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Research Forecasting for Health Information Technology (HIT), using technology intelligence

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ABSTRACT

Due to the rapid pace of change in technology and its impact on society, there is an increasing demand for use of Technology Forecasting methods to improve policy planning and implementation. One such area is the field of Health Care and the impact of Health Information Technology (HIT) on this field. Using HIT has shown to be associated with reduced cost, improved quality, and better patient experience; yet HIT adoption has been slow. Therefore, there is a need to better understand the HIT adoption processes in order to meet the evolving requirements for health care delivery.

We propose collecting Technology Intelligence for use in Research Forecasting as part of the larger HIT Technology Forecasting efforts. In this study, we systematically probed for HIT-related technology intelligence in the fields of Information Systems, Engineering Management, and Medical Informatics. Results of our analysis show that all three fields are active in Health IT research, but could benefit from further collaboration. We were also able to identify instances of emerging journals and emerging topics in Health IT research. We conclude that it is indeed plausible and meaningful to collect technology intelligence on HIT adoption, to support the overall goal of improving healthcare delivery.

1. Problem introduction

Due to the rapid rate of technological and societal changes, there is a growing demand for Technology Forecasting (TF). Public and private sector entities are applying TF from regional to global levels to gain competitive advantage, create social change, implement regulations, and more. Therefore, we propose gathering technology intelligence for forecasting and impact assessment in the field of Health Information Technology; this has not been previously done using the methods in the Technology Forecasting domain. We show how to establish technology intelligence, and how to probe this intelligence to support Health IT adoption. Our methodology may also be useful to other fields considering studying Technology Adoption.

Some of the methods popular for analyzing future technologies include: Technology Intelligence, Forecasting, Road Mapping, Foresight and Impact Assessment [1,2]. Some have even proposed integrating these different methods under a unified field of study: Technology Futures Analysis (TFA) [1]. There is an expectation that renewed focus on innovation and sciences, along with political and social factors, will be major drivers for more effective and efficient Technology Forecasting. In these times of change, the field of TF more so than ever is utilizing interdisciplinary concepts and integrating fields such as political science, computer science, and scientometrics to resolve the complex problems that effect society [2].

Using technology intelligence is a key to successfully forecasting technology and understanding its social impact. The exponential growth of internet and electronic communication has led to an increasing number of data sources that can be useful for gathering technology intelligence. Having the proper Information Technology tools to collect, analyze, and act on this data is of critical

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importance to users of technology intelligence. For example, researchers have shown that through technology, intelligence organizations can link knowledge and ideas originating outside of their organization with internal competencies, to create new innovations and gain a competitive advantage in their marketplace [3].

2. Health IT and technology intelligence

In terms of annual spending, the healthcare industry in United States, is the largest delivery system in the world. However, this system is facing monumental challenges. For example, patients suffering from chronic illnesses account for approximately 75% of the nation's healthcare related expenditures. It is generally accepted that the use of Health Information Technology (HIT) can assist in solving the problem by reducing cost and increasing quality of patient care.

Even though the potential benefits of using HIT have been widely accepted, to date, adoption has been slow; for example, currently only about 20% of physician practices and 25% of hospitals use an Electronic Medical Record (EMR) [4]. Previous reviews have shown that broad use of health IT may improve health care quality, prevent medical errors, reduce health care costs, increase administrative efficiencies, decrease paperwork, and expand access to affordable care [5]. Additionally, interoperable health IT may improve individual patient care, and it may also bring many public health benefits including: early detection of infectious disease outbreaks around the country, improved tracking of chronic disease management, and evaluation of health care based on value enabled by the collection of de-identified price and quality information that can be compared [6].

To be able to accelerate the rate of HIT adoption, there is a need to better understand the organizational science that enables future planning and social change. Therefore, we intend to gather technology intelligence from existing research literature to partially support this goal. To that end, we identified four research questions:

1) Within the Management Science knowledge areas, which ones are actively investigating HIT adoption? (areas: *Technology Acquisition*, *Technology Adoption*, *Technology Assessment*, *Technology Diffusion*, *Technology Transfer*)
2) What are the research streams evaluating or forecasting HIT adoption issues? (streams: *Information Systems*, *Engineering and Technology Management*, *Medical Informatics*)
3) What are the current themes in Health IT adoption research?
4) How collaborative are the research networks investigating Health IT adoption?

To identify publications of interest, a comprehensive search was performed across Medical Informatics, Engineering Management and Business databases from 1940 to 2008. Medical Informatics publications are mainly housed in PubMed, which is a service of the U.S. National Library of Medicine that includes over 18 million citations from MEDLINE and other life science journals for biomedical articles. Articles related to Business & Economics were queried through major databases including Business Source Premier. In the Engineering and Information Science domain, Compendex, IEEE and other databases were queried. Science databases such as Web of Science were reviewed for Life Science and Social Science publications addressing Health IT adoption.

