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Olugbenga A. Adenuga

*Tshwane University of Technology*, [adenugaakeem@gmail.com](mailto:adenugaakeem@gmail.com)

Pieter Pretorius

*Tshwane University of Technology*, [PretoriusP@tut.ac.za](mailto:PretoriusP@tut.ac.za)

Oladeji O. Akinfenwa

*Ressuct Centre for Skills Development*, [Oladeji.olawumi@ressuctcollege.co.za](mailto:Oladeji.olawumi@ressuctcollege.co.za)

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**Olugbenga A Adenuga**  
Department of Informatics  
Tshwane University of Technology  
adenugaakeem@gmail.com

**Pieter Pretorius**  
Department of Informatics  
Tshwane University of Technology  
PretoriusP@tut.ac.za

**Oladeji O Akinfenwa**  
Ressuct Centre for Skills Development  
Oladeji.olawumi@ressuctcollege.co.za

# A MODEL OF COMPETITIVE INTELLIGENCE FOR e-Health TECHNOLOGIES

## ABSTRACT

*Competitive intelligence is an important part in enterprises' competitive strategy and decision support. It entails the collection of data, analyzing the data and delivering the analyzed data by means of available information on the behavior outside the organization. The study is based on research where competitive intelligence has been explored. The study also reviews e-Health technology and its impact.*

*A proposed model is developed from Technology, Organization and Environment (TOE) framework for competitive intelligence for e-Health technologies. Subsequently, efforts made extend to elaborate on the construct, measurement items, hypotheses and research questions which will be used in the validation of the framework. Future work will use confirmatory factor analysis to reduce the variables from the constructs and Structure Equation Modeling (SEM) will also be used for the reliability and the validity of the construct of the framework.*

## Keywords

Competitive intelligence, e-Health, Technology Organization and Environment framework.

## INTRODUCTION

Competitive intelligence entails the collection of data, analyzing the data and delivering the analyzed data by means of available information on the behavior outside the organization. Competitive intelligence has been utilized in the business system in order to improve R&D effectiveness, to support management decisions, and to provide early advice on threats to an organization (Song and Zhang, 2012; Wang, Zhao and Zhang, 2011). Competitive intelligence is an indispensable tool in gaining an edge in a competitive organizational environment. However, the strategy of competitive intelligence has become an essential tool for an organization's existence.

Obtaining immeasurable quantities of information does not guarantee successful competitive intelligence – it requires skills in collecting appropriate information, analyzing the information, and attracting the attention of corporate decision-makers. This is a challenge, not only to business but also in healthcare. The problems associated with healthcare industries are inequalities in healthcare status, quality of healthcare delivery, and a shortage of healthcare professionals (Baroud, 2008). In addition, healthcare information is collected haphazardly and irregularly, thus, rendering collected information incomplete and unreliable (Odhiambo-Otieno, 2005). This paper is concerned with the benefit and effect of competitive intelligence as an enabler to e-Health technologies' success.

This paper proposes a model of competitive intelligence for e-Health technologies based on the idea from literatures and on the constructs and measurement items of Technology, Organization and Environment (TOE) framework.

The subsequent section in the paper describes related study on the framework, while the section that follows presents the proposed model of competitive intelligence for e-Health technologies and the conclusion is drawn in the last section.

## RELATED STUDY ON COMPETITIVE INTELLIGENCE

Ding's (2009) study explores the increasing role of CI (competitive intelligence) in today's business management and some practical aspects of how this new concept could be implemented and used. His effort investigates hypercompetition, where too many businesses are pursuing too little business – when there is not enough demand to go around for all providers of goods and services. In such a situation, the success of the business can be directly related to the quality of decisions made by management. Jing-yan, Huang and Zhang's (2012) study is on Marketing Dynamic Tracking and Competitive Intelligence Collecting Based on Mobile Communication Technology. In their study, they introduce a new system of marketing dynamic tracking and competitive intelligence collecting based on mobile communication technology; system architecture and software function framework are discussed in detail. The outcome of this study can enable enterprises to identify at an early stage opportunities or threats, reduce market reaction time, enhance enterprise advantage in severe market competition; and marketing strategy could be implemented effectively (Jing-yan et al., 2012; Xianjin and Feng, 2009).

Haiying and Na (2011) developed a model strategic process, and competitive intelligence process of universities; their study is based on how to conduct strategic management for universities, combined with the changing environment the universities are faced with as well as its own characteristics and the actual condition. In geospatial intelligence, Othenin-Girard, Caron and Guillemette (2011) argue that an enterprise may be able to improve its competitive position by developing a better understanding of the value of its data, and competitive intelligence may prove very useful in this regard. The study identifies the key criteria and dimensions and then determines the most promising approaches. The outcome demonstrates that geospatial intelligence may serve competitive intelligence by improving and integrating certain dimensions of competitive analyses, and, in the process, efficiently identify business opportunities.

