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Artículos científicos

Evaluación empírica de la calidad de la información: caso de estudio en el sector salud

Empirical Evaluation of Information Quality: Health Department Case Study

Avaliação empírica da qualidade da informação: estudo de caso no setor saúde

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Resumen

Las instituciones suelen emplear sistemas de información a fin de recabar, procesar, almacenar y obtener información de calidad para la toma de decisiones. Contar con información de calidad es un tema clave para las instituciones. La presente investigación pretende percibir problemas concretos de calidad de información en sistemas de información con el fin de proporcionar una mayor calidad de la información en la prestación de servicios de salud pública. Se diseñó un cuestionario con base en un conjunto de dimensiones de calidad de la información. Posteriormente, se aplicó a 160 usuarios finales de sistemas de información de 10 unidades médicas del estado de Tamaulipas, México. Se han obtenido oportunidades específicas de calidad de

información para sistemas de información. Se evidencia la oportunidad de mejora en el tema de calidad de la información en relación con la muestra de sistemas de información considerados en esta investigación. Se sugiere que los resultados obtenidos se consideren en el ámbito académico y profesional a razón de contribuir a elevar la calidad de la información proporcionada por los sistemas de información.

Palabras clave: calidad de la información, sistemas de información, sector salud.

Abstract

Institutions often use information systems to collect, process, store and obtain quality information for decision-making. Having quality information is a key issue for institutions. This research aims to perceive specific problems of information quality in information systems to help provide a higher quality of the information in the provision of public health services. A questionnaire was designed based on a set of information quality dimensions. Later, it was applied to 160 end users of information systems from 10 medical units in the state of Tamaulipas, Mexico. Specific information quality opportunities have been obtained for information systems. The opportunity for improvement in the issue of information quality is evidenced about to with concerning the sample of information systems considered in this research. It is suggested that the results obtained to be considered in the academic and professional sphere to contribute to raising the quality of the information provided by the information systems.

Keywords: information quality, information systems, health department.

Resumo

As instituições costumam usar sistemas de informação para coletar, processar, armazenar e obter informações de qualidade para a tomada de decisões. Ter informações de qualidade é uma questão fundamental para as instituições. Esta pesquisa visa perceber problemas específicos de qualidade da informação em sistemas de informação, a fim de proporcionar uma maior qualidade de informação na prestação de serviços públicos de saúde. Um questionário foi elaborado com base em um conjunto de dimensões da qualidade da informação. Posteriormente, foi aplicado a 160 usuários finais de sistemas de informação de 10 unidades médicas no estado de Tamaulipas, México. Oportunidades específicas de qualidade de informação foram obtidas para sistemas de informação. A oportunidade de melhoria na questão da qualidade da informação é evidenciada em relação à amostra de sistemas de informação considerada nesta pesquisa. Sugere-se que

os resultados obtidos sejam considerados no âmbito acadêmico e profissional, a fim de contribuir para a elevação da qualidade das informações prestadas pelos sistemas de informação.

Palavras-chave: qualidade da informação, sistemas de informação, setor saúde.

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Introduction

The most developed post-industrial societies conceptualize information as accumulated knowledge and the foundation of economic, political and social development (Perez and Lacalle, 2020). To obtain competitive and key information, these societies use cutting-edge information and communication technologies (ICT), since it is important that the information is updated (Guenther, Bat and Mathur, 2020). Within the economic context of each country in the business area, computer systems play a fundamental role (Chalupa and Petricek, 2020). And along these lines, information systems administrators face a critical issue regarding how to develop systems that provide great benefits in the quality of information for the organizations that are created (Jebraeily, Rahimi, Fazlollahi and Afshar, 2019). These systems must provide timely and quality information in the provision of services (Azeroual, Schöpfel and Ivanovic, 2020) and in decision-making (Al-Ammary, Al-Doseri, Al-Blushi, Al-Blushi and Aman, 2019) . Given the importance of information systems in developed societies, an area of knowledge has been generated for the study of the correct performance of these systems called information quality (Chen, Yu, Hailey and Cui, 2020). This area of knowledge has aroused the interest of researchers for several years, although especially in the most recent ones, in different contexts (Zhu and Zhou, 2020).

