Association for Information Systems
AIS Electronic Library (AISeL)

2005

Conceptualizing an Anchor-Oriented Approach for Healthcare Systems Integration

Vasiliki Mantzana
Brunel University, vasiliki.mantzana@brunel.ac.uk

Marinos Themistocleous
Brunel University, marinos.themistocleous@brunel.ac.uk

Follow this and additional works at: http://aisel.aisnet.org/amcis2005

Conceptualizing an Actor-Oriented Approach for Healthcare Systems Integration

Vasiliki Mantzana
School of Information Systems,
Computing and Mathematics
Brunel University
London, UB8 3PH, UK
Vasiliki.Mantzana@brunel.ac.uk

Marinos Themistocleous
School of Information Systems,
Computing and Mathematics
Brunel University
London, UB8 3PH, UK
Marinos.Themistocleous@brunel.ac.uk

ABSTRACT

The efforts undertaken by healthcare organisations to modernise their services have resulted in the development of disparate Healthcare Information Systems (HIS). Systems heterogeneity has an impact on the quality of the services provided to patients. Thus, the integration of HIS will result in improvement of the quality of care provided to patients. Although healthcare organisations have turned to Enterprise Application Integration (EAI) technology to overcome their integration problems, they lag in applying EAI comparing to other sectors. Also, there is limited literature in this area, with the majority of it focusing on the adoption of EAI in healthcare. This paper proposes an actor-oriented approach, which the authors claim as novel as: (a) it identifies healthcare actors involved in EAI adoption process and (b) it is combined with the factors influencing EAI adoption. This approach is significant, as it (a) extends existing EAI adoption models by incorporating an actor-oriented analysis and (b) enhances the decision-making in this area, by supporting a more detailed level of analysis of the factors that the multiple healthcare actors perceive.

Keywords

Enterprise Application Integration, Healthcare Information Systems, Actors.

INTRODUCTION

The efforts for modernization of the healthcare sector, through Information Systems (IS), have resulted in the development of isolated solutions (Howcroft and Mitev, 2000). Recently, much emphasis has been given on Enterprise Application Integration (EAI) technology to bridge together heterogeneous systems. Many private and public organizations have deployed EAI solutions (Irani *et al.*, 2003), with the healthcare sector having recently realized the EAI effectiveness. In the normative literature, IS researchers have focused on the identification of parameters affecting EAI adoption process (Khoumbati *et al.*, 2003; Themistocleous, 2002). Nonetheless, further work is required in this field, as: (a) new technology's adoption and (b) systems integration in a multi-vendor environment were the most frequently cited priorities (HIMSS, 2004).

The IS adoption remains a complex process and issues associated with its management would appear to be of paramount importance (Irani and Love, 2001). However, not only technical and organizational, but human factors should be considered to reduce the EAI adoption's complexity and enhance its management (Fitzerald *et al.*, 2002). The unawareness of human factors increases the actors'[1] resistance to adopt EAI (Mantzana and Themistocleous, 2004). Thus, researchers and decision-makers involved in the adoption should consider the actors to successfully accomplish them (Turunen and Jan, 2000). This paper initially introduces the IS and integration technologies adoption area. The need for healthcare actors' identification is highlighted to support the analysis of EAI adoption influential factors. Thereafter healthcare actors are identified and research hypotheses are proposed. Then, the research methodology and case study used to evaluate the research hypotheses are described. The empirical findings are discussed and conclusions are drawn.

BACKGROUND

The adoption of IS technological innovations in different sectors is a research topic that has attracted multiple researchers. The variables affecting their adoption depend among others, on the organizational setting that it is applied. For example, it has been stated that IS adoption in healthcare is more critical than in other organizations (Wiley-Paton and Malloy, 2004). In particular, HIS adoption is critical as it is related to human lives. For instance, despite the HIS importance is widely

---

[1] In this paper, the terms actor and stakeholder are used equally.

recognized in healthcare, various healthcare actors resist to their adoption (Aspden *et al.*, 2004). Thus, actors' views should be analyzed. The authors through the literature study the factors affecting the EAI adoption in the healthcare sector. In doing so, initially the multiple factors related to the adoption of: (a) IS, (b) advanced integration technologies such as EAI and web-services in private and public organizations and (c) EAI in the healthcare sector are presented in Table 1. Moreover, the authors identify the dimensions (organizational, technical, human, managerial and social) that each adoption factor is related to, in an effort to enhance the level of factors' analysis.

Table 1 illustrates that the efforts for the identification of factors influencing IS adoption in healthcare organizations, have focused on: (a) organizational, (b) technical, (c) human (individual, professional), (d) managerial, (e) technical and (f) social dimensions. Much emphasis has been given on organizational, human and social dimensions, as the IS introduction in healthcare is associated with changes in structure, organization and professions (Gagnon *et al.*, 2004). Similarly, in the integration technologies adoption area, Chen, (2003b) proposed that among others, actors should be considered during the web-services adoption process. In addition, Themistocleous (2002) has studied the application of EAI in private and public organizations, proposed and validated a model, which explains factors influencing EAI adoption. This model includes factors like: (a) cost, (b) barriers, (c) benefits and (d) external pressures. Themistocleous (2002) also reported that issues related to the actors' role during the adoption process should be investigated. However, due to the focus of his study, this issue (actors' role) remained un-explored and proposed for further research.

