
Improving disability evaluation productivity: linking innovative business models with information technology

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Abstract: This paper examines the relationship between the healthcare industry and disability evaluation, with a special focus on how information technology (IT) can assist in fostering the disability evaluation process. In the USA, various disability compensation programmes exist, and each uses a specialised terminology to define disability based on the compensation payer's definition. However, ambiguity arises as a result of the use of these multiple definitions and interpretation of terms, which contributes to delays in the disability evaluation process. This paper develops two conceptual models for disability evaluation and explores the underlying business models and the role of IT in achieving productivity gains. Throughout this discussion the focus is on process inefficiencies in determining disabilities and the potential role of innovative business models and technology practices. Finally, future research opportunities and their implications are also enumerated.

Keywords: healthcare; disability evaluation; disability evaluation process; productivity; information technology; business model.

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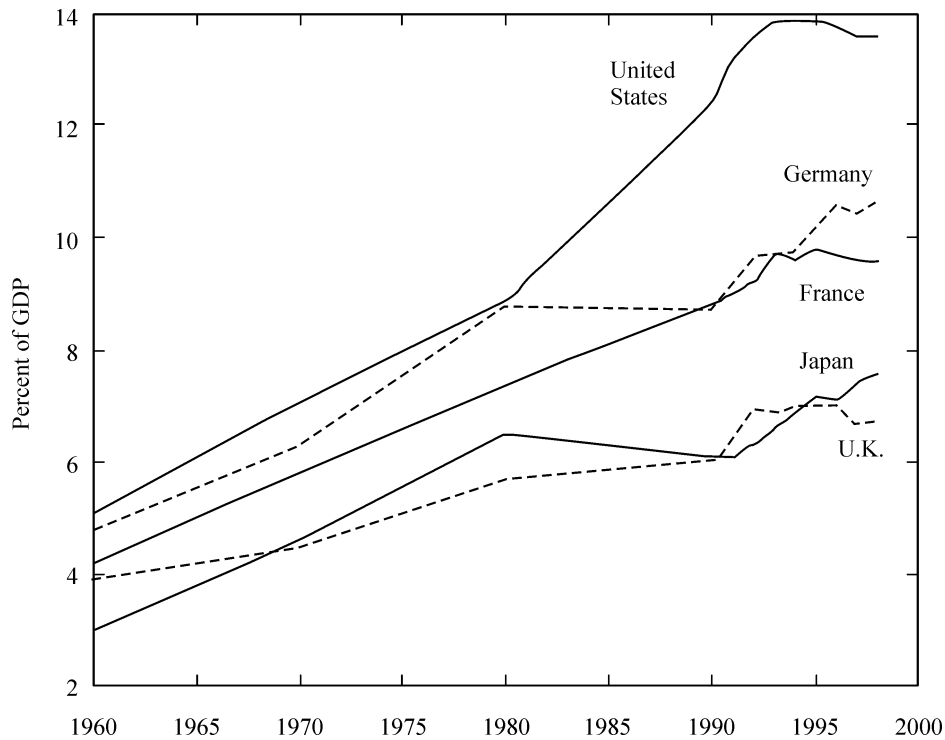
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1 Introduction

Healthcare is a significant and growing part of the global economy. For example, of the 29 members of the Organization of Economic Cooperation and Development (OECD), the average percentage of gross domestic product (GDP) attributed to healthcare nearly doubled from 3.9 to 7.6% between 1960 and 1997 (PriceWaterhouseCoopers, 1999). Figure 1 (Jones, 2002) further illustrates the fact that health expenditures as a share of GDP have been increasing in many OECD countries.

Figure 1 OECD health expenditures as a share of GDP (Jones, 2002)



Technology Advisory Committee, IT is becoming more important for healthcare organisations, with its potential to reduce costs and improve quality of services (President's Information Technology Advisory Committee, 2001). For example, the quality-adjusted cost of treating a specific medical condition has recently declined by a rate of 1 to 2% per year due to technological advances (Jones, 2002).

The US federal government operates more than 100 programmes to serve the needs of people with disabilities. While national data on the cost of disability assessment is scarce, it is estimated that these programmes cost the federal government nearly \$185 billion for fiscal year 1995 (Berkowitz, 1996). In 2002, the Veterans Administration (VA) resolved almost 800,000 claim decisions (Bascetta, 2003) while basic monthly payments paid by the VA for disabled veterans ranged from \$104 to \$2,193 for 2002. In 2001, the Social Security Administration (SSA) processed over three million claims. These figures illustrate the fact that disability occupies a significant position within the healthcare industry, one that deserves analytical attention.

