



# Chapter 12

## Resistance to Integrate Information Systems in Healthcare Service: A Study on Developing Country

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**Abstract** Information systems are vital for meeting the service expectations of customers and stakeholders. However, integration of information systems in health service is inhibited due to numerous resistance factors which need to be addressed in order to ensure a quality healthcare service. Despite its significance, there is a paucity of research in addressing the resistance to information technology adoption in the healthcare industry. This relates to two domains: (i) factors contributing to resistance to health information systems (HIS) in developing country contexts and (ii) strategies to mitigate the resistances. This chapter sets out to develop a methodology to address the aforementioned gaps in the literature using an analytical hierarchy process (AHP) integrated quality function deployment (QFD) approach. The developed methodology will be used in a healthcare service providing organization in Bangladesh to identify the factors contributing to resistance to health information systems (HIS) and to determine the most significant strategies to mitigate those resistance factors. This research has significant theoretical, methodological and managerial implications.

**Keywords** Health service • Information systems • Mitigation strategies  
Optimization • QFD resistance

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## 12.1 Introduction

ICT is an avenue for change, offers effectiveness and efficiency in many facets of the society. By implementing health information systems (HIS), the health sector has been able to improve its health service quality and lessen medical errors (Menachemi and Collum 2011). In the contemporary world, HIS has been successfully adopted by many developed countries in their health service organizations (Mutale et al. 2013). Yet, the HIS in developing countries has not been widely adopted. There are numerous factors that influence the resistance to HIS implementation in developing countries. A review of the relevant, extant literature reveals that issues responsible for reluctance to HIS in developing countries are still underexplored.

Akter et al. (2013) posit that ICT is a leading issue for ensuring health service quality. Likewise, it has been asserted by Chowdhury and Quaddus (2016) that information technology enabled health service design is supportive for sustainable health service systems. They also focused on the significance of information systems (IS) in health service to ensure improved service delivery processes in Bangladesh. Similarly, studies by Braa et al. (2004, 2007) and Lucas (2008) informed the health information systems in developing countries.

The health service industry in Bangladesh still lags behind in the adoption of information technology in delivering their healthcare service, although the advantages of ICT usage in health service are well explored. The reluctance to non-adoption of information and communication technology to deliver and manage health service is contributed by many factors. If such resistances cannot be mitigated, improving health service delivery process is not easy. As a result, it is important to examine the factors responsible for reluctance to HIS implementation in order to identify and mitigate them.

Although the extant literature finds that a lack of ICT infrastructure (Gichoya 2005) is the salient factor contributing to the resistance of IS, the literature on resistance shows that the HIS resistance in a developing country context is still under investigated. This gap in the literature encourages the researchers to investigate the following research questions:

1. What are the factors responsible for resistance to HIS in the developing countries?
2. What are the most significant strategies to mitigate the resistance factors?

## 12.2 Literature Review

The following sections include a thorough review of existing literature to identify the factors responsible for resistance to the adoption of health information systems and strategies to mitigate that resistance.



### 12.2.1 Importance of Health Information Systems

Because of the efficiency, effectiveness, productivity and accuracy gained through technology in business and society, technological dependencies are becoming exponential. In order to satisfy e current business needs, more and more businesses are now keen to utilize technology (Mohammad Alamgir 2012). For improving the service quality in the service industry, technological excellence has also made a substantial contribution (Brynjolfsson 1993). Technological excellence is a vital enabler for service quality which is highly evident in the healthcare industry (Chowdhury and Quaddus 2016). The healthcare industry concerns a broad spectrum of areas which includes primary health care, medical research, pharmaceuticals, etc. (Seninger 1996). Of those, primary health care is one of the most important areas since it provides a direct medical service to a large number of people. The technology used in the healthcare environment is often referred to as health information systems (Hirdes et al. 2008), computerized health information systems (Metsemakers et al. 1992) and hospital information systems (Cline and Luiz 2013; Anderson 1997) by the health service institutions.