Area		Reference	Factors	Dimension				
				Organizational	Technical	Human	Managerial	Social
Efforts on Innovations Adoption	IS in the Healthcare	Hu *et al*, (2000)	Technological		✓			
			Organizational	✓				
			External	✓		✓	✓	✓
		Lehoux *et al*, (2000)	Human			✓		✓
			Organizational	✓				
		Gagnon *et al*, (2004)	Individual			✓		✓
			Professional			✓	✓	✓
			Organizational	✓				
			Contextual	✓	✓	✓	✓	✓
		Wiley-Paton and Malloy, (2004)	Social Network Theory			✓		✓
			Persuasion and Social Influence Theory			✓		✓
			IT Adoption Theories	✓	✓	✓	✓	✓
	Advanced Integration Technologies	Themistocleous, (2002)	Benefits	✓	✓			
			Barriers	✓	✓			
			Costs	✓	✓			
			Internal Pressures	✓	✓		✓	
			External Pressures	✓	✓		✓	
			IT Sophistication		✓			
			IT Infrastructure		✓			
			Support		✓			
			Framework for Integration Technologies/Packages		✓		✓	
		Chen, (2003b)	Stakeholders	✓		✓		✓
			Organizational Factors	✓	✓		✓	
			IT Standards Characteristics		✓			
	EAI in the Healthcare	Khoumbati *et al*, (2003)	Benefits	✓	✓			
			Barriers	✓	✓			
			Costs	✓	✓			
			Internal Pressures	✓	✓		✓	
			External Pressures	✓	✓		✓	
			IT Sophistication		✓			
			IT Infrastructure		✓			
			Support		✓			
			Framework for Integration Technologies/Packages		✓		✓	
			Readiness of Organization		✓			
			Telemedicine		✓			
			Clinical Support	✓	✓			
			Patient Satisfaction			✓		✓

Table 1: Background to the Adoption Process

Khoumbati *et al.,*(2003) applied the model proposed by Themistocleous (2002) and slightly extended it based on a comprehensive literature review on health informatics. In doing so, they suggested that other factors, like medical (e.g. clinical support) should be considered during the EAI adoption in the healthcare sector. As it is illustrated in Table 1 most of the factors (10/11), proposed by Khoumbati *et al.,*(2003), focus on organizational, technical and managerial dimensions, but not on human and social. This is possibly a limitation of Khoumbati's *et al.,*(2003) model as McGrath and More (2001), suggested that there are "People-Related Issues" (e.g. actors involved) that should be analyzed by organizations when introducing HIS. Therefore, particular attention should be drawn to these "softer issues", which are usually underestimated (McGrath and More, 2001).

In support of the research efforts presented in Table 1, Robey (1979) and Ginzberg and Zmud (1998) have studied the importance of actors' beliefs and attitudes and how these are affected and/or affect the factors influencing innovations' adoption. The diffusion theory (Rogers, 1995) proposes that actors and the perceived characteristics of innovation have an impact on individual's adoption of IT. These individual actors can be critical in defining the success of IT adoption. For example, Chau and Hu (2002) argue that physicians play a fundamental role in IT adoption. Fitzerald *et al.,* (2002) highlighted that the adoption process is highly affected by innovation 's "adopters". The healthcare actors are not passive acceptors of an idea, but are a fundamental attribute actively involved in the adoption process. The adopters exercise a powerful influence on the form of innovations' adoption. In support of this, Lauer *et al.,* (2000) suggested that factors like benefits and pressures should be analyzed from actors' point of view. In addition, Chen (2003a) suggested that actors should be considered with other parameters affecting the decision making process related to the adoption of integration technologies.

CONCEPTUAL DEVELOPMENT

The authors suggest that the recommendations of the researchers mentioned above (e.g. Hu *et al.,* (2000), Chen (2003a)) can be applied in the area of EAI adoption in healthcare. In doing so, the factors influencing EAI adoption in healthcare will be analyzed using an actor-oriented approach. This approach might significantly enhance the level of understanding and analysis in this area. Thus, the authors will review the normative literature, provide hypotheses and evaluate them in the following sections.