3. Advances in Technology Forecasting

Bibliometrics, text mining, clustering, database tomography, factor analysis, and taxonomies are among some of the most widely used tools for gathering technology intelligence. Daim et al. have used bibliometrics, patent analysis, and systems dynamics to forecast emerging technologies in fuel cell, food safety, and optical storage industries [7]. Database Tomography (DT) has been used to extract technical intelligence from a range of text-based data sources; for example, Science Citation Index (SCI). Kostoff has used DT for phrase frequency analysis, proximity analysis, and bibliometrics. Phrase frequency analysis provides the prevalent technical themes in literature, and Proximity analysis provides the relationships among the prevalent themes. Bibliometrics provides the following: recent most prevalent topical area authors; the journal that contains topical area papers; the institution that produces topical area papers; most frequent keywords used by topical area authors; authors' work sited most in topical area papers; and journals most sited in topical area papers [8].

Science and technology infrastructure at the national level has also been evaluated using TF methods. Clustering and bibliometrics have been used to identify structure of technical literature for Thin Films industry in Mexico [9]. Using a similar method, Indian's research literature has been examined using the following TF tools: 1) article clustering; 2) bibliometrics to identify value of collaborative research; 3) network mapping to identify networks of organizations publishing together, networks of organizations with common technical interests, and organizations with common interest that are not co-publishing together; and 4) trend analysis for placing results into historical context [10]. Bibliometrics, clustering, and thematic trends have also been used to identify and analyze science and technology core competencies in China [11]. The analysis, based on a two year window, showed that China's research article output has increased significantly over the last decade. And those Chinese publications concentrated on physical and engineering sciences, in contrast to the U.S. publications that concentrated more on medical, social and psychological sciences [12–14].

Another tool used in TF is applying term (keyword) frequency analysis as a way to identify important research and technology trends from journal articles. Of particular interest is the relationship between publication patterns and underlying technological developments. Using bibliometrics, one study extracted the commercialization gap between science and technology. Citation networks were used to link scientific publications with patents. The case report in solar cell showed that scientific research was more concerned with basic fundamentals, such as cell design itself, where patents were concerned more with applied use of technology in solar cell modules [15]. The results concluded that while for some instances scientific activity existed, there were no corresponding

technical applications of those scientific instances, and therefore a commercialization gap. Such analysis could offer an alternative to discover opportunities for industrial commercialization of scientific findings.

Others have used citation networks and clustering published articles to investigate structures of research and detect emerging research domains; for example, in the field of Chemistry [16]. Others have used forecasting tools to explain economic development at a regional, community level. For example, information from patent and publication analysis was used to inform out-of-network recruiters of knowledge growing within a community. Application of data mining was able to identify top researchers in the region for inclusion in a state economic development effort [17].

Porter has even proposed the Quick Technology Intelligence Processes (QTIP) for forecasting, where analysis only takes minutes to run, rather than months. A one-page summary of composite information based on automated routines would inform stakeholders [18]. Others have tracked science and technology for renewable and sustainable energy through citation network analysis and clustering [19], as well as biomass and biofuels [20]. Another manner in which technology intelligence and forecasting can be useful is by helping determine industry convergence. Using bibliometrics, a study in the chemical industry was able to predict first indicators of convergence in the two industries of Cosmeceuticals and of Nutraceuticals and Functional Foods [21]. The research showed that a multiple indicator concept based on bibliometrics could be developed to monitor coverage in R&D intensive fields through publicly available data.

Kostoff has also presented the idea of Literature-related discovery (LRD) for linking two or more concepts in literature that have not already been linked. LRD could be used to create new knowledge, and is made up of two components: Literature-based discovery (LBD), which generates potential discovery by searching literature analysis, and Literature-assisted discovery (LAD), which generates discovery through a combination of analysis of literature and interaction of selected literature authors [22,23].

Yet others have used TF to define the concept of key inventors, meaning individuals who are highly productive and widely cited [24]. It is hypothesized that key inventors are likely to be the leaders in developing new fields and knowledge. Using bibliometrics, the concept of key inventors has been successfully examined in the fuel cell and nanotechnology industry.

Others have also applied bibliometrics, patent analysis, or network analysis to agri-food systems[25], emerging technologies [26], innovation forecasting [27], decision making [28], technology diffusion[29], research impact assessment [30], nanotechnology in Brazil [31], innovation indicators [32], developing countries [33], Literature-Related Discovery [23], electric polymer Nano composite [34], technological threat and opportunity assessment [35] and evaluating innovation networks [36] and social network analysis [37,38].

4. Research method

A mixed-method approach was used for data analysis. Table 1 summarizes the methods used to analyze each research question with the corresponding sample size. Fig. 1 shows the detail of steps performed in content, cluster, and keyword analysis.

Using content analysis, and based on the topic addressed, research articles were grouped into Management Science knowledge areas [39]: Technology Acquisition, Technology Adoption, Technology Assessment, Technology Diffusion, and Technology Transfer.

During cluster analysis, research articles were divided into three clusters for analysis: Information Science (IS/MIS), Engineering & Technology Management (ETM) and Medical Informatics. Using these clusters and based on frequency of publication on HIT adoption topic, active journal publications were identified.

Keyword Analysis was used to further examine technology diffusion related articles, but within the Medical Informatics cluster only. The candidate articles were examined using their author-assigned MeSH keywords provided by PubMed. MeSH is the U.S. National Library of Medicine's controlled vocabulary used for indexing articles for MEDLINE/PubMed. The collection of headings produces a large number of useful headings, to reduce the data to a manageable set, and only unique occurrence of each keyword was considered. Using these keywords we were able to identify the most investigated themes in literature related to HIT adoption [40].