Xiang-jun, Hong-na and Li-wen's (2009) research on competitive intelligence is on enterprise collection system based on cross-language information retrieval. The research emphasizes the need for enterprise competitive intelligence and the problem of the traditional competitive intelligence collection. Guo (2008) observed that competitive intelligence system of Chinese enterprises is made from the following four aspects: information demand, organization demand, technology demand and harmony demand. In addition, Guo (2008) designed the framework model of the competitive intelligence system, the organization model, layer structure model, functional modules model, data flow model, network structure model and platform management rules for Chinese enterprises.

## Studies on e-Health

e-Health application to healthcare can be felt in treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health (Kwankam, 2004). e-Health is an all-encompassing term for the combined use in the health sector of electronic information and communication technology (ICT) for clinical, educational, research and administrative purposes – both at the local site and at a distance. It lies at the intersection of medical informatics, public health and business. Numerous studies have been painstakingly considered in this area of research in information technology and in the healthcare industry that discusses the needs and expectations of stakeholders from the technical implementation point of views (Gupta, Keren, Samia and Agrawal, 2004; Lee and Kwak, 2011; Nauert, 2005; Trimmer, Pumphrey and Wiggins, 2002; Jenkins and Christenson, 2001; Khoubati et al., 2006; Poba-Nzaou, Raymond, Uwizyemungu and Pare, 2012), and found that stakeholders' views on both the healthcare and e-Health was substantial to the decisions in investing in e-Health technologies (Suebsin and Gerdri, 2010; Ahsan, Shah and Kingston, 2010).

## What is eHealth technologies?

WHO, 2005 initiative on new technologies in health care describes eHealth as the use of Information and Communication Technologies (ICT) for health. eHealth application to health care can be felt in the treating of patients, in conducting research, educating the health workforce, tracking diseases and monitoring public health. The resolution of 58<sup>th</sup> World Health Assembly on eHealth works with partners at the global, regional and country level to promote and strengthen the use of information and communication technologies in health development, from applications in the field to global governance. The unit is based in the department of knowledge management and sharing, in the cluster of innovation, information, evidence and research. Kwankam (2004) portray e-Health as all-encompassing term for the combined use in the health sector of electronic information and communication technology (ICT) for clinical, educational, research and administrative purposes, both at the local site and at a distance. It lies at the intersection of medical informatics, public health and business.

### **The need for e-Health competitive intelligence and decision making**

Healthcare organizations are complex, unique, and information intensive, which differs from other types of organizations in many aspects (Chang et al., 2007; Jenkins and Christenson, 2001). Typically, healthcare institutions are often recognized as quality-focused and community-served rather than profit-seeking organizations.

However, focusing on service quality and community benefits might not be sufficient for funding business operation. Like other types of organization, the limitation of resources such as budget, personnel, and facilities forces healthcare organizations to learn to manage their operations efficiently to overcome these constraints (Langabeer, 2008). Unquestionably, technology has been considered as a key enabling a healthcare business to create a competitive advantage from its operation.

The need for e-Health was due to the existence of numerous systems within an organization that were not interrelated (Trimmer et al., 2002). Hence, the strategy for the adoption of e-Health in health care can be view from the perspective of reinforcing organizational competitiveness to survive in a dynamic the business environment (Suebin and Gerdri, 2010). The need to comply with standard in the health care industry by combining clinical, financial and administrative activities is all factors that motivate organization to adopt e-Health.

### **MODEL**

Technology Organization Environment (TOE) framework developed by Tornatzky and Fleischer (1990) has been used as a solution in industrial, national and cultural contexts. In an industrial context, such as healthcare (Lee and Shim, 2007), it includes manufacturing (Mishra, Konana and Barua, 2007) and retail, wholesale, and financial services (Zhu, Kraemer and Xu, 2006). In an information and telecommunications technology (ICT) context, such as electronic data interchange (EDI) (Kuan and Chau, 2001), it includes enterprise systems (Ramadani, Kawalek and Lorenzo, 2009); e-business (Zhu, Kraemer and Xu, 2003; Zhu and Kraemer, 2005; Zhu et al., 2006); open systems (Chau and Tam, 1997); interorganizational systems (Grover, 1993; Mishra et al., 2007); and a broad spectrum of general Information System (IS) applications (Thong, 1999). Countries in Europe, America, and Asia have also adopted TOE framework in national affairs that concern citizens (Zhu et al., 2006, Zhu and Kraemer, 2005; Zhu et al., 2004; Zhu et al., 2003). The constructs, measurement items, hypotheses and research questions raised from the TOE framework in order to achieve competitive intelligence for e-Health technologies are explained in Figure 1 below.