Factors and Actors Influencing the EAI Adoption in Healthcare Organizations

It has been highlighted in the previous section that EAI adoption influential factors in healthcare sector should be studied in relation to multiple healthcare actors. Hence, the authors propose that the factors identified by Khoumbati *et al.,*(2003) should be analyzed in accordance to healthcare actors. Thus, the focus of this paper is not the identification of factors influencing EAI adoption in healthcare, but the analysis of them in combination with healthcare actors. It is necessary to explore the following hypothesis:

> *H1: The healthcare actors affected by and/or affect the EAI adoption might be studied in relation to the EAI influential factors.*

Healthcare Actors Classification and Identification

Freeman's research (1984) has had a great impact on the management and research thinking as he was among the first, who introduced the actors' concept. Since then, multiple researchers have defined the term actor in the normative literature. Many of these definitions provide examples or broad guidance for identifying actors. However, to the best of the authors' knowledge, there is limited literature on the identification and classification of a full range of healthcare actors that get affected and/or affect EAI adoption. There is therefore a need to identify healthcare actors' categories as well as the actual actors belonging to these categories. To address this need, the authors have reviewed the normative literature and identified practical efforts to support the classification of healthcare actors. These efforts are summarized below:

- An actor-oriented approach has been employed for the classification of the benefits that derived from the adoption of Electronic Health Care Records (EHCR) in healthcare area (NHS, 1993). In 1993, the National Health Service, in UK, published a report, in which an actor-oriented approach had been used to classify the EHCR benefits. That report identified three different "worlds" that will be affected by EHCR adoption and use, which are the following: (a) patients (patients, next of kin), (b) clinicians (clinicians, non-clinicians, responsible clinician, a health care facility and clinical student) and (c) third parties (controller, technologist, administrator, legal professional).

- Siau *et al.*, (2002) studied the benefits of Internet applications to different healthcare actors. According to their study, healthcare actors have been classified in: (a) providers and (b) consumers. Similarly, Siau (2003) mentioned that Internet can be used to link multiple actors, such as hospitals, suppliers, physicians and patients.

- In Australia, Information and Communication Technologies' (ICT) impact on pharmaceutical companies has been studied in relation to actors. The researchers initially identified which actors interact with ICT. The actors had been classified in: (a) payers, (b) providers, (c) practitioners and (d) patients. Moreover, ICT's impact on each of them had been analyzed (Houghton, 2002).

From the practical approaches, it appears that healthcare actors can be classified into: *(a) Acceptors, (b) Providers, (c) Supporters and (d) Controllers.* Hence, the authors assert that:

> *H2: Healthcare actors can be categorized into: (a) Acceptors, (b) Providers, (c) Supporters and (d) Controllers.*

According to Chen, (2003b) actors have been defined as individuals or organizations that affect or get affected by adoption decisions. The authors suggest that for each of the four proposed categories there exist actors that can be classified in: (a) human and (b) organizational dimensions. Such a categorization has been used by others (e.g. Miles and Huberman,(1994)). Human and organizational issues should be studied through the adoption or application of a new technology. It is important to identify how the technology's adoption will affect human relationships and organizational processes. Such a categorization: (a) improves the level and depth of analysis, (b) can further facilitate the decision-making process and (c) distinguishes human from organizational actors. Therefore, it allows different strategies to be applied when focusing on one or the other dimension. The latter is in accordance with other classifications, which separate human and organizational parameters (Irani, 1998). Thus, another hypothesis arising is the following:

> *H3: The main categories of healthcare actors can be extended, using the human and organizational lenses.*

The authors analyze the four categories of healthcare actors (acceptors, providers, supporters and controllers) through human and organizational lenses. Thus, they identify and present actors in Table2. This taxonomy is novel as it can support HIS developers to realize the healthcare sector's complexity and to provide effective IS solutions.

		ACTORS			
		Acceptor	**Provider**	**Supporter**	**Controller**
DIMENSION	**Human (H)**	1. Patients 2. Next of kin	3. Clinicians 4. Non-clinicians 5. Clinical students	8. Administrators 9. Legal professionals 10. Researchers	14. Managers
	Organizational (O)	-	6. Hospitals 7. Medical departments–Clinics	11. Suppliers 12. Technologists 13. Insurance companies	15. Government (e.g. Department of Health, Economics) 16. Health authorities

Table 2: Taxonomy of Healthcare Actors

Hence, the hypothesis arising is related to the analysis of the four categories through the human and organizational lenses.

> *H4: Healthcare actors might include the following among others: (a) Patients, (b) Next of kin, (c) Clinicians, (d) Non-clinicians, (e) Clinical students, (f) Managers, (g) Legal professionals, (h) Researchers, (i) Suppliers, (j) Technologists, (k) Hospitals, (l) Medical departments–Clinics, (m) Administrators, (n) Insurance companies, (o) Government (e.g. Department of Health, Economics) and (p) Health authorities.*

METHODOLOGY

Considering the depth, sensitivity and aim of this paper (identify and understand which actors are affected and/or affect each factor), a qualitative single case study strategy was adopted (Yin, 1994). Such an approach can be used to: (a) investigate little-known phenomena as if understanding and analyzing actors and factors affect and affected by EAI adoption in healthcare, (b) examine in depth complex processes (EAI decision-making), (c) examine the phenomenon in its natural setting and (d) learn from practice. A single case study strategy was employed to explore and understand the factors

associated with EAI adoption. In doing so, various data collection methods such as interviews, and observation were used. The bias that is considered a danger in using qualitative research approach was overcome in this research through data triangulation. The use of multiple data collection methods makes the triangulation possible which provides stronger substantiation of theory (Eisenhardt, 1989). For the purpose of this paper, three types of triangulation were used namely: (a) data (Denzin, 1978), (b) methodological and (c) interdisciplinary triangulation (Janesick, 2000).