Accordingly, this paper examines the relationship between the healthcare industry and disability evaluation, with a special focus on how IT can facilitate the development of an independent disability evaluation model within the healthcare industry. The paper then develops two conceptual models for disability evaluation (traditional and independent) and examines their underlying business models and the role of IT in achieving productivity gains. Throughout this discussion the focus is on process inefficiencies in determining disabilities and the role that innovative business and technology practices could play in improving productivity in this area.

2 Background

In the US, an individual with a disability is defined by the ADA as 'a person who has a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment' (US Department of Justice, 2002, p.1). A broader conceptual definition of disability is 'the gap between what a person can do and what a person needs or wants to do' (Demeter, Andersson and Smith, 1996, p.3). Demeter, *et al.* further state that disability arises out of an individual's inability to perform a task successfully because of an insufficiency in one or more areas of functional capability.

The need for a standardised, objective approach for evaluating medical impairments arose in the 1960's, and as a result, the American Medical Association (AMA) published the *Guides* in book form in 1971; the *Guides* was originally published in the *Journal of US Medical Association* from 1958 to August 1970 (Cocchiarella and Andersson, 2000). Like many specialty disciplines, the disability industry (including disability evaluation) uses its own specialised terminology. Unfortunately, within this industry, multiple definitions exist for each term and are generally based on a compensation payer's individual assessment. Even at the most general level, there is substantial disagreement on the definitions of the three basic concepts of disability evaluation: disability, impairment, and handicap. For example, handicap is a term that has been historically used to determine disability in both legal and policy contexts, and although the term is still being used, it has been mostly replaced by the preferred term disability (Cocchiarella and Andersson, 2000). A comparison of the existing definitions of disability and impairment and how these are interpreted is provided in Table 1 below.

Table 1 Comparison of existing definitions for disability and impairment (Cocchiarella, Andersson, 2000)

<i>Organisation</i>	<i>Disability</i>	<i>Impairment</i>	<i>Physicians' Role</i>	<i>Comments</i>
American Medical Association (AMA) (2000)	An alteration of an individual's capacity to meet personal, social, or occupational demands because of an impairment	A loss, loss of use, or derangement of any body part, organ or system, or organ function	Determine impairment; provide medical information to assist in disability determination	An impaired individual may or may not have a disability
World Health Organization (WHO) (1999)	Activity limitation (formerly disability) is a difficult in the performance, accomplishment, or completion of an activity at the level of the person. Difficulty encompasses all of the ways in which the doing of the activity may be affected	Problems in body function or structure as a significant deviation or loss. Impairments of structure can involve an anomaly defect, loss, or other significant deviation in body structures	Not specifically defined; assumed to be one of the decision makers in determining disability through impairment assessment	Emphasis is on the importance of functional abilities and defining context-related activity limitations
Social Security Administration (SSA) (1995)	The inability to engage in any substantial, gainful activity by reason of any medically determinable physical or mental impairment(s), which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months	An anatomical, physiological, or psychological abnormality that can be shown by medically acceptable clinical and laboratory diagnostic techniques	Determine impairment; may assist with the disability determination as a consultative examiner	Physicians and non-physicians are required to work together to define the situational disabilities
State Workers' Compensation Law (typical example)	'Temporary disability' means a decrease in wage-earning capacity due to an injury or occupational disease during the period of recovery. (<i>Idaho Code</i> section 72-102 (Cocchiarella, Andersson, 2000)) "Permanent Disability" results when the actual or presumed ability to engage in gainful activity is reduced or absent because of permanent impairment and no fundamental or marked change in the future can be reasonably expected. (<i>Idaho Code</i> section 72-424)	'Permanent Impairment' is any anatomic or functional loss after maximal medical improvement has been achieved and which abnormality or loss, medically, is considered stable or non-progressive at the time of evaluation. Permanent impairment is a basic consideration in the evaluation of permanent disability and is a contributing factor to, but not necessarily an indication of, the entire extent of permanent disability. (<i>Idaho Code</i> section 72-422)	'Evaluation (rating) of permanent impairment' is a medical appraisal of the nature and extent of the injury or disease as it affects an injured employee's personal activities of daily living, such as self-care, communication, normal living postures, ambulation, elevation, traveling, and non-specialised activities of bodily members. (<i>Idaho Code</i> section 72-424)	Purpose is to provide sure and certain relief to those who become injured by accident or suffer effects of disease from exposure to hazards arising out of and in the course of employment

Ambiguity increases as one examines the different functional assessments conducted at the behest of different sponsors. A few examples illustrate this confusion. According to ADA(1990), disability refers to any physical and/or mental impairment that substantially limits one or more of life's critical functions (such as caring for one's self, walking, seeing, hearing and the like). The SSA defines disability as the,

“Inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months.”