It is crucial to implement HIS in the health service organizations. The health service institutions have been able to achieve improved health service, more efficiency, less medical errors and more accuracy with the increased adoption of HIS use (Buntin et al. 2011). Despite the benefits achieved through HIS adoption, it has not yet been diffused in all regions at the same rate. It is evident that the higher adoption of HIS is seen in most developed countries such as the USA, Canada and Australia (Jha et al. 2008; Ludwick and Doucette 2009; Buntin et al. 2011). Developed countries improve their health service by implementing HIS. However, developing countries such as India, Bangladesh and Nepal are still far from adopting HIS across the broader spectrum. There are many important issues which are responsible for the non-adoption of HIS by health service providers in developing countries. Among there are many reasons for the slower adoption of HIS in developing countries, resistance to accept the technology is one of the most significant ones (Kapurubandara and Lawson 2006). The following section enumerates the resistance factors responsible for the non-adoption or slower adoption of HIS.

### 12.2.2 Factors Responsible for Resistance to Health Information Systems

Different studies find that people show resistance to accept new technology both in the context of developing (Knol and Stroken 2001; Kapurubandara and Lawson 2006) and developed countries (Lapointe and Rivard 2005; Bhattacharjee and Hikmet 2007). Existing literature reveals that lack of telecommunication infrastructure, financial constraints (Blaya et al. 2010), lack of IT knowledge and training (Knol and Stroken 2001), lack of skilled human resources (Kapurubandara and

101 Lawson (2006) and a few other factors are important drivers towards resistance to  
102 technology in the context of developing country. On the other hand, in developed  
103 countries, the significant drivers of resistances are related to compatibility,  
104 IT-related knowledge (Bhattacharjee and Hikmet (2007) and perceived threat  
105 (Lapointe and Rivard (2005)). Table 12.1 lists the factors responsible for resistance to  
106 HIS.

107 The lack of an integrated framework to address the possible factors contributing  
108 to resistance in the healthcare industry is realized specifically in the context of  
109 developing countries, although resistance to technology has caught the attention of  
110 scholars for many years. This study, therefore, aims to examine the factors con-  
111 tributing to the resistance of implementing HIS in developing countries.

112 It is imperative to address the factors responsible for resistance to health  
113 information systems, especially in the case of developing countries. Failure to  
114 address the factors responsible for resistance to Health Information Systems results  
115 in the non-adoption or ineffective implementation of HIS. Therefore, it is crucial to  
116 identify the strategies which can mitigate the current resistance problems. Current  
117 studies identify a number of strategies to mitigate HIS resistance. It is revealed that  
118 ICT Infrastructure development (Detmer (2003)), ICT training (Gagnon et al. (2012)),  
119 Investment in ICT projects (Detmer (2003)); effective change management (Markus  
120 (2004) and compatible systems (Tung et al. (2008) can mitigate the resistance to  
121 integrate the HIS in a developing country context. Table 12.2 presents various  
122 strategies for addressing resistance to HIS.

**Table 12.1** Factors responsible for resistance to HIS in developing countries

Resistance factors	Sources
Lack of interest and awareness	Lapointe and Rivard (2005), Kim and Kankanhalli (2009)
Lack of tendency to take responsibility	Lapointe and Rivard (2005), Kim and Kankanhalli (2009)
Lack of Internet coverage	Azam (2014)
Lack of required hardware, software	Azam (2014)
Inadequate Internet speed	Azam (2014)
Power supply interruption	Azam (2014)
Lack of IT knowledge	Venkatesh et al. (2003), Mohammad Alamgir (2012), Azam (2014)
Lack of change management	Anderson (1997), Lorenzi and Riley (2000), Umble et al. (2003)
Lack of compatibility with existing systems	Venkatesh et al. (2003), Azam (2014)
Feeling uncertainty of output	Ali et al. (2016)

Strategies to mitigate resistance to Health Information Systems

**Table 12.2** Strategies for addressing resistance to HIS

Strategies	Sources
ICT infrastructure development	Detmer (2003)
Imparting ICT training	Gagnon et al. (2012)
Investing in access to high speed internet	Chowdhury and Quaddus (2016)
Investing in hardware and software	Azam (2014)
Awareness creation	Chowdhury and Quaddus (2016)
More ICT projects	Detmer (2003)
Arranging alternative power supply	Chowdhury and Quaddus (2016)
Effective change management	Markus (2004)
Compatible system	Tung et al. (2008)
Government policy	Azam (2014)
Recruiting IT skilled people	Chowdhury and Quaddus (2016)

### 12.3 Methodology

This research adopts mixed methods to increase the validity and reliability of data (Creswell and Tashakkori 2007). Aligned with the research objectives, our study adopts both qualitative and quantitative methods. Table 12.3 depicts a summary of the research design. In the qualitative stage, it uses interviews with respondents to identify the resistance factors and the strategies to mitigate resistance to adopt HIS. Data were collected from two decision-makers and three employees of a large public hospital. The average interview time was around 40–60 min. Data collected from the interviews were analysed using content analysis technique.

