. (2010). What can be expected of information and communication technologies in terms of patient empowerment in health? *Journal of health organization and management*.
- Lorden, A., Coustasse, A., & Singh, K. P. (2008). The balanced scorecard framework-A case study of patient and employee satisfaction: What happens when it does not work as planned? *Health care management review*, 33(2), 145-155.
- Maiga, A. S., & Jacobs, F. A. (2003). Balanced scorecard, activity-based costing and company performance: an empirical analysis. *Journal of Managerial Issues*, 283-301.

- Messeghem, K., Bakkali, C., Sammut, S., & Swalhi, A. (2018). Measuring nonprofit incubator performance: Toward an adapted balanced scorecard approach. *Journal of Small Business Management*, 56(4), 658-680.
- Muhos, M., Saarela, M., Foit, D., & Rasochova, L. (2019). Management priorities of digital health service start-ups in California. *International Entrepreneurship and Management Journal*, 15(1), 43-62.
- Naranjo-Gil, D. (2009). Strategic performance in hospitals: The use of the balanced scorecard by nurse managers. *Health care management review*, 34(2), 161-170.
- Niven, P. R. (2008). *Balanced scorecard: Step-by-step for government and nonprofit agencies*: John Wiley & Sons.
- Reardon, J. L., & Davidson, E. (2007). An organizational learning perspective on the assimilation of electronic medical records among small physician practices. *European Journal of Information Systems*, 16(6), 681-694.
- Russell, S. (2015). Investor Drought And Regulatory Headwinds Slow Device Innovation. In Sasse, C. (2005). A literature review on the balanced scorecard's impact on performance. LeaderPoint, available at: www.leaderpoint.biz (accessed 24 May 2005).
- Schalm, C. (2008). Implementing a balanced scorecard as a strategic management tool in a long-term care organization. In: SAGE Publications Sage UK: London, England.
- Tian, K., Sautter, P., Fisher, D., Fischbach, S., Luna-Nevarez, C., Boberg, K., . . . Vann, R. (2014). Transforming health care: Empowering therapeutic communities through technology-enhanced narratives. *Journal of Consumer Research*, 41(2), 237-260.
- Wagrell, S., & Baraldi, E. (2019). The joys and sorrows of a start-up's interactions with the public sphere: a case from medical technology. *Journal of Business & Industrial Marketing*.
- Wu, L., & Chang, C.-H. (2012). Using the balanced scorecard in assessing the performance of e-SCM diffusion: A multi-stage perspective. *Decision Support Systems*, 52(2), 474-485.
- Zelman, W. N., Pink, G. H., & Matthias, C. B. (2003). Use of the balanced scorecard in health care. *J Health Care Finance*, 29(4), 1-16. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/12908650>