This is a very strict definition, indicative of long-term disability only. On the other hand, Workers' Compensation supports both long-term and short-term disabilities. The VA also uses alternate interpretations of disability. Their disability system supports partial disability as well as disability as defined by the SSA.

As described, each disability programme has its own definitions and terminology. Furthermore, as seen in Table 1, the definition of disability also differs from one programme to another. For example, within Worker's Compensation, there are many definitions and terms with which the physician conducting an evaluation must be familiar (Novick and Rodinelli, 2000). Consequently, a physician who is dealing with a disability claim is expected to learn the terminology related to that specific claim process and provide an evaluation report accordingly. These differences between terminologies of one organisation and another, may cause further confusion and result in a less accurate and/or poor quality assessment. Thus, the existence of more than one definition for basic concepts is problematic for all parties involved in disability assessment.

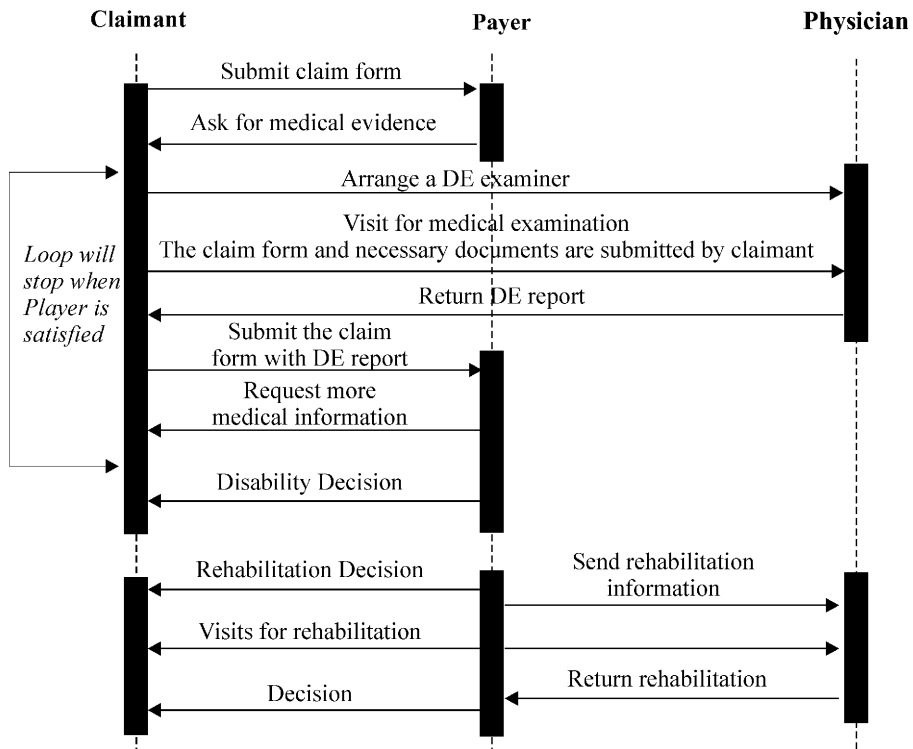
The following section details the observed inefficiencies related to disability assessment and introduces its implications for the model, the 'Traditional Disability Evaluation Model' and the 'Independent Disability Evaluation Model', based on the authors' observations of the US disability evaluation industry. The value proposition of the Independent Disability Evaluation Model is discussed as well. In the next section, the role of IT in the industry is explored and two independent disability evaluation business models are examined. The last section discusses implications and directions for future research.