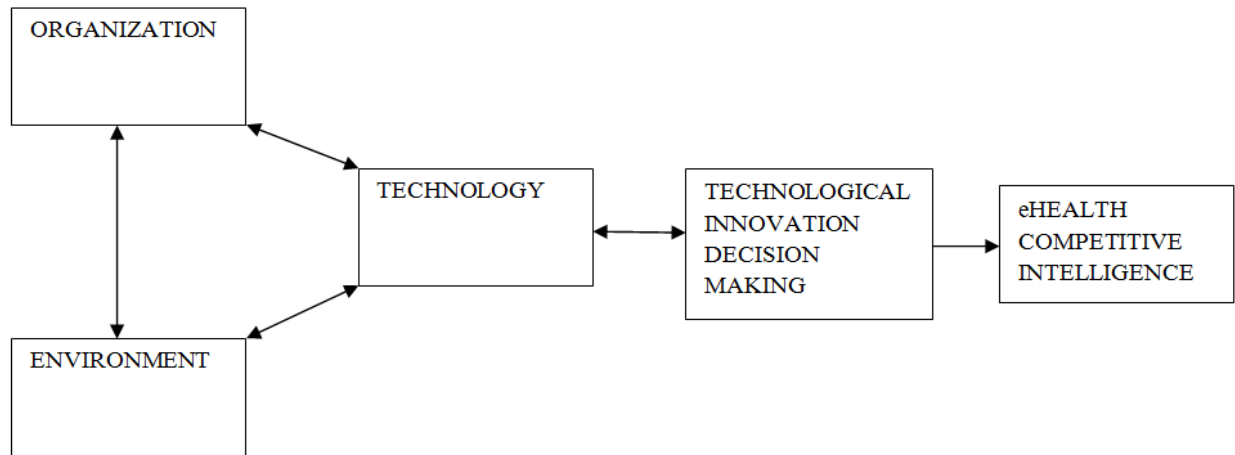


Figure 1: Proposed model of competitive intelligence for e-Health technologies.

From Figure 1 above, the main dependent construct is technology adoption. The technology adoption encompasses the likelihood of adoption, intention to adopt and the extent of adopting technology in healthcare for competitive intelligence realization in e-Health technologies. The independent constructs are technological context, organizational context and environmental context. The unit of analysis is firm, organization or the healthcare industry.

Constructs	Measurement Items	Hypotheses	Research Questions
Technological	Compatibility; Complexity; Perceived direct benefits; Observability; Triability; IT Skills; Technology Competence.	e-Health technological factors impact positively on effective healthcare delivery.	How will a healthcare IT infrastructure positively impact on the level of e-Health technological factors?  How will healthcare IT expertise positively impact the level of e-Health technological factors?  How will healthcare IT knowledge positively impact the level of e-Health technological factors?
Organizational	Satisfaction with existing systems; Top management support; Diversity in Knowledge; Organizational perceptions of technological uncertainty; Organizational readiness; Employees' IS knowledge; Financial commitment; Financial resources; Performance gap; Patient	e-Health organizational factors impact positively on effective healthcare delivery.	How will a healthcare structure impact positively on e-Health organizational factors?  How will a healthcare environment impact positively on e-Health organizational factors?

	and healthcare provider readiness.		
Environmental	Technology policy; Patient interaction; Perceived industry pressure; Perceived government pressure; Regulatory environment.	e-Health environmental factors impact positively on effective healthcare delivery.	How will government regulation impact positively on e-Health environmental factors? How will industrial characteristics impact positively on e-Health environmental factors? How will technological support infrastructure impact positively on e-Health environmental factors?
e-Health Competitive Intelligence	Organizational network; Information network; Social network.		

**Table 1: Proposed model constructs measurement items, hypotheses and research questions.**

## CONCLUSIONS

This paper proposes a model of competitive intelligence for e-Health technologies based on the idea from literatures and on the constructs and measurement items of Technology, Organization and Environment (TOE) framework. The study adopts Technology Organization Environment (TOE) framework on the basis of its use in industrial, national and cultural contexts. The construct, measuring items, hypotheses and research questions that will be used for the validation and reliability of the proposed model are discussed.

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