Finally, we used Social Network Analysis (SNA) to examine research networks investigating HIT adoption [41]. This information was used to examine the extent of collaboration between these disparate networks working on Health IT adoption.

5. Active research areas in Health IT adoption research

As seen in Fig. 2, according to the publications reviewed, there is an increasing trend in number of Health IT articles published.

Our first research goal was to understand: currently, what are the active knowledge areas investigating Health IT. Using content analysis, we organized the publications into generally accepted areas of Management Science relating to IT adoption: Technology

Table 1
Research study methods and sample size summary.

Analysis method	research question	Sample size
Content analysis	1) Within the Management Science knowledge areas, which ones are actively investigating HIT adoption? (areas: *Technology Acquisition*, *Technology Adoption*, *Technology Assessment*, *Technology Diffusion*, *Technology Transfer*)	610 research articles
Cluster analysis	2) What are the research streams evaluating or forecasting HIT adoption issues? (streams: *Information Systems*, *Engineering and Technology Management*, *Medical Informatics*)	610 research articles
Keyword analysis	3) What are the current themes in Health IT adoption research?	119 PubMed articles
Social network analysis	4) How collaborative are the research networks investigating Health IT adoption?	119 PubMed articles

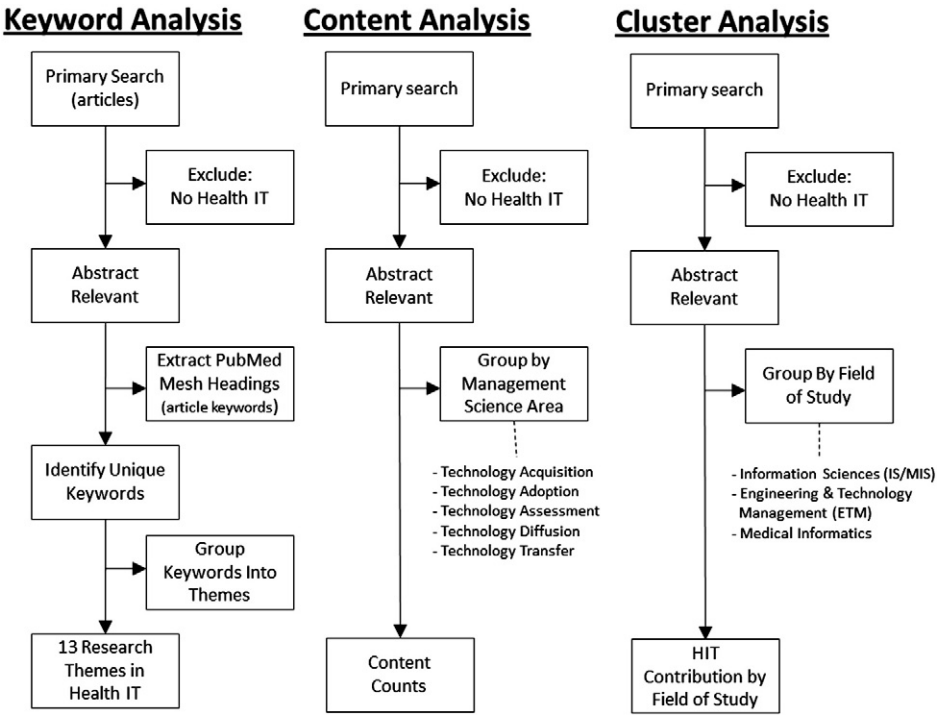

Fig. 1. Steps performed to collect and analyze research articles.

Acquisition, Technology Adoption, Technology Assessment, Technology Diffusion, and Technology Transfer. Fig. 3 shows the results, where based on number of publications, the area of Technology Diffusion was the most active research area in Health IT. This was followed by Technology Adoption, Technology Assessment, Technology Acquisition, and Technology Transfer.

The results of analysis show that inventory of research in Health Information Technology is on an increasing trend across various management science knowledge areas. Over the last two decades, research has increased tenfold, from roughly ten relevant articles published in 1989, to over 100 in 2008. Among various factors, the increasing trend has been contributed to the following conditions: social trends, renewed research interest, and technological advances [5]. The healthcare delivery system in the United States is facing monumental challenges, and this has generated renewed interest from the government and the public which is fueling healthcare diffusion research streams. Technology advances and the new healthcare services it enables are also contributing to interest in HIT research. The promise of applying technology to healthcare lies in increasing efficiency, accountability, and quality of care, while decreasing cost.