The authors interviewed the different actors' categories, identified in Table 2, to explore the proposed hypotheses. Face-to-face, semi-structured interviews were conducted to different actors and lasted forty-five minutes each. The aim of these interviews was to test all four hypotheses. All actors, except the Administrators, Legal Professionals, Government and Health Authorities had been interviewed. The authors tried to contact these four actors' categories and to interview them, but it was not possible, due to their lack of availability. Information about the involvement of these actors was collected through the rest actors. Although this information does not represent the beliefs and ideas of the actors *that were not* interviewed, it was considered for this work. The reason for this is that the interviewees provided interesting information and were aware of the role of the non-interviewed healthcare actors. However, the authors are aware that such a decision includes a kind of bias.

EMPIRICAL DATA AND DISCUSSION

A case organization-hospital (UK_HOSP) has been studied to explore the proposed research hypotheses. UK_HOSP is a specialized acute trust and an international centre for postgraduate teaching and research that runs in UK. It has more than 1,000 employees in 11 sites. UK_HOSP faced many problems including: (a) lack of integration of primary, secondary and tertiary services, (b) lack of communication between the trust and its patients and (c) unsatisfactory level of quality of the patient services and care. Moreover, there was a need for: (a) the development of a patient centric approach, to support patients' involvement in the medical decision-making process and (b) reduction of medical errors. Thus, the hospital with the support of the Commission for Health Improvement (CHI) decided to improve its services. This is in accordance to the UK healthcare sector's modernization efforts that are taking place. During the last years, the UK government, has focused on the development of an essential patient centric IT infrastructure, to provide efficiently and effectively care (DoH, 2004). The key objectives for UK NHS, in this area are to provide services to patients twenty-four hours, seven days a week and to modernize healthcare sector especially through the new IS Strategy (NHSIA, 2004).

UK_HOSP decided to seek more efficient IT solutions, due to: (a) problems that the hospital faced and (b) targets set by the NHS. Therefore, UK_HOSP developed partnerships with software suppliers and consultants to integrate its systems. This practice is related to the published literature, which suggests that organizations seek consultants' support to adopt EAI solutions (Themistocleous, 2002). The consultants initiated the development of a pilot project to support an integrated HIS. This was proposed to integrate a number of processes of UK_HOSP. In doing so, the hospital managed to assess EAI technology's benefits and make decisions for further development. These actions are also in accordance to existing practices followed by organizations in other sectors when deploying EAI applications. Thus, the authors interviewed the actors mentioned above, to evaluate the four hypotheses identified from literature. The main findings from the interviews are presented and discussed in the following paragraphs.

H1: All interviewees agreed that EAI adoption influential factors should be presented, analyzed and discussed with the multiple healthcare actors involved. Thus, they will resist less and adopt the new integration technology easier and quicker. This interesting finding supports the *first hypothesis*. Also, it revealed that there is a relationship between healthcare actors and EAI adoption influential factors. Each of the actors interviewed was interested in specific factors affecting EAI adoption process. These relationships are discussed below:

- *Cost factor:* It appears that the following actors are related to different parameters of the Cost factor: (a) Clinicians, (b) Non-Clinicians, (c) Clinical Students, (d) Hospitals, (e) Medical Departments, (f) Administrators, (g) Researchers, (h) Suppliers, (i) Technologists, (j) Managers, (k) Government and (l) Health Authorities. Nonetheless, there are differences to the cost type that is associated with these actors. For example, Clinicians (human Providers) and other actors are related to Cost in terms of training whereas Hospital actor (organizational Provider) is responsible to cover training expenses as well as to pay for the integration cost. *It would be more interesting though to investigate these relationships in depth to facilitate a better level of analysis.* Hence, the authors suggest that the cost factor should be further analyzed.

- *Barriers and Benefits factors:* It reveals that all healthcare actors would be interested in Benefits and Barriers depicting from EAI adoption. *This finding highlights the actors' need to be considered during EAI adoption process as individuals.* Such an issue is also emphasized in the normative literature (NHS, 1993; Siau, 2003). In addition, a more detailed analysis

of the different parameters of benefits and barriers should be carried out in relation to the actors (for the same reasons reported in the analysis of Cost factor).

- *Support factor:* The analysis of the empirical data indicates that the Suppliers, Technologists, human and organizational Controllers and the organizational Providers are related to this factor (Support). It is indicated that due to EAI technology's complexity and the lack of employees with EAI skills, the actors need support to adopt it. This is also reported in other relevant studies in which there was a lack of employees skills, e.g. ERP systems (Ginzberg and Zmud, 1998; Robey, 1979). The findings derived from the analysis of Cost factor, apply to this as well as to the rest of the factors.