**Table 12.3** Summary of the research design

Research objectives	Data collection	Data analysis
<ul style="list-style-type: none"> <li>– Identifying the factors responsible for resistance to HIS and</li> <li>– Prioritizing the resistance factors</li> </ul>	<ul style="list-style-type: none"> <li>– Review of literature on resistance to HIS</li> <li>– Interviewing decision makers and employees using semi-structured interview for identifying resistance factors (WHATs in QFD matrix)</li> <li>– Comparing the resistance factors using AHP</li> </ul>	<ul style="list-style-type: none"> <li>– Using content analysis for literature and field study data</li> <li>– AHP analysis</li> </ul>
<ul style="list-style-type: none"> <li>– Identifying the strategies to mitigate the resistance factors and selecting the most important strategies among them</li> </ul>	<ul style="list-style-type: none"> <li>– Review of existing literature on mitigation strategies</li> <li>– Using interview protocol (semi-structured) to identify mitigation strategies (HOWs in QFD matrix)</li> <li>– Using structured questionnaire for determining WHAT-HOW relationship matrix</li> </ul>	<ul style="list-style-type: none"> <li>– Using content analysis technique of literature and field study data</li> <li>– QFD analysis</li> </ul>

**Fig. 12.1** Weighting of WHATs using AHP (Saaty 1980)

	$A_1$	$A_2$	...	$A_n$
$A_1$	$W_1/W_1$	$W_1/W_2$	...	$W_1/W_n$
$A_2$	$W_2/W_1$	$W_2/W_2$	...	$W_2/W_n$
$A_n$	$W_n/W_1$	$W_n/W_2$	...	$W_n/W_n$

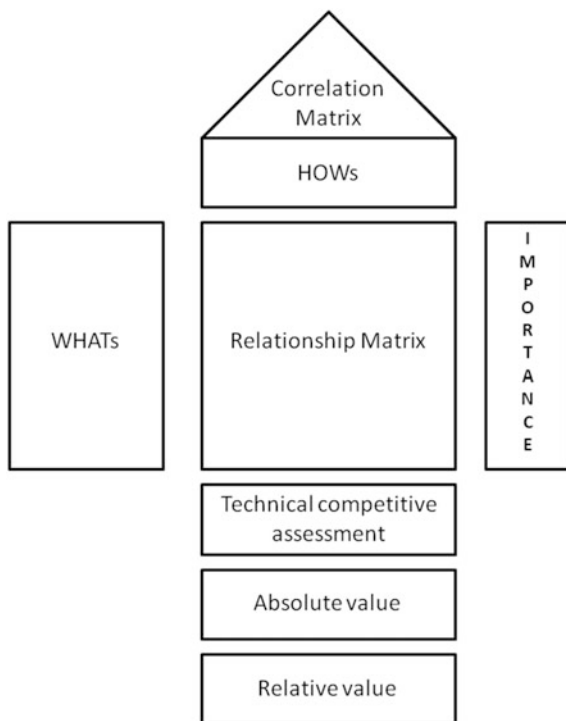
In the quantitative stage, it uses AHP integrated QFD. The analytic hierarchy process (AHP), developed by Saaty (1980), is a widely used multi-criteria decision modelling technique which deploys a paired comparison method of hierarchical structuring of a decision problem to rank alternative solutions. Figure 12.1 depicts the weighting of decision criteria using AHP.