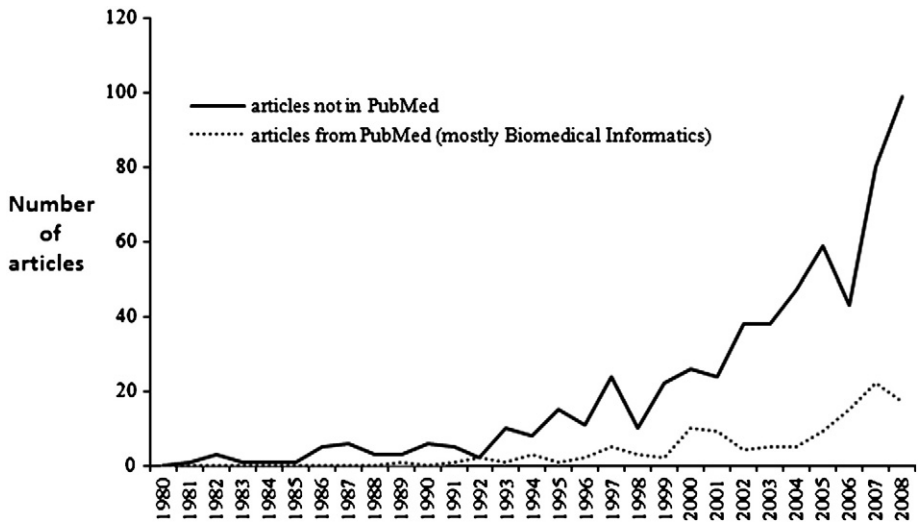

Fig. 2. Number of Health IT related articles published by year.

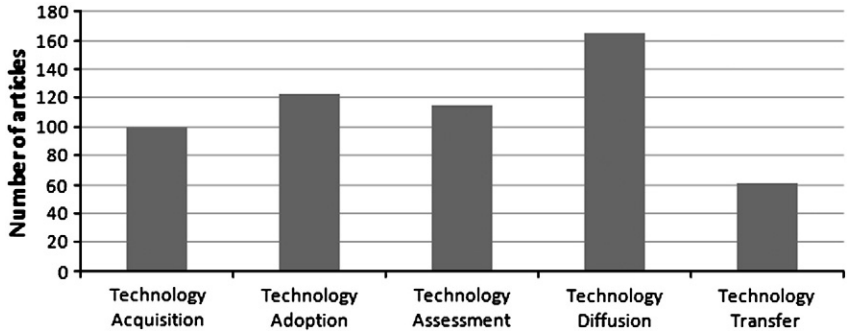

Fig. 3. Number of articles published by knowledge area (1980–2008).

6. Research streams evaluating Health IT adoption

The second research goal was to identify research streams that are actively contributing to the Health IT adoption research. For the purposes of this analysis, we defined a research stream as combinations of Field of Study, Journal Publication, and Journal Authors. Using expert judgments, and based on source of publication, articles were grouped into one of the following fields of study: *Management Information Systems (IS/MIS)*, *Engineering and Technology Management (ETM) and Medical Informatics*. IS/MIS contributes information technology methods and theories to Health IT research. ETM concerns itself with studying the process of technology management and Health IT implementation. And Medical Informatics, due to its proximity to the actual healthcare field being housed in Medical or nursing schools, is a valuable source of subject matter expertise [42].

Within the Engineering & Technology Management cluster, the *International Journal of Technology Assessment in Health Care* has published most on the topic, with 25 research articles. In the Medical Informatics cluster, the *International Journal of Medical Informatics* has published the most on the topic, with 19 research articles. Within the Information Systems cluster, *MIS Quarterly* and *Information Systems Research* has published the most on the topic. Additionally, within the Medical-Informatics cluster, seven authors have published ten or more articles addressing Health IT adoption, and 24 authors have published at least three times.

Considerable involvement in all three fields of study is an encouraging sign for advancing Health IT adoption. We believe it is important to examine both Engineering Management and Medical Informatics research communities, since these two fields conduct overlapping research, and at times are not efficiently integrated. Medical Informatics departments are often housed in Medical schools, and are staffed with a significant number of physicians whom through extended graduate studies have crossed into the more technical field of Informatics (16). In contrast, Engineering Management researchers are generalists in applying their specific set of knowledge to various domains including healthcare, finance, energy and transportation.

Collaboration between these three groups can result in valuable and more efficient research efforts. One recommendation is to have researchers from the fields of ETM and IS/MIS exchange graduate-level students, through research assistant positions, with

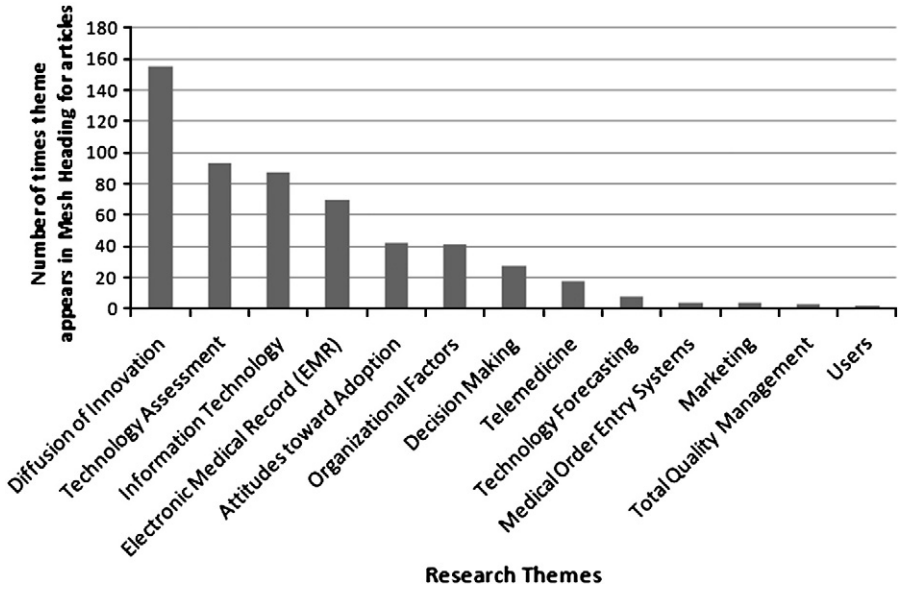

Fig. 4. Current themes and topics in Health IT adoption research (n = 119 articles).