- *Internal and External Pressures factors:* Clinicians and Non-clinicians, organizational Providers, Suppliers and Managers are interested in Internal and External Pressures. *This indicates that mainly these actors cause or receive pressures during EAI adoption process. This finding should be studied in relation to these actors, as these factors can possibly increase the resistance to change and adopt EAI in healthcare (Mantzana and Themistocleous, 2004). Thus, they can affect adversely the EAI adoption process.*

- *IT Infrastructure, IT Sophistication, Evaluation Framework of Integration Technologies and Framework for the EAI Packages Assessment factors:* The empirical data suggest that all these factors can be examined and analyzed as a group since, they are related to the same actors: Organizational Supporters, Researchers (Human Supporters) and Managers (Human Controllers). This finding suggests that *technological factors should be studied in relation to the aforementioned actors to support EAI adoption.* Similarly, Grimson *et al.,* (2000) reported that the existing healthcare IT Infrastructure and Sophistication are main barriers in the healthcare services improvement.

- *Readiness of Organization factor:* It appears that: (a) Clinicians, (b) Non-clinicians, (c) Hospitals, (d) Medical Departments – Clinics, (e) Researchers, (f) Technologists, (g) Managers, (h) Government and (i) Health Authorities are related to this factor. Along similar lines to the literature (Themistocleous, 2002) the organizational readiness is strongly related to other parameters such as training and skills development (e.g. technical). All these parameters are coming from different factors influencing and being influenced by various actors. This indicates that the analysis should not only focus on relationships among actors and factors but also on interrelationships among different factors and actors (e.g. how a specific actor or a parameter of a factor affects or is affected by other factors, actors or parameters of the same factor). *To this end, the authors suggest that these interrelationships should be studied in detail and mapped using modeling techniques (e.g. Fuzzy Cognitive Mapping or Structural Equation Modeling) to enhance the decision making process.* Thus, further research is required on this field.

- *Telemedicine factor:* The Acceptors, Providers, Researchers and Managers are related to the Telemedicine Factor. It appears that EAI application should support this factor. Telemedicine is of great importance to the aforementioned healthcare actors and to the UK_HOSP trust.

- *Clinical Support and Patient Satisfaction factors:* These factors affect and/or are affected by all the actors expect the Legal Professionals, Suppliers and Technologists. As, the vision in healthcare sector is the development of a patient-centric HIS (Wanless *et al.*, 2002), *it appears that most of actors are interested in EAI adoption's effect upon the clinical processes and the patient satisfaction.*

Despite **H1** was initially explored, the authors propose that an in-depth analysis of relationships between healthcare actors and factors should be made. This extensive research will provide a better understanding of EAI adoption process and the way that actors are affected and/or affect factors. Thus, the level of understanding will be enhanced and EAI adoption will become quicker. However, the authors agree that to better formulate the findings deriving from **H1**, the interrelationships between actors and factors should be more studied and analyzed. Therefore, the following hypothesis (*H_proposed*) is proposed for further research:

> ***H_proposed: Various interrelationships exist among different actors and factors. These might affect the adoption process.***

H2 and H3: Moreover, interviewees were requested to provide feedback on healthcare actors' categories (**H2**) and dimensions (**H3**). All of them agree with the categorization of the actors and the use of the human and organisational dimensions. For instance, a healthcare manager reported that '*your categorization [***H2***-actors categorization] is clear and*

captures all different groups of actors in healthcare'. Regarding **H3**, a clinician (doctor) mentioned that *'it is good to see that you separate the human actors from the organizational because in many cases human actors share different views from their organizations'*. As a result, it appears that *the healthcare actors can be classified into Acceptors, Providers, Supporters and Controllers. Also, these categories can be extended using human and organisational lenses.*

H4: Sixty-six percent *of interviewees from different actors' categories mentioned that other actors, such as "bank" should be considered an actor as well. Also, from the interviews it reveals that the various actors should be analyzed in more detail.* For instance, in the proposed taxonomy the actor manager (Controller) represents all managers at all levels. Nonetheless, this is not accurate in terms of analysis, as diverse categories of managers exist with different interests (e.g. IT Manager, Clinicians' Manager). In addition, patients should be differentiated from citizens, for whom the government is trying to improve quality of life. It has become one of EU plans not to focus on how to provide treatment to patients, but to place effort on minimizing the percentages of people that need treatment, by improving their (*citizens*) life quality. For this reason, the authors suggest that this research should be expanded, to define the whole range of actors at all levels and then test again their perceptions regarding EAI influential factors. *Thus,* **H4** *should be revised and the "bank" actor should be considered, with the authors suggesting further investigation of this hypothesis.*

The authors graphically represent in Figure 1 their proposed research model. The authors suggest that the proposed model should be further investigated and tested through the practical arena.

CONCLUSIONS

In this paper, the need to improve healthcare services through the integration of its information systems has been highlighted and explained. EAI is an emerging technology and although it is widely applied in many sectors, its adoption in healthcare is underutilized. Thus, there is a need to investigate this area and analyze the factors influencing its adoption in healthcare. This will significantly contribute to the decision making process and thus, speed up its adoption in this area.