3 Disability evaluation models

3.1 Traditional disability evaluation model

At their most fundamental level, disability evaluations are essential for determining the fiscal obligation of a compensation payer to a claimant. This fiscally oriented disability evaluation process is a complex transactional event because it involves not only decisions relating to medical conditions, but also decisions relating to compensation. This complexity can result in inefficiencies due to the myriad transactions between disability benefit agencies, physician offices, and third party administrators who often use different terminologies to describe the same functional characteristics of the disability in question (Demeter, Andersson and Smith, 1996). For instance, these differences often require parity between subjects as diverse as law and medicine.

Figure 3 Traditional disability evaluation assessment process: no intermediation



Rather than concentrate solely on the accuracy and relevancy of their assessments, physicians must also interpret these various definitions, which leads to inefficiencies. There is an expectation that examiners will ensure the accuracy and relevancy of their disability reports based on these varied definitions and ratings. As a result, insufficient and/or incorrect data is collected along with the attendant, additional, and unnecessary paper work. These inefficiencies occur especially in the medical evidence collection phase. The process of gathering the necessary medical evidence to render a fiscal decision can easily create a near infinite loop that significantly lengthens the timeframe of decision making. For example the initial medical examination may be inaccurate or incomplete, requiring successive visits to resolve ambiguities in order to meet set standards for determining disability.

Similar loops can also occur in the administrative process. However, since this process is at the core of disability determination, it cannot be outsourced to disability evaluation companies. On the other hand, the medical evidence collection and creation processes may benefit from the use of intermediaries where such utilisation can provide an efficient process flow and can ensure a more accurate and relevant medical report. For example, the SSA estimates that its claim process can take from as few as 125 days to as many as 1,760 days (almost five years). To its credit, the rating-related decision timeline has shown improvement at the VA (Bascetta, 2003) – requiring 199 days on an average to process a claim in the first half of 2003 compared to an average of 223 days required in 2002. This is a result of the ‘Claims Process Improvement Initiative’ started in 2002.

Figure 3 illustrates the traditional disability evaluation assessment process where the claimant is solely responsible for managing the claim process between various parties, that is, no intermediaries are involved.

Here, the claimant initiates the disability evaluation process by filling the claim form provided by the compensation payer and submitting it with existing medical data. The payer may then ask for a complete medical disability assessment report from a physician; the patient is responsible for visiting a physician who can provide a disability evaluation examination report for that specific payer. The report prepared by the physician is then submitted to the payer for evaluation. The recursive loop starts at this point if the adjudicator assessing the report requires additional medical information or discovers missing information in the report. This necessitates another visit by the claimant to the same physician for another medical exam. Sometimes the reason for a visit may be very minor, for example, a single missing field in the report. This loop between claimant-physician-payer continues until the payer is equipped with all the necessary information to render a decision.

3.2 Independent disability evaluation model

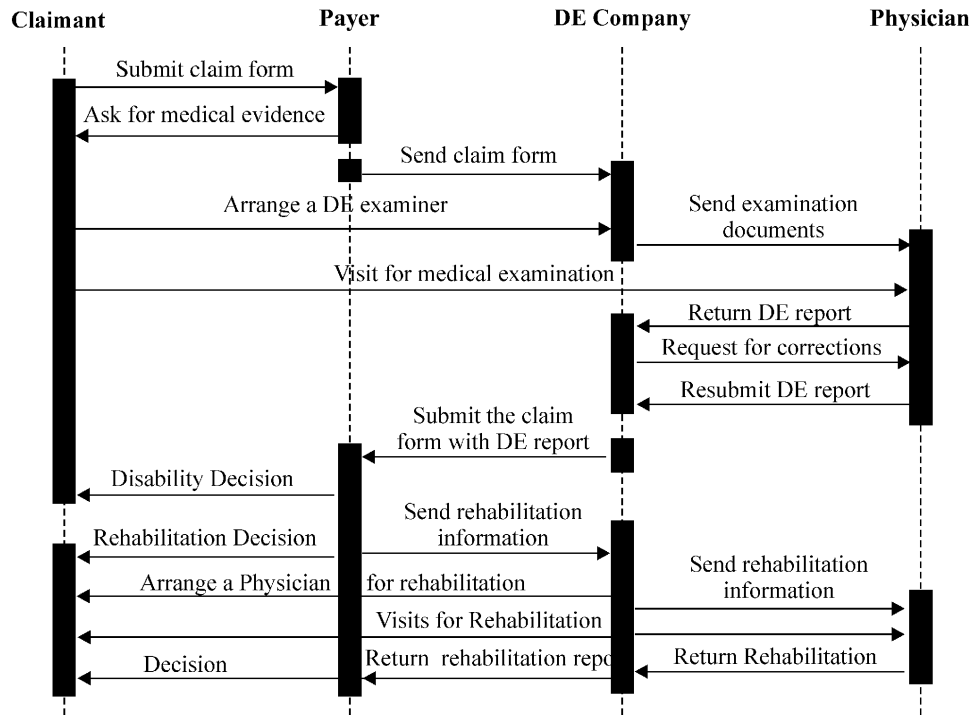
Disability evaluations involve medical (e.g., hospitals) and non-medical (e.g., SSA) organisations (Demeter, Andersson and Smith, 1996) and the necessary information exchange between them. These organisations, which are involved in the disability evaluation process, should be able to communicate with each other using the same terminology, or at the very least with an understanding of the different terminologies used in the process. These translations and workflow activities create the opportunity for an intermediary to facilitate transactions among all parties as well as add value by ensuring a fair, impartial, and expeditious determination of the medical condition. The Independent Disability Evaluation Model originates from this need.