Medical Informatics departments embedded in Medical or Nursing Schools. We have been able to successfully demonstrate this exchange between the ETM department at Portland State University and the Medical Informatics department at Oregon Health and Science University.

7. Current themes in Health IT adoption research

The third research goal was to identify current themes and topics in Health IT adoption research. Due to the complex nature of this analysis, we opted to limit the scope of analysis to PubMed articles from the original set of articles. This decision was also influenced by the fact that PubMed provides standardized keywords in the form of MeSH. In all, 119 journal articles containing 1512 major headings, which 472 were unique, were coded into 13 themes by the authors [43].

Results of keyword analysis show that the themes of *Diffusion of Innovation (DOI)*, *Technology Assessment*, *Information Technology (IT) and Electronic Medical Record (EMR)* are the most frequently appearing research themes. As shown in Fig. 4, some of the other emerging themes include: *Attitudes toward Adoption*, *Organizational Factors*, *Technology Forecasting*, *Total Quality Management and Users*.

Analyzing the PubMed MeSH headings (keywords) assigned to Health IT adoption related papers, in the Biomedical Informatics cluster, helps further characterize the state of research. For example, among the sample set, the terms *Diffusion* and *Technology Assessment* were most used, which could be an indication of researcher focus and interest. Since the MeSH headings are author-assigned, it could be a reliable indication of the author's research intention, and a good tool for this analysis performed here. Reviewing the complete list of themes shows that some important elements for Health IT adoption may be understudied, including patient's perspectives and characteristics of innovations. In this study, this portion of the analysis was only performed for the papers in the Medical Informatics cluster; the method could be extended to also examine publications in IS/MIS and ETM clusters.

8. Research network collaboration in Health IT adoption research

The fourth research question in this study was to evaluate the extent to which various research networks collaborate in investigating Health IT adoption. To examine this complex relationship, we used social network analysis [41]. Table 2 summarizes the tests performed and the resulting technology intelligence; each of the tests is described later in this section.

Network analysis proves useful for comparing research agendas among researchers; for example, consider the *International Journal of Technology Assessment in Health Care* (IJTAHC), the most active research stream in Health IT adoption. Fig. 5 shows IJTAHC is not connected to the other research sub-networks along the edges of the Figure. This means that there were no authors in our sample that published in the IJTAHC journal, and at least one other journal related to Health IT adoption. Further examining the outer sub-networks in Fig. 5 shows that even those are seldom connected to one another, similar to the IJTAHC node. It is possible this is a sign of discontinuity between adoption and assessment researchers.

Applying Social Network Analysis to combinations of articles and the PubMed MeSH headings exposes other interesting dynamics of the research stream. For example, in one sub-network, shown in Fig. 6, the MeSH heading *Organizational Factors* appears in 29 articles as part of the author-assigned keyword list, 37 articles used the heading *ICT* (Information and Communication Technology), and 9 used both *Organizational Factors* and *ICT*. This type of union can show, when studying ICT systems, that examining the impact of Organizational factors is relevant in the research community. This type of network analysis can systematically be applied to any combination of PubMed MeSH headings and the articles they appear in, to generate a list of relationships for technology intelligence.

Table 2
List of social network analyses and the resulting technology intelligence.

Analysis goal	SNA analysis variables	Analysis results *(technology intelligence)*	Related figure
Examine collaboration among research agendas in HIT (collaborating journals and authors)	–Journal Name –Author Name	Not adequate collaboration among sub networks. For example, authors for the most active journal (*International Journal of Technology Assessment in Health Care*), haven't published in the other journals working on Health IT adoption research.	Fig. 5
Determine instances of HIT topics that are being collaborated on.	–Journal Article Id –Article MeSH heading (keywords)	PubMed MeSH headings *Information Technology* and *Organizational Factors* are often being researched in conjunction with one another.	Fig. 6
Perform power analysis for HIT topics that are being highly researched.	–Journal Name –Article MeSH heading (keywords)	*Diffusion of Innovation*, *United States* and *Humans* appear the most, as article keywords (MeSH headings).	Fig. 7
Examine IS/MIS theory application and usage in research.	–Author Name –IS/MIS Theory Name	IS Theories of *TAM*, *TPB*, *TRB*, *DOI*, *ET* and *UTAUT*, are all used in research literature.	No figure
Determine instances of emerging journals and topics in HIT research.	–Journal Name –Article MeSH heading (keywords)	*Methods of Information in Medicine* is an emerging Journal in the area of Health IT adoption, and *Public Health* and *Health Services Research* are emerging topics in Health IT research; introduced by *Journal of Public Healthcare*.	Fig. 8