QFD is an effective technique to translate the customer needs into suitable design requirements/strategies (Kuo et al. 2009). QFD is also used to address specific problems of companies by finding the relationships between organizational problems and strategies to solve those (Chowdhury and Quaddus 2015, 2016). In this chapter, QFD is used to identify the factors responsible for resistance to HIS and develop design requirements/strategies to mitigate those resistance factors. In a typical QFD model, 'design requirements/strategies are referred to as 'WHATs' and 'how to fulfil requirements/solve problems' are referred to as 'HOWs' (Fig. 12.2). In this chapter, WHATs are the resistance factors and HOWs are the strategies to mitigate the resistance factors. A typical QFD model includes some basic inputs such as: (a) requirements/problems—WHATs; (b) importance of WHATs; (c) design requirements/strategies—HOWs; (d) WHAT-HOW relationship matrix; (e) roof matrix (interrelationship among HOWs/Strategies).

The relationship between the resistance factors (WHATs) and corresponding strategies (HOWs) to mitigate the resistance factors is measured as 'no', 'very weak', 'weak', 'moderate', 'strong' and 'very strong' a relationship that is later replaced by the scale 0, 1, 3, 5, 7 and 9. These weights are used to represent the degree of significance attributed to the relationship. The importance of each strategy is determined by the following equation:

$$AI_j = \sum_{i=1}^m w_i R_{ij} \quad \forall_j, j = 1, \dots, n \quad (12.1)$$

Fig. 12.2 QFD layout



159 where,

160  $AI_j$  absolute importance of  $j$ th strategy.

161  $w_i$  weight of the  $i$ th resistance factor.

162  $R_{ij}$  relationship value; extent of mitigating  $i$ th resistance factor by  $j$ th strategy  
 scaled as 9, 7, 5, 3, 1, or 0.

163  $n$  number of strategies.

164  $m$  number of resistance factors.

165 The relative importance of strategy  $j$  is:

166

$$167 \quad RI_j = \frac{AI_j}{\sum_{j=1}^n AI_j} \quad (12.2)$$

169

## 170 12.4 Case Study

171 The method as outlined in Table 12.3 was applied in the case of the healthcare  
 172 industry in Bangladesh. Bangladesh is one of the developing countries in the  
 173 South-East Asian region with a high density population. According to the

174 Population Census Bangladesh 2011, it has a population of 150 million people and  
 175 among those, 72% live in rural areas. It is apparent that among 10,000 individuals,  
 176 there are only 3–4 doctors and the numbers are even less in the rural areas (World  
 177 Health Organization 2015). Similar to other developing nations, the problem of  
 178 inadequate information infrastructural facilities in the healthcare service is acute in  
 179 Bangladesh. The quality and accessibility of health service is poor, although health  
 180 service facilities are available in different locations, including the remote areas.  
 181 Health service efficiency is important to provide health services to people in a  
 182 highly populated country like Bangladesh and, it is evident that ICT implementa-  
 183 tion contributes significantly to the health service efficiency (Buntin et al. 2011).  
 184 Health service organizations can not only improve their operational efficiency but  
 185 also its long-term viability with the use of ICT. Therefore, ICT-enabled healthcare  
 186 service has huge potential in improving healthcare service in developing countries.  
 187 This is supported by the findings of Chowdhury and Quaddus (2016). Despite the  
 188 benefit of using health information systems, the adoption, implementation and use  
 189 of health information systems in Bangladesh are inhibited due to a number of  
 190 resistance factors. Therefore, this study develops a model that identifies the resis-  
 191 tance factors to HIS and strategies to mitigate those resistance factors. Application  
 192 of the model is operationalized below.

### 193 **12.4.1 Identifying the Resistance Factors (WHATs)**

194 As mentioned earlier, this study adopts a mixed method research where the resis-  
 195 tance factors identified from the literature (Table 12.1) were compared with the  
 196 field study findings to contextualize the resistance factors. Based on the compar-  
 197 ison, a list of resistance factors are selected which are presented in Table 12.4 and  
 198 were finalized for further analysis. Once the list of resistance factors was selected,  
 199 the importance weights of the resistance factors were then determined using AHP.  
 200 Table 12.4 presents the resistance factors and their weights. It is apparent from  
 201 Table 12.4 that lack of awareness about the benefits of HIS is the most important  
 202 factor creating resistance to HIS, followed by lack of telecommunication infras-  
 203 tructure and lack of IT knowledge and training.