A definition of this model is: 'independent disability evaluation solely encompasses the transactions between disability claimants, physicians and compensation payers through an independent third party'. Based on this definition, the major 'value-added' of the Independent Disability Evaluation Model is in improving the quality and organisation of information and reducing the amount of time required to document an accurate assessment. As third parties, disability evaluation companies are not involved in decision making regarding payment or the medical condition. Specifically, neither the payment decision nor the medical condition decision is made by the independent disability evaluation companies. These are determined solely by each payer and each physician, not a part of the payer organisation, respectively. This structural arrangement further eliminates situations of any possible conflict of interest among these entities.

The independent disability evaluation industry can benefit from IT-based innovations to achieve this value proposition. In fact, the use of IT-based innovations may enable the independent disability evaluation approach to reduce inefficiencies in the disability evaluation process. This does not imply, however, that technological innovations cannot occur in the traditional model. They do. The key difference is that under the independent model, (where process innovation is fundamental) IT-based innovation is part of the process.

Figure 4 illustrates the independent disability evaluation assessment process where a disability evaluation company plays an intermediary role and is solely responsible for managing the claim process between various parties.

Figure 4 Independent disability evaluation assessment process: intermediation



Unlike the traditional disability evaluation industry assessment process, here, once the claimant submits the claim form to the payer, the disability evaluation company manages the entire process, ensuring that complete and relevant medical evidence is submitted to the payer in the requested format. By focusing solely on this process, a disability evaluation company may gain competitive advantage by implementing various IT-based innovations to shorten the processing time and thereby ‘add value’ to the process.

It is important to acknowledge that the introduction of a third party could result in additional organisational complexity. This implies that the introduction of another entity can become problematic, if institutional conflict arises over the role of this entity. One way to mitigate this problem is to establish clearly defined service level agreements, outlining the functions of the new entity. These agreements would represent efficiency gains over current practices.

The challenges that arise as a result of this new entity are similar to the challenges confronting outsourcing arrangements (Lacity, 2002). As with other third party (outsourced services) arrangements in the IT industry, there could arise unanticipated consequences of the independent disability evaluation company becoming focused solely on the completion of independent medical evaluations. For example, there could be concerns over ‘rapid-fire’ assessments carried out to meet service level agreements or financial incentive clauses. This would require quality assurance to be made a part of the contractual obligations.

3.3 The role of information technology

The use of IT can help to ensure that the disability evaluation report is comprehensive, unambiguous, and timely with respect to the functional assessment areas that form the basis of an evaluation. In order to achieve a comprehensive report, algorithms can be developed to ensure that each essential functional area is included in the assessment. In order to ensure unambiguous results, online references can be developed to clarify the use of terms in assessment. The use of electronic submission processes can help in providing information in a timely manner and can thus eliminate the delays that occur during the submission process.

There are many ways that IT can create value and improve the disability evaluation process. IT can enable less costly training procedures while building on the most up-to-date information on the subject. IT can provide a means to connect members of the disability evaluation community for an exchange of ideas and knowledge (for example, through online forums). By including online resources to assist disability evaluators and to inform them about the differences between definitions and procedures, IT can enable the industry to become more efficient and accurate. The use of IT for online disability evaluation and submission can improve evaluation timeliness and accuracy. The use of 'knowledge base' databases for providing real-time knowledge support to evaluators can further improve evaluation quality and accuracy. In short the use of IT can help eliminate some of the costs that occur in an environment where the creation of one standard is not possible.