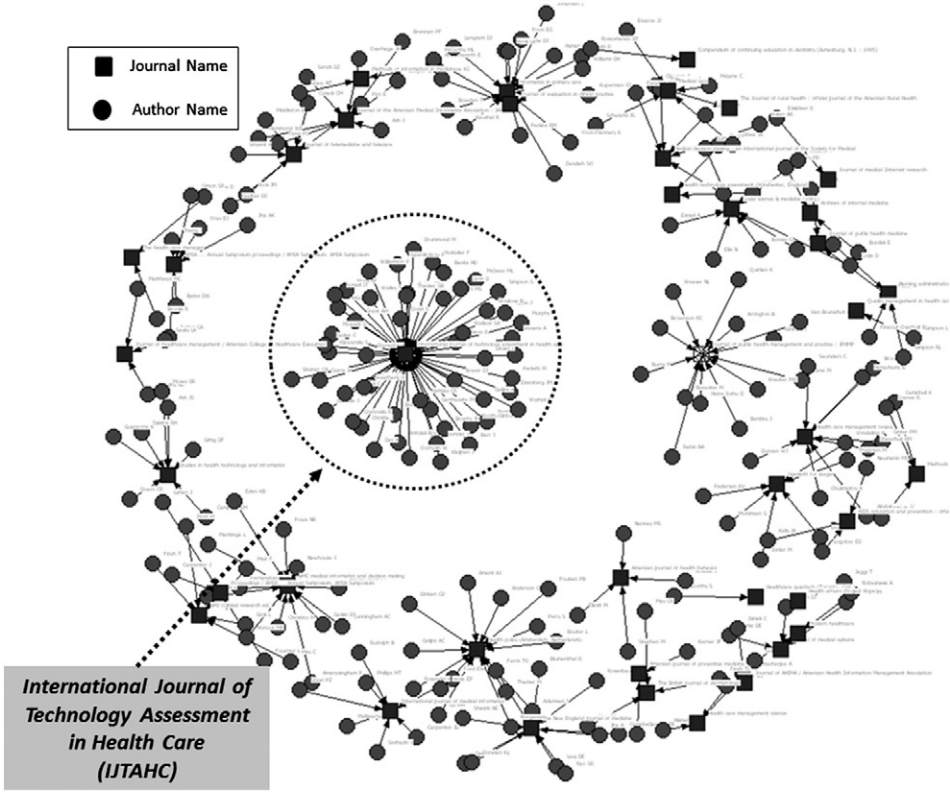

Fig. 5. Social network analysis by Journal Name and Author Name.

In Social Network Analysis, Centrality of a node is an indication of the power of that element in the network; the larger the node size, the larger its impact. Fig. 7 shows measurement for centrality among the articles examined, the most significant of which are (centrality rating of 0.1 or higher): *Attitude of Health Personnel*, *Medical Records Systems*, *Computerized/Utilization*, *Health Care*

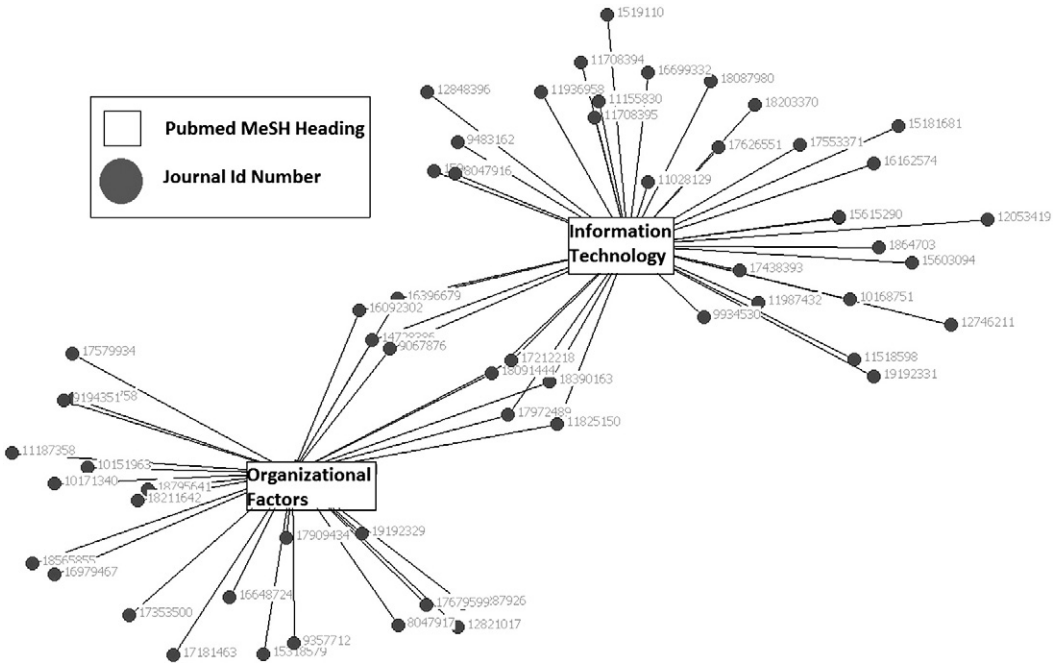

Fig. 6. Social network analysis by PubMed Journal Id Number and MeSH Heading.