The authors reviewed the normative literature and realized that human parameters and other soft issues were not considered in previous published models explaining EAI adoption, while multiple researchers have mentioned the actors' significant role in the adoption process. This is a limitation as the actors' role is important during the IS implementation in healthcare. Therefore, the authors proposed that healthcare actors should be studied in accordance to the factors affecting the EAI adoption in healthcare **(H1)**. Moreover, the authors reviewed the literature related to healthcare actors' identification and made hypotheses related to the main categories, dimensions and the taxonomy of healthcare actors **(H2, H3, H4)**. These four hypotheses were proposed and explored through the practical arena. The proposed research model is novel in terms that is combining an existing classification of EAI factors with an actor-oriented approach and it is applied in an area, which lacks of research. Moreover, the paper makes novel contribution to this area as, it is the first time that an actor-oriented approach is used to analyze and understand EAI adoption influential factors (in general).

Using such an approach the paper: (a) allows a better realization of EAI adoption process, (b) supports managers and researchers in understanding which actors should be considered during the study of EAI adoption factors. Moreover it supports multiple healthcare actors in realizing the factors related to EAI adoption process and might increase the adoption of EAI in healthcare. Consequently, it is suggested that this approach might reduce the resistance to change and speed up EAI adoption. Therefore, the services provided to patients and citizens will be improved.

One of the limitations of this research is that the outcomes presented herein are based on a real life case study. Thus, the data and the observations derived from this case cannot be generalized. Nonetheless, it is not the intention of this paper to offer prescriptive guidelines about which actors are affected and/or affect each influential factor in healthcare but rather to describe a case study perspective that allows others to relate their experiences to those reported. Therefore, this paper offers a broader understanding of the phenomenon of EAI realization in healthcare.

However, the analysis of the case study suggests that there is a need for a more detailed categorization of the actors. For instance, the actor manager (in the controllers' category) represents all managers in the healthcare sector. However, from the interviews conducted, it derived that the managers in the healthcare sector are multiple (e.g. Clinicians' Manager) and each has different role and responsibilities. Moreover, the interviewees mentioned that according to the new EU plans, the focus of the healthcare practitioners should be on minimizing the percentage of patients, by improving the quality of life for the citizens. Thus, it appears that the citizens should be another actor in the acceptors' category (human dimension). Therefore, the authors propose that the fourth hypothesis **(H4)** should be analyzed in more detail.
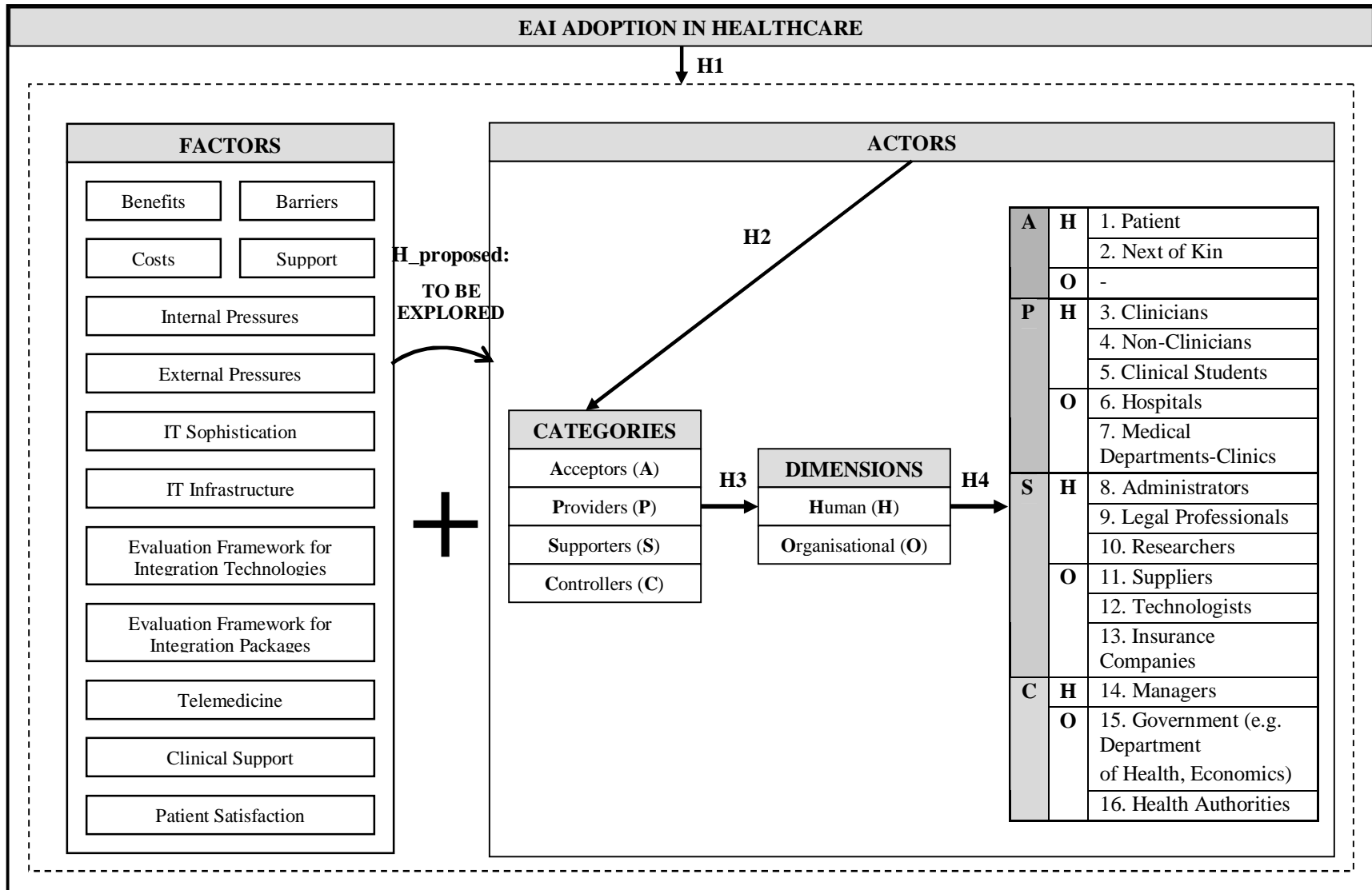
Figure 1: Proposed Research Model