Another fundamental area of the economy is public health: a country whose members do not have good health will hardly be able to have a good economic development. Proof of this was the 2019 coronavirus disease (covid-19) pandemic, thanks to which the economy of different countries was affected (Nájera, 2020). In Mexico, there are information quality problems in the health sector. In particular, there is a need to ensure the measurement of information quality in third-level hospitals (Saturno et al., 2021). It should be noted that this information is reported worldwide for analysis and comparison with that of other member countries of the Organization for Economic Cooperation and Development (OECD). Therefore, it is imperative to improve information systems both in quantity and quality and their effective use (Saturno, Martínez, Flores and Poblano, 2019). To objectively exemplify the lack of quality of

public information from the Ministry of Health in Mexico during the coronavirus pandemic in 2020, hospital data from the Sentinel system can be taken, which showed confirmed, suspected and unconfirmed cases of covid-19; These data showed information of doubtful representativeness because they were extrapolated from data from a sample of a few hospitals. (Dyer, 2020).

Now, at a global level, public health is a field with a large volume of data that needs high-quality information for the provision of services (Chan and Chang, 2020), for decision-making and to ensure the health of communities. (Alolayyan, Alyahya, Alalawin, Shoukat, and Nusairat, 2020). The evaluation of the quality of information is important for public health, as highlighted, for example, by studies carried out in Brazil (Landmann et al., 2019) and in Kenya (Lucyk, Tang and Quan, 2017). Multiple key functionalities have been proposed based on ICTs in the health area for the exchange of information between providers and their patients (Esmaeilzadeh, Mirzaei and Maddah, 2020), among which are the use of clinical support and decision-making. assisted electronic prescription (Choudhary, Agrawal, Dama and Rathod, 2021), as well as the ability to achieve greater participation in population management through electronic disease registries and reports as clinical instruments (Casillas et al., 2019) . On the other hand, in the United States there are efforts to create information systems that are fed by doctors, patients, administrators and researchers to share and analyze data, store it and serve as a source of continuous and systematic learning, since these systems will be a source knowledge generation (Bindman, 2019). The creation of these systems is encouraged as it is currently known that the Internet does not provide reliable health information for non-professionals and the quality of online health information requires significant improvement (Anom, 2020).

In order to achieve quality information in computer systems, essential components have been identified in the data collection process for public health systems (Katarahweire, Bainomugisha and Mughal, 2020). These dimensions measure factors such as communication and attitude towards data, quality, functionality, technological support, leadership and financing. These components should be taken into account in the development of public health information systems to achieve good quality information. To date, there are a large number of results available in relation to the quality of the information (Byabazaire, O'Hare and Delaney, 2020), however, these results have had a limited impact and it has not been possible to combine and enhance the quality of the information. theory and practice at its best; On the other hand, the work done in disseminating the results obtained regarding the value added by the quality of the

information is insufficient (Bawden and Robinson, 2018). The quality of the information has been considered an important factor that determines the success of applications aimed at collecting, storing and processing information (Au, Ho and Chiu, 2021).

Given the need for information quality systems, a method is proposed to detect specific information quality opportunities in computer systems provided by subject matter experts or manifested by end users. The present study focuses on perceiving specific problems of information quality in computer systems, conceptualized as specific opportunities for improvement to disseminate them in the academic field, to software developers and system managers, in order to be considered in the next developments of information systems. This will help provide a higher quality of information in the provision of public health services.

Methodology

Research objective

Detect the common opportunities of information quality in selected computer systems that belong to the health sector of the state of Tamaulipas.

Research design

A mixed research model (quantitative and qualitative) was used. Data was collected using a self-made instrument to detect common opportunities for information quality. This instrument was a questionnaire created ad hoc as a tool to collect data for this study. For the detection of areas of opportunity in the information systems examined, the variable "Level of conformity of the end user" was analyzed. In addition, in each information quality dimension, a space was left to collect textual comments expressed by the user.

Description of the questionnaire

The questionnaire was made up of 35 closed questions (quantitative) and a textual comment per dimension (qualitative) with the purpose of gathering specific information and facilitating its processing and analysis. The sections of the questionnaire and the number of questions considered are shown in Table 1.