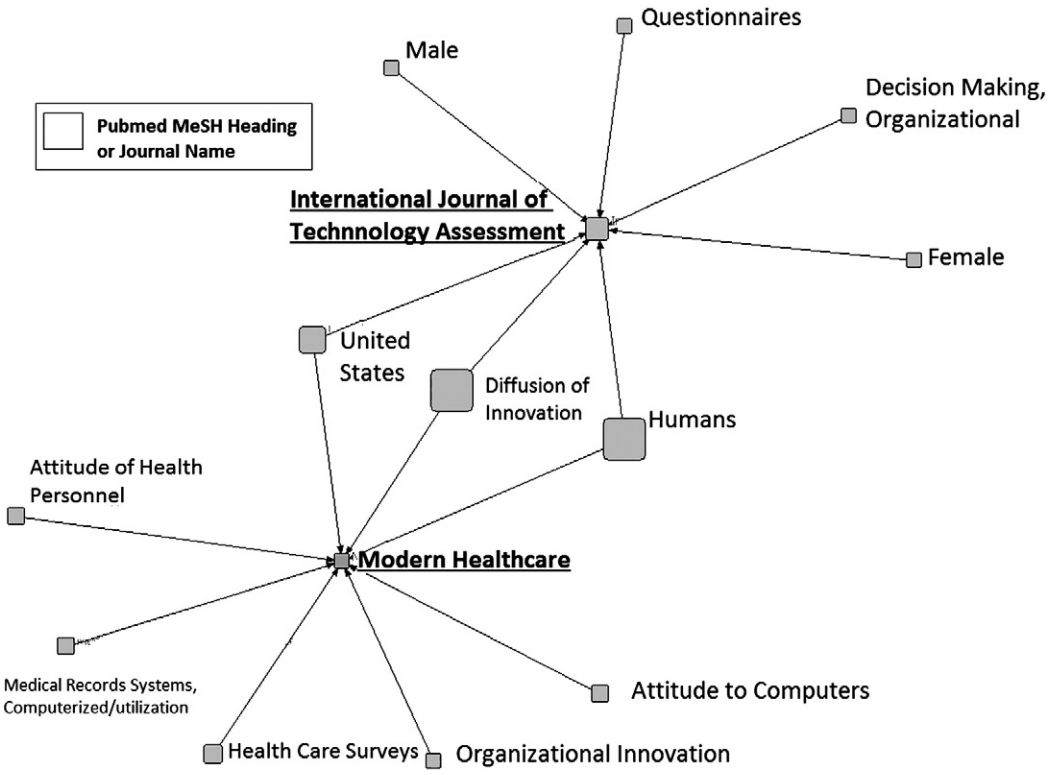

Fig. 7. Social network analysis showing centrality > 0.1.

Surveys, *Organizational Innovation*, *Attitude toward Computers*, *Modern Healthcare*, *Humans*, *Diffusion of Innovation*, *United States*, *Female*, *Decision Making*, *Organizational* and *Questionnaires*.

Using social network analysis, we also tested for application of Information Systems Theories in Health IT adoption literature. The most popular applications of theory included the following: *Roger's Diffusion of Innovation*, *Technology Acceptance Model* [44], *Theory of Planned Behavior* [45], *Theory of Reasoned Action* [46], *Unified Theory of Acceptance and Use of Technology* [47] and *Evolutionary Theory* [48].

Network analysis graphs can further be used to speculate on emerging topics in Health IT adoption research. For example, the bottom-left section of Fig. 8 shows the overall network graph in this study. The graph includes over 1400 keywords and hundreds of journals. Fig. 8 also shows two subnets that could be of interest: subnet-A and subnet-B.

In subnet-A, the publication *Methods of Information in Medicine* could be speculated as a possible emerging Journal in this field of research. There are very few nodes connecting the journal to the overall network graph. The graph shows that in our sample, papers published in this journal used three PubMed MeSH headings: *Medical Informatics*, *Technology Assessment* and *Internet*. The headings *Technology Assessment* and *Internet* previously existed in the network by way of other journals. However, *Medical Informatics* as a MeSH heading makes its first appearance in the network. Based on evidence from subnet-A, we could speculate that the *Methods of Information in Medicine* is an emerging journal in Health IT adoption, and the word *Medical Informatics* was used as a MeSH heading for the first time in this research network.

Examining subnet-B is a bit more complex, as the journal at its center, *Journal of Public Healthcare*, already has nine headings linked to it. Seven of the headings shown in the bottom left of subnet-B circle in Fig. 8 are not new. But from the top right side of the subnet-B circle, two new terms are emerging: *Health Services Research/trends* and *Public Health*. From analyzing subnet-B, we can conclude that the *Journal of Public Healthcare* introduced the emerging topics of *Health Service Research* and *Public Health* into the Health IT adoption research network.

9. Conclusion

We posed four research questions as a way of generating technology intelligence for Health IT Research Forecasting. Table 3 summarizes the questions and the individual findings. This study has analyzed the research streams of Information Systems, Engineering and Technology Management, and Medical Informatics for Health IT adoption, and showed that all three fields of study are making considerable progress. In general, there seems to be a promising number of academic journals forming the backbone of the Health IT research network. The journals of *International Journal of Technology Assessment in Health Care* and *Journal of American Medical Informatics Association* are the two most active journals in the field. However, more activity from a