The aforementioned issues are of great importance, as a key objective of an information system should be to handle that: (a) information is captured as soon as it occurs (b) information is captured once and (c) information is stored in a central database (Simon, 2004). To assure that the developed IS meets the specified requirements, the flow of the information should be analyzed. Finally yet importantly, further research can be made on the detailed analysis of all the factors related to EAI adoption individually. This is a research field that not much research has been made. Thus, the factors affecting the EAI adoption in the healthcare sector should be studied and analyzed in accordance to the different healthcare actors, as this will support multiple actors to fully realize the adoption factors **(H_proposed)**. Thus, the proposed research model should be further examined in relation to the aforementioned propositions for extra research. There is a need for integration in the healthcare sector and such further work will improve the analysis in this area and contribute in better healthcare services and decision-making.

REFERENCES

1. Aspden, P., Corrigan, J., Wolcott, J. and Erickson, S. 2004. *'Patient Safety: Achieving a New Standard for Care'*, Washington DC: National Academies Press,,
2. Chau, P. Y. K. and Hu, P. H. 2002. 'Investigating healthcare professionals' decision to accept telemedicine technology: an empirical test of competing theories', *Journal of Information and Management,,* **39**(4): 297-311.
3. Chen, M. 2003a. *'An Analysis of the Driving Forces for the Adoption of Web Services'*, In (Eds), Proceedings of The Second Workshop on e-Business, Seattle, U.S.A, 173-184., Dec 13-14 2003
4. Chen, M. 2003b. 'Factors Affecting the Adoption and Diffusion of XML and Web services Standards for E-business Systems', *International Journal of Human-Computer Studies,* **58**(2003): 259-279.
5. Denzin, N. Y. K. 1978. *'The Research Act: A Theoretical Introduction to Sociological Methods',* McGraw Hill, New York, USA.
6. DoH 2004. '*The NHS Plan - A Plan for Investment, a Plan for Reform'.*
7. Eisenhardt, K. M. 1989. 'Building Theories from Case Study Research', *Academy of Management Review,* **14**(4): 532-550.
8. Fitzerald, L., Ferlie, E., Wood, M. and Hawkins, C. 2002. 'Interlocking interactions, the diffusion of innovations in health care', *Human Relations,* **55**(12): 1429-1449.
9. Freeman, R. E. 1984. *'Strategic Management: A stakeholder Approach',* Ballinger Publishing Co., Cambridge.
10. Gagnon, M., Lamothe, L., Fortin, J., Cloutier, A., Godin, G., Gagne, C. and Reinharz, D. 2004. *'The Impact of Organisational Characteristics on Telehealth Adoption by Hospitals'*, In Sprague, R. J. (Eds), Proceedings of Thirty-Seventh Annual Hawaii International Conference on System Sciences, (Hicss 37), Big Island, Hawaii, USA, IEEE Computer Society, Los Alamitos, California, USA, [CD Proceedings]. January 5-8
11. Ginzberg, M. J. and Zmud, R. W. 1998. 'Evolving Criteria for Information Systems Assessment' *In Information Systems Assessment: Issues and Challenges* (Ed, Bjorn-Anderson, N. and Davies, N., pp. 41-52.
12. HIMSS 2004. '*15th Annual HIMSS Leadership Survey Sponsored by Superior Consultant Company',* HIMSS.
13. Houghton, J. 2002. *'Information Technology and the Revolution in Healthcare',* Victoria University of Technology, [Day of Access, 25th August 2004]
14. Howcroft, D. and Mitev, N. 2000. 'An empirical study of Internet usage among medical practice management in the UK', *Internet Research: Electronic Networking Applications and Policy,* **10**(2): 170-181.
15. Hu, P. J., Chau, P. Y. K. and Sheng, O. L. 2000. *'Investigation of Factors Affecting Healthcare Organisation's Adoption of Telemedicine Technology'*, In Sprague, R. J. (Eds), Proceedings of Thirty-Third Hawaii International Conference on System Sciences (HICSS-33), Big Island, Hawaii, USA, IEEE Computer Society, Los Alamitos, California, USA, 1-10. January 4-7
16. Irani, Z. 1998. '*Investment Justification of Information Systems: A Focus on the Evaluation of MRPII', PhD Thesis, Department of Manufacturing and Engineering,* Brunel University, London, UK.
17. Irani, Z. and Love, P. 2001. 'The Propagation of Technology Management Taxonomies for Evaluating Investments in Information Systems', *Journal of Management Information Systems,* **17**(3): 161-177.
18. Irani, Z., Themistocleous, M. and Love, P. E. D. 2003. 'The Impact of Enterprise Application Integration on Information System Lifecycles', *Information and Management,* **41**(2): 177-187.
19. Janesick, V. 2000. 'The choreography of qualitative research design' *In Handbook of qualitative research* (Ed, (Eds, Denzin, N. Y. K. and Lincoln, Y. S.) Sage publications, Thousand Oaks, CA, pp. 379-399.
20. Khoumbati, K., Themistocleous, M. and Irani, Z. 2003. *'A Conceptual Model for the Adoption of Enterprise Application Integration In Healthcare Organisations'*, In Chung, M. (Eds), Proceedings of Ninth Americas Conference on Information Systems, (AMCIS 2003), Tampa, Florida, USA, pp. 881-889. August 4-6
21. Lauer, T. W., Josshi, K. and Browdy, T. 2000. 'Use of the Equity Implementation Model to Review Clinical System Implementation Efforts: A Case Report', *Journal of the American Medical Informatics Association,* **7**(1): 91-102.
22. Mantzana, V. and Themistocleous, M. 2004. 'Identifying and Classifying Benefits of Integrated Healthcare Systems Using an Actor Oriented Approach', *Journal of Computing and Information Technology,* **2**(4):265-278