**Table 12.4** Resistance factors and their weights

Resistance factors	AHP weight
Lack of IT knowledge and training	0.188
Implementation cost	0.100
Maintenance cost	0.034
Lack of telecommunication infrastructure	0.213
Interruption in utility supply	0.056
Lack of awareness about the benefits of HIS	0.409

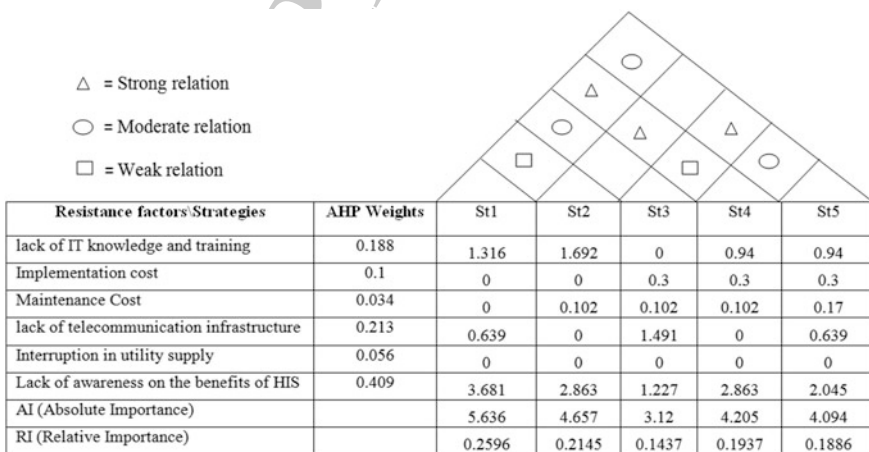


**Table 12.5** Importance score of mitigation strategies

Mitigation strategies	Importance score from QFD matrix
St1—Awareness building	0.2596
St2—Imparting training	0.2145
St3—Investing in ICT infrastructure	0.1437
St4—Effective change management	0.1937
St5—Recruiting IT skilled people	0.1886

### 12.4.2 Strategies to Mitigate Resistance Factors (HOWs)

In line with the research objective, after determining the importance weight of the resistance factors, strategies to mitigate those resistance factors were identified from the interview with the decision makers. The strategies—as identified from the field study—were compared with the strategies identified from the literature (Table 12.2) to determine the final list of strategies as relevant with the context. Table 12.5 presents the strategies relevant to our research context. Once the strategies to mitigate the resistance factors were identified, the decision-makers were then asked to determine the relationship between resistance factors and the corresponding strategies. Figure 12.3 presents the relationship matrix. The relationship matrix is used to determine the most important ‘HOWs’ or strategies. The relationship between WHATs and HOWs can be measured using the scale 9, 7, 5, 3, 1 and 0 which stand for very strong, strong, moderate, weak, very weak or no relation, respectively. Once the relationship between WHATs and HOWs is determined, the relationship score (in the scale of 9, 7, 5, 3, 1 and 0) is multiplied by the weight of corresponding WHAT to derive the final value of each cell in the relationship


**Fig. 12.3** Relationship between resistance factors and corresponding strategies

matrix. For example, corresponding to strategy 1 and resistance factor 1, the cell value 1.316 in the relationship matrix has derived from the multiplication of the AHP weight of resistance factor 1 (0.188) with the ‘WHATs and HOWs’ correlation score 7 (in the scale of 9, 7, 5, 3, 1 and 0). After determining all the cell values as mentioned, the value of absolute importance (AI) and relative importance (RI) can be determined using Eqs. 12.1 and 12.2 as presented in Fig. 12.3. It is inferred from Fig. 12.3 that the importance weight of awareness building (strategy 1) is highest (0.2596), followed by imparting training (strategy 2) (0.2145) and effective change management (strategy 4) (0.1937).