3.4 The value proposition of the independent disability evaluation

As introduced above, the objective of an independent disability evaluation assessment process is to provide a fair and timely assessment of a disability for use in the determination of a fiscal obligation to a claimant. In this context, fair is operationally defined as faithful to the criteria set by the compensation payer. Timely is operationally defined as the time gap between initial referral and disposition of the claim. As such, the economic value-proposition of the independent disability evaluation approach is that through the use of IT-based innovations, billions of dollars wasted in processing inefficient claims can be saved through the development of streamlined processes.

To achieve this objective, the five goals of this approach should be to:

- provide disability evaluations that are responsive to the needs of all parties
- ensure the accuracy of disability evaluations for all parties involved in the evaluation: the claimant, the examiner physician, and the compensation payer
- use IT to increase the efficiency and accuracy of the disability evaluation process
- provide training to parties involved in the disability evaluation process
- generate a standard for evaluating disability under different definitions.

With these goals in mind, independent disability evaluation can be seen as a subset of a larger arena – that of independent medical examinations – from insurance claims to pre-employment physical examinations. While this larger arena includes functional medical assessments, it also comprises many facets that are not functionally related to

disability evaluation, such as genetic testing. As a result, the metrics, skills, and techniques used for independent disability evaluation may be applied to independent medical examinations as well.

The disability evaluation intermediary has a potentially important role to play: it can provide the necessary documentation and training for physicians working on claims, and it can provide this support either through traditional paper-based means or through the use and adaptation of IT. It has been reported (Christiansen, 1999) that the use of IT makes it easy and inexpensive to create, retain, process, and retrieve sensitive information, while the internet makes its distribution virtually frictionless. The use of IT, in an environment where sensitive data is being exchanged among various parties very frequently, will add value to this industry.

4 Variations of the independent disability evaluation model in the disability industry

Within the general 'independent' model, there are two variations: the full service model and the assessment model. The full service model, provided by disability organisations, offers a complete package of disability assessment and disability treatment. The assessment model, provided by disability organisations, focuses only on disability assessment, leaving disability treatment to be performed by a third party.

The full service model takes a comprehensive approach to disability. This model provides all the services involved in work-related disability cases including assessment of the claimed condition, treatment, and rehabilitation. In the case of Workers' Compensation, which specifically requires rehabilitation after determining the degree of disability, this model may be more suitable. The companies utilising this model provide a variety of services from pre-injury to care management.

The assessment model focuses solely on the disability assessment process, leaving disability treatment to other parties. Under this model, once a claim arrives at the disability evaluation company, it is analysed only for the purpose of carrying out a disability assessment of the claimant. The claim may include information on previous medical examinations completed by physicians prior to the arrival of the claim at the disability evaluation company. The company may then grade the disability case by reviewing these medical records and using US Medical Association guidelines. If the information provided in these medical records is insufficient to make a disability determination, or if the compensation payer requests another opinion, then the disability evaluation company is responsible for conducting a disability evaluation based on the 'claimed conditions'. The compensation payer specifies these claimed conditions and refers the case to the disability evaluation company. The result of the disability evaluation then specifies the degree of disability based on the compensation payer's ratings. These results are returned to the payer for a final decision. The companies utilising this model provide a variety of services based on a focused approach to disability evaluations.

Table 2 summarises the advantages and disadvantages of each model. The varying needs of a compensation payer present business opportunities for both business models. Consequently, to achieve success in this industry it is important that business goals and business models are aligned. Furthermore, given the enormous size of the disability

industry, it is not an either, or choice. Rather it is a matter of making the best use of both the full service and assessment models.

Table 2 Comparison of disability industry business models

	<i>Full Service Model</i>	<i>Assessment Model</i>
Value proposition	Broad focus on a complete solution from assessment to treatment and/or rehabilitation	Narrow focus on objective assessments at a predefined level of quality and cost
Advantages	Comprehensive solution with predefined costs	Treatment-independent results Focused use of IT
Disadvantages	Possible biased results Lagging IT practices Competing stakeholder pressure	Does not link with treatment or rehabilitation Could create further delays if organisational conflicts occur regarding third parties

5 Research opportunities and implications

5.1 Research opportunities

The disability domain of healthcare is ripe for innovation that can produce significant productivity gains, and IT holds a promise to make a central contribution to this endeavour. While the argument may be logical, there is at present a paucity of hard data on precise performance gains under either independent or full service innovations, especially with regard to IT innovation therein. The IT environment is extremely dynamic and, therefore, ongoing attention should be given to the specific impacts of emerging technologies on the disability evaluation process. Social-technical research involving the management, design, and development of emerging technologies is a popular research activity. However, these technologies must be fully understood for their successful implementation within the disability evaluation industry.