23. McGrath, G. M. and More, E. 2001. *'Data Integration Along the Healthcare Supply Chain: The Pharmaceutical Extranet Gateway Project'*, In Sprague, R. J. (Eds), Proceedings of Proceedings of Thirty-Fourth Annual Hawaii International Conference on System Sciences, (Hicss 34), Big Island, Hawaii, USA, IEEE Computer Society, Los Alamitos, California, USA., [CD Proceedings]. January 3-6

24. Miles, M. B. and Huberman, A. M. 1994. *'Qualitative Data Analysis: an Expanded Sourcebook',* London.

25. NHS 1993. *'The Good European Health Record: Ethical and Legal Requirements',* National Health Service (NHS), [Day of Access, 23rd June 2004]

26. NHSIA 2004. '*Information for Health - An Information Strategy for the Modern NHS 1998-2005: A National Strategy for Local Implementation'*.

27. Robey, D. 1979. 'User Attitudes and Management Information System Usage', *Academy of Management Journal,* **22**(1): 527-538.

28. Siau, K. 2003. 'Health Care Informatics', *IEEE Transactions on Information Technology in Biomedicine,* **7**(1): 1-7.

29. Siau, K., Southbard, P. and Hong, S. 2002. 'E-healthcare strategies and implementation', *International Journal of Healthcare Technology and Management,* **4**(1/2): 118-131.

30. Simon, S. 2004. 'Hospital Profitability Crisis: an Integrated Process and Technology Solution', *International Journal Healthcare Technology and Management,* **6**(2): 158-172.

31. Themistocleous, M. 2002. '*Evaluating the Adoption of Enterprise Application Integration in Multinational Organisations', PhD Thesis, Department of Information Systems and Computing,* Brunel University, London.

32. Turunen, P. and Jan, T. 2000. *'Stakeholder groups in the evaluation of medical information systems'*, In Brown, A. and Remenyi, D. (Eds), Proceedings of Seventh European Conference on the Evaluation of Information Technology, Dublin, Ireland, 329-334. 28-29 September

33. Wanless, D., Charlesworth, A., Walker, I., Beck, M., Black, J., Blue, I., Brindle, S., Bucht, C., Dunn, S., Fairweater, M., Ghazi-Tabatabai, Y., Innes, D., Lewis, L., Patel, V. and York, N. 2002. *'Securing our Future Health: Taking a Long-Term View',* HM Treasury, http://www.hm-treasury.gov.uk/wanless, [Day of Access, May 2004]

34. Wiley-Paton, S. and Malloy, A. 2004. *'Understanding Healthcare Professionals' Adoption and Use of IT'*, In Gallette, D. and Ross, J. (Eds), Proceedings of Tenth Americas Conference on Information Systems, New York, 179-183. August 6-8

35. Yin, R. K. 1994. *'Case Study Research: Design and Methods',* SAGE Publications, California, USA.