Tabla 1. Preguntas del cuestionario agrupado por dimensiones comunes de la calidad de la información (DCCI)

DCCI	Cantidad de preguntas
Disponibilidad	2
Precisión	5
Confiabilidad	3
Completitud	3
Usabilidad	2
Facilidad de manipulación	2
Objetividad	2
Relevancia	4
Seguridad	2
Oportuna	2
Valor añadido	2
Libre de error	2
Integrada	2
Ambiente institucional	2

Fuente: Elaboración propia

This instrument was used because it allows data to be collected from many people without having to spend a lot of time and money (Amorrós, 2019). The advantages of using a questionnaire are: low cost, easy to obtain, and simplicity to quantify and interpret information (González and Gamboa, 2020). In addition, it is one of the most successful techniques in the field of information quality metrics because the questions are specially designed to find out the perception of the quality of the information of the end users of the information systems.

Tables 2 and 3 show the questions associated with the DCCI; a portion of the answers to these questions were closed ("Yes", "No", "I don't know"), and a text comment box was also added for end-user comments to be noted on each dimension.

Tabla 2. Cuestionario aplicado a usuarios finales (a)

DCCI	Pregunta
Disponibilidad	*1)* ¿La información requerida está disponible cuando la necesita?
	2) ¿La información requerida es fácil de obtener?
Precisión	*3)* ¿Captura los datos en el momento en que se originan?
	4) ¿Captura los mismos datos en más de un sistema?
	5) ¿La información proporcionada por el sistema coincide con la esperada?
	6) ¿La información proporcionada por el sistema contiene datos innecesarios para la actividad en cuestión?
	7) ¿La información proporcionada por el sistema expresa una gramática deficiente?
Confiabilidad	*8)* ¿La información proporcionada por el sistema procede de una fuente de confianza?
	9) ¿La información es confiable, sin importar que los datos sean recolectados de forma manual, mediante sistemas basados en computadoras o una combinación de estos?
	10) ¿Considera algún margen de error en los datos que captura?
Completitud	*11)* ¿Se justifican todos los datos capturados/recolectados?
	12) ¿Tras la realización de una búsqueda, toda la información requerida es proporcionada?
	13) ¿La información se proporciona de forma completa y con el detalle requerido?
Usabilidad	*14)* ¿La información se proporciona en el formato adecuado?
	15) ¿La información requerida se proporciona en el medio adecuado?
Facilidad de manipulación	*16)* ¿El sistema permite manipular la información proporcionada de acuerdo con lo requerido?
	17) ¿La información proporcionada es aplicable en más de una actividad?
Objetividad	*18)* ¿La información proporcionada posibilita la realización de actividades concretas?

	19) ¿La información proporcionada por el sistema está influenciada por sesgos o prejuicios?
Relevancia	*20)* ¿Los datos que captura/recaba son útiles para la(s) actividad(es) en cuestión?
	21) ¿La información proporcionada por el sistema es útil para la(s) actividad(es) en cuestión?
	22) ¿La información proporcionada sustenta la toma de decisiones?
	23) ¿La información proporcionada contribuye a incrementar la calidad de los servicios prestados?

Fuente: Elaboración propia

Tabla 3. Cuestionario aplicado a usuarios finales (b)

DCCI	Pregunta
Seguridad	*24)* ¿Inicia sesión en el sistema para realizar las actividades asignadas?
	25) ¿Tras haber iniciado sesión en el sistema y transcurrido cierto tiempo sin utilizarlo, se cierra la sesión automáticamente?
Oportuna	*26)* ¿La información es proporcionada en la periodicidad requerida?
	27) ¿La información está actualizada a la fecha en que es requerida?
Valor añadido	*28*) ¿La información proporcionada es útil para situaciones emergentes?
	29) ¿La información proporcionada supera las expectativas?
Libre de error	*30)* ¿Verifica que los datos que captura/recaba sean correctos?
	31) ¿La información proporcionada por el sistema presenta algún tipo de error?
Integrada	*32)* ¿Se cuenta con al menos un catálogo de datos institucional?
	33) ¿Se cuenta con al menos un diccionario de datos institucional?
	34) ¿La organización o relación laboral tiene trascendencia con la eficacia y credibilidad de los datos?