While the importance of IT to the disability evaluation process is generally recognised, there are many uncertainties about how best to deploy IT at the enterprise level. While several research centres have an IT focus (Gregg, and Vanderheiden, 2003; Gregg, Vanderheiden and Judy Harkins, 2003; Joseph Lane, 2003), none are examining the role that IT can play in the management of disability and medical evaluation services. Three research domains – socio-economic analysis, management and productivity, and technology – along with topics that could be considered for future research are highlighted below.

5.2 Socio-economic analysis

While the economic dimensions of the general healthcare arena are widely studied, little data exists on the economic dimensions of the disability industry. This is especially critical with regard to the socio-economic consequences of prolonged disability evaluation delay. Many studies have reported the lack of comprehensive data on people

with disabilities (Hendershot, 2002; Jette and Badley, 2002). Furthermore, the design of existing large-scale surveys does not capture the details required to perform disability-specific research. The specific activities related to this research domain would be to design a comprehensive survey that captures detailed disability data and develop an electronic 'disability database' for research collaboration. Qualitative research could also be conducted to better understand the social dimensions of how claimants perceive both full services and assessment models. This set of activities will provide a foundation upon which additional research can be conducted.

5.3 Management and productivity research

This research domain would examine the impact that IT can have on the effectiveness and the efficiency of the disability management process. Included in this assessment would be the impact that IT can have on improving the quality and satisfaction of the evaluation outcome. Of course, crucial to the understanding of productivity gains would be a study of the impact that IT can have on cost reduction in the evaluation process.

A comprehensive understanding of this domain would include a greater appreciation of the factors affecting a physician's acceptance of IT to improve the disability evaluation process. Preliminary research by the authors (Horan *et al.*, 2004) found that local work-system factors were very important in explaining a physician's use of innovative systems, and there is a broad literature of this general subject that can be drawn upon to help guide innovative processes.

5.4 Technology research

In this domain, the need exists to establish a research laboratory for systematically testing innovative solutions regarding disability evaluation processes. Research would be enabled through the development of a testing environment using the latest technology. One area of research that would utilise this laboratory is disability evaluation e-services. For instance, research would explore the possibility of providing online training to physicians; examine the role that data exploration techniques, such as data mining, may play in the analysis of disability evaluation data; examine the possibility of applying 'Expert System' algorithms to the evaluation process; and examine the possibility of data mining of disability databases to uncover trends in disability evaluation.

There are many new technology platforms that may play a role in the collection of medical evidence and that will bring innovation to the disability evaluation process. Research in this domain would examine the role that technologies such as PC tablets, wireless communication networks, and voice recognition technologies may play in knowledge acquisition and retrieval. Another research stream would examine the role of video conferencing for various scenarios such as training, examination, and customer support. Finally, as discussed above, since a number of problems arise with the use of varying terminologies, a research agenda would explore an understanding of the conceptual issues surrounding a common terminology set, including a definition of 'disability', and how IT can enable such a common definition set.

5.5 Implications

In a social context, disability evaluations of a physical and mental impairment are primarily conducted to determine whether the impairment has prevented the claimant from being actively engaged in the workforce. Consequently, at a basic social level, this industry fulfils a societal obligation of rendering fiscal judgment and assistance in the most expeditious manner.

At a basic economic level, IT promises to enhance effectiveness and to bring greater efficiency to this process. A number of sectors in the economy have benefited from the rapid evolution of information systems and technologies. The time is right to bring these advances to the service of the disabled and focus on equipping the disability evaluation industry to help it utilise IT in this fashion. This article has focused on the potential role that the independent disability evaluation segment can play in propelling such innovations to take place regardless of the business model.

Every major industrial segment has been exploring how IT-enabled innovation can bring new efficiencies and service quality to customers, users, and suppliers. It is not any different in the healthcare industry. The role of medical assessment requires dedicated research and testing efforts to explore the best means of harnessing IT for social and economic good.

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