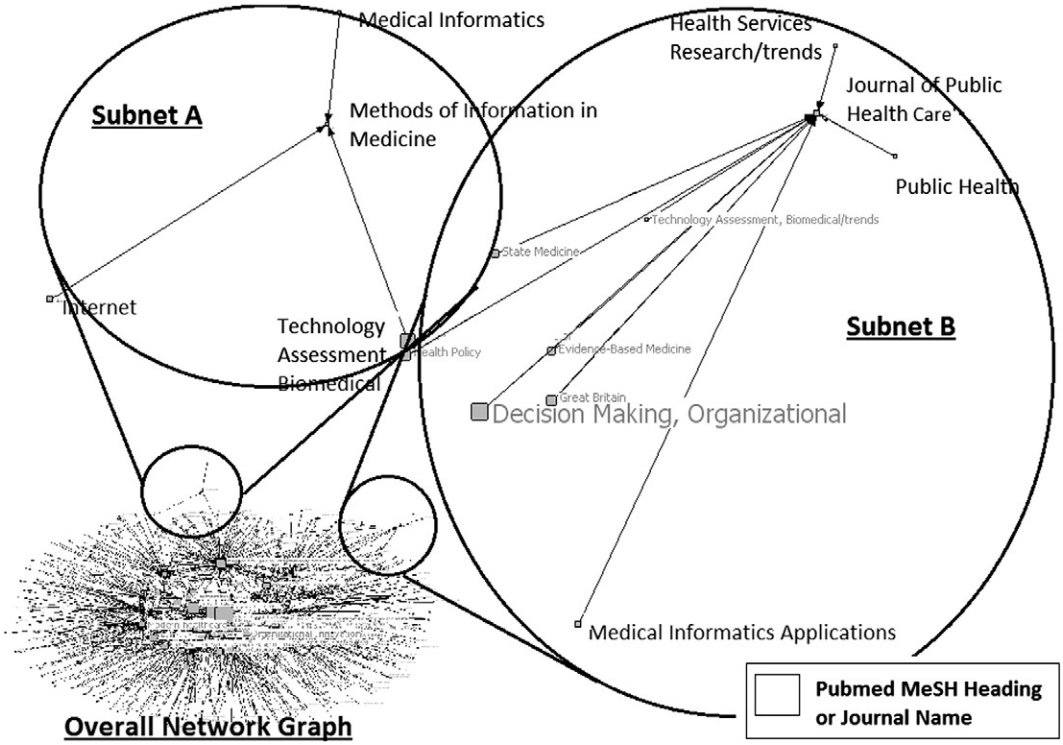

Fig. 8. Social network analysis, emerging journal and topics in the research network.

Table 3
Research questions and the resulting technology intelligence.

Research question	Resulting technology intelligence
1) Within the Management Science knowledge areas, which ones are actively investigating HIT adoption? (areas: *Technology Acquisition*, *Technology Adoption*, *Technology Assessment*, *Technology Diffusion*, *Technology Transfer*)	The results of analysis show that inventory of research in Health Information Technology is on an increasing trend across various management science knowledge areas. Among various factors, the increasing trend has been contributed to by the following conditions: social trends, renewed research interest and technological advances [5]. Based on the number of HIT articles published, the most active areas, in order, are: *Technology Diffusion*, *Technology Adoption*, *Technology Assessment*, *Technology Acquisition and Technology Transfer*.
2) What are the research streams evaluating or forecasting HIT adoption issues? (streams: *Information Systems*, *Engineering and Technology Management*, *Medical Informatics*)	The three fields of study: IS/MIS, ETM and Medical Informatics are active in Health IT research. The most active journals in IS, ETM, and Medical Informatics are, respectively: *MIS Quarterly* and *Information Systems Research*, *International Journal of Technology Assessment in Health Care*, *International Journal of Medicine Informatics*. Collaboration between these three groups can result in valuable and more efficient research efforts.
3) What are current themes in Health IT adoption research?	Current Themes: *Diffusion of Innovation*, *Technology Assessment*, *Information Technology*, *Electronic Medical Records*, *Attitudes*, *Organizational Factors*, *Decision Making*, *Telemedicine*, *Technology Forecasting*, *Medical Order Entry Systems*, *Marketing*, *TQM and Users*.
4) How collaborative are the research networks investigating Health IT adoption?	Collaboration among sub-networks is not adequate. For example, authors for the most active journal (International Journal of Technology Assessment in Health Care), haven't published in the other journals working on Health IT adoption research. PubMed MeSH headings *Information Technology* and *Organizational Factors* are often being researched in conjunction with one another. *Diffusion of Innovation*, *United States* and *Humans* appear the most as article keywords (MeSH headings). IS Theories of *TAM*, *TPB*, *TRB*, *DOI*, *ET* and *UTAUT*, are all used in research literature. *Methods of Information in Medicine* is an emerging Journal in the area of Health IT adoption, *and Public Health* and *Health Services Research* are emerging topics in Health IT research; introduced by *Journal of Public Healthcare*.

broader base of authors would be beneficial, and the study findings indicate recommendation of a more integrated research effort between the engineering management and medical informatics research communities.

Solving the Healthcare crisis in the United States is one of the most important challenges facing its society and government. Various entities have called for decreasing cost and increasing quality of care delivery [49]. Scientists, practitioners, and policymakers have all identified accelerating rate of Health IT adoption as a key contributor [5]. Therefore, we believe by gathering technology intelligence, and using it in Research Forecasting as part of the larger HIT Technology Forecasting efforts, with this research we have contributed in helping move forward this nation's healthcare improvement agenda.

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