Ambiente institucional	*35)* ¿El ambiente institucional propicia la generación de información efectiva y creíble?

Fuente: Elaboración propia

After obtaining a released version of the questionnaire, it was validated in two ways: first, a preliminary pilot was carried out in order to prevent spelling, grammar, ambiguous word or phrase errors in the wording of the questions. Second, reliability was validated by evaluating internal consistency through the calculation of Cronbach's alpha of the questionnaire, since it is known that this is a metric of intercorrelation of internal consistency between items that make up the scale. (Omary y Kalinga, 2017).

Reliability analysis

The Cronbach's alpha reliability test was performed using the statistical software MiniTab version 16 to validate the internal consistency of the research. According to the criteria proposed by Furr (2021), the alpha values for most of the DCCI are acceptable, with the exception of the dimensions Accuracy, Objectivity, Added Value and Error Free, whose values are not acceptable and, therefore, Therefore, they have been removed from the study, because there is not enough internal consistency in these dimensions (see table 4).

Tabla 4. Alfa de Cronbach por DCCI

DCCI	Cantidad de preguntas	Alfa de Cronbach
Disponibilidad	2	0.74
Confiabilidad	3	0.58
Completitud	3	0.70
Usabilidad	2	0.77
Facilidad de manipulación	2	0.57
Relevancia	4	0.72
Seguridad	2	0.65
Oportuna	2	0.67
Integrada	2	0.64
Ambiente institucional	2	0.76

Fuente: Elaboración propia

Target population

The universe of the study was 273 end users, who were uniformly distributed in 10 medical units of the health sector of the state of Tamaulipas. The data for the calculation of the representative sample, with 95% confidence, are in Table 5.

Tabla 5. Tamaño de la muestra

Tamaño de la población	*N*	273
Nivel de confianza	*Z*	1.96
Proporción esperada	*p*	0.5
Complemento	*q*	0.5
Margen de error	*E*	0.05
Tamaño de la muestra	*n*	160

Fuente: Elaboración propia

The characteristics of the sample regarding gender, age and experience in computer use are shown in Table 6. The questionnaire was applied to 160 final users in total, 16 people for each medical unit of the health sector of the state of Tamaulipas, Mexico. . For the application of the questionnaire, the end users available at the time of the visit to the medical units were invited to a talk to explain the details of the study. Special attention was paid to pointing out that the questionnaire was anonymous and confidential, in order to collect information with greater certainty. Next, a questionnaire was provided to each end user. It was important to measure the real perceptions of the end users, and the way to know them was through their levels of conformity with the elements that measured the perception of the quality of the information. Quantitative and qualitative data were collected at the same time.

Tabla 6. Características de la muestra

		Frecuencia	Porcentaje
Género	Hombre	48	30 %
	Mujer	112	70 %
Edad	21-39 años	80	50 %
	40-60 años	80	50 %
Experiencia en uso de la computadora	Básico	36	22.5 %
	Intermedio	96	60 %
	Avanzado	28	17.5 %

Fuente: Elaboración propia

Quantitative analysis

For the analysis of the level of conformity measured, the value 1 was assigned to the answers "Yes", the value 2 to the answers "I don't know" and the value 3 to the answers "No", with the purpose of indicating a higher level of nonconformity Subsequently, the mean, mode and standard deviation of the responses for each of the questions were calculated. If the mean was greater than or equal to 1.5, then a higher opportunity level of improvement was established. On the contrary, if the mean was less than 1.5, a lower opportunity level of improvement was established.

Qualitative analysis

In the qualitative analysis, the textual comments were grouped according to living codes expressed in the text by the end users. These codes were grouped by categories, which, in turn, were associated with a specific dimension. The association of dimensions, categories and textual comments are shown in table 9, 10 and 11.

Mixed analysis

The correction levels detected quantitatively were established for the dimensions with the highest level of opportunity. The level of correction of each quantitative dimension was compared with the qualitative dimension according to the comments expressed by the users. If a higher level of correction was detected quantitatively compared to the textual comments and if the higher level of correction was confirmed, it was concluded that there must be a higher level of opportunity. Conversely, if the textual

comments contradicted the higher correctness level, it was concluded that a higher correctness level could not be determined.