## 12.5 Discussion and Implications

This study finds that ‘lack of awareness’ about the benefits of health information systems is the most important factor (40.9%) resisting the adoption and implementation of HIS. Usually, health service staffs in the less developed countries are reluctant to use new technology as they have limited knowledge about the technology and its benefits to improve services to patients—which is consistent with the study of Chowdhury and Quaddus (2016). In their study on sustainable service design for m-health (mobile health) services in Bangladesh, Chowdhury and Quaddus (2016) find that the service providers are not very aware about the customer requirements and some of the health staffs have a lack of knowledge to provide technology enabled services. The second most important resistance factor is a lack of telecommunication infrastructure which accounts for 21.3% weight. The telecommunication infrastructure is essential to information technology. Most of the cases concerning telecommunication infrastructure in the developing and under developed countries are not well built. As a result, it is difficult to adopt and implement HIS which creates resistance among the managers and the employees to adopt HIS. This finding is consistent with the findings of Azam (2014). This study also finds that the third most important factor resisting HIS is a lack of IT knowledge and training—which accounts for 18.8% of the total weight. This finding is highly relevant as found in previous studies. Azam (2014), Mohammad Alamgir (2012) and Venkatesh et al. (2003) found that people with a lack of IT knowledge felt reluctant to adopt and implement information systems. Similarly, our study also found that implementation costs, maintenance costs and interruptions in utility supply were the other factors in relation to the resistance of HIS in Bangladesh.

Corresponding to the resistance factors, our study found a number of mitigation strategies. Among the strategies, awareness building was found to be most significant which accounts for 25.96% of the total weight. In line with this finding, it can be inferred that building awareness among employees and managers is very important to adopt HIS and to create readiness to implement HIS. Previous studies (Kim and Kankanhalli 2009; Lapointe and Rivard 2005) also found that awareness building is salient in mitigating the resistance to adopt information systems. The

findings also reveal that a strategy for building awareness is effective for mitigating vital challenges such as lack of IT knowledge and training, lack of telecommunication infrastructure and lack of awareness about the benefits of HIS. This is highly relevant, because building awareness about the uses and the benefits of HIS will create interest and expectations among the users and decision-makers to use the systems, develop infrastructure for proper implementation of the systems and train people to run the systems effectively and efficiently. The second most important strategy (21.45%) was found to be imparting training—which is effective for mitigating the resistance factors such as: lack of IT knowledge and training, maintenance cost and lack of awareness about the benefits of HIS. Our findings also reveal that the third most important strategy is effective change management which can assist in mitigating most of the resistance factors, except lack of telecommunication infrastructure and interruption in utility supply.

The findings of this study contribute to the existing literature on the health information systems literature—particularly resistance to adopt health information systems in the case of developing countries. The findings of this study identify the most important resistance factors to adopt and implement health information systems in a developing country context. To our knowledge, this has not been studied before and consequently, can make a useful addition to existing literature. This study also determines the strategies to mitigate resistance to health information systems and determines the weight of the strategies to identify the most significant strategies to mitigate the resistance. Previous studies fall short of identifying strategies to mitigate resistance to adopt health information systems in general and in the case of developing countries in particular. With regard to managerial implications, it is proposed that our study outcomes will help health service managers to identify the most important resistance factors to be aware of with regard to the adoption of health information systems in a developing country context. Identifying significant resistance factors will help them to prepare and to mitigate the resistance factors. Further, this study will help managers to determine the most important strategies to mitigate the resistance to adopt health information systems.

## 12.6 Conclusion

This study aims to identify the factors contributing to the resistance to health information systems and strategies to mitigate that resistance. As there is a paucity of current research in addressing the resistance to information technology adoption in the healthcare industry, this study adds value to the existing body of knowledge in health information systems. First, it identifies the most important factors resisting the health information systems. Second, it determines the strategies to mitigate resistance to health information systems. The findings of this study reveal that lack of awareness about the benefits of HIS, lack of telecommunication infrastructure and lack of IT knowledge and training are the most important resistance factors. On the other hand, the study finds that awareness building, imparting training and

effective change management are the most important mitigation strategies. This study also has limitations that can provide opportunities to pursue further research. The study is conducted on few sample cases, thus empirical verification is needed by operationalizing survey research to ensure the external validity of the findings. Finally, it opens the avenue for further research based on surveys to explore the relationship between the resistance factors and the mitigation strategies. Though this study considers the healthcare service of Bangladesh as a case study, it is proposed that the findings and implications have significance for the healthcare services of other developing countries.

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