Results

It was observed that the mean for most of the questions was less than 1.5, which indicates that the respondents perceived a lower level of correction, however, in questions 10, 16, 25, 32 and 33 their mean was greater than 1.5 , which indicates greater problems (greater opportunity for improvement) (see table 7).

Tabla 7. Valor promedio y desviación estándar por pregunta

DCCI	Núm. Pregunta	Media	Moda	Desviación estándar
Disponibilidad	1	1.24	1	0.632
	2	1.21	1	0.589
Confiabilidad	8	1.18	1	0.504
	9	1.34	1	0.667
	10	2.04	3	0.933
Completitud	11	1.13	1	0.454
	12	1.31	1	0.695
	13	1.36	1	0.734
Usabilidad	14	1.11	1	0.423
	15	1.11	1	0.385
Facilidad de manipulación	16	1.54	1	0.859
	17	1.34	1	0.695
Relevancia	20	1.04	1	0.262
	21	1.05	1	0.273
	22	1.24	1	0.593
	23	1.17	1	0.504
Seguridad	24	1.32	1	0.709
	25	2.45	3	0.851
Oportuna	26	1.24	1	0.590
	27	1.45	1	0.804
Integrada	32	1.66	1	0.798
	33	2.05	2	0.775

Ambiente Institucional	34	1.28	1	0.649
	35	1.33	1	0.692

Fuente: Elaboración propia

Table 8 shows the DCCI associated with each question of the questionnaire; they were assigned a higher correction level of improvement when the mean value of this question was very close to two, otherwise a lower correction level was considered.

Tabla 8. Oportunidades específicas en la calidad de la información para sistemas de información por DCCI

DCCI	Núm. de pregunta	Oportunidad	Nivel de mejora
Disponibilidad	1	*1)* Proporcionar la información requerida cuando se necesite.	Menor
	2	*2)* Facilitar la información requerida de tal manera que resulte fácil de obtener.	Menor
Confiabilidad	8	*3)* Verificar que las fuentes de información sean confiables.	Menor
	9	*4)* La información que proporcione debe ser confiable, sin importar que los datos sean recolectados de forma manual, mediante sistemas basados en computadoras o una combinación de estos.	Menor
	10	*5)* Considerar márgenes de error para los datos que se capturan.	Mayor
Completitud	11	*6)* Capturar solamente los datos que se requieran.	Menor
	12	*7)* Proporcionar la información requerida tras la realización de búsquedas.	Menor
	13	*8)* Proporcionar la información con el detalle requerido.	Menor
Usabilidad	14	*9)* Proporcionar la información en el formato adecuado.	Menor
	15	*10)* Proporcionar la información en el medio adecuado.	Menor

Facilidad de manipulación	16	*11)* Preparar el sistema de tal manera que permita a los usuarios finales manejar la presentación de la información proporcionada de acuerdo con sus requerimientos.	Mayor
	17	*12)* Adecuar la información que se proporcione para que sea aplicable a más de una actividad.	Menor
Relevancia	20	*13)* Verificar que los datos que se capturen sean verdaderamente útiles para las actividades en cuestión.	Menor
	21	*14)* Revisar que la información proporcionada por el sistema sea útil para la(s) actividad(es) en cuestión.	Menor
	22	*15)* Verificar que la información proporcionada contribuye a sustentar la toma de decisiones.	Menor
	23	*16)* Revisar que la información proporcionada contribuye a incrementar la calidad de los servicios prestados.	Menor
Seguridad	24	*17)* Implementar mecanismos de inicio de sesión en el sistema para poder realizar las actividades asignadas.	Menor
	25	*18)* Implementar mecanismos efectivos de cierre de sesión automáticos en los sistemas.	Mayor
Oportuna	26	*19)* Proporcionar la información en la periodicidad óptima requerida.	Menor
	27	*20)* Verificar que la información esté actualizada a la fecha en que sea requerida.	Menor
Integrada	32	*21)* Fomentar la creación y uso de catálogos institucionales de datos.	Mayor
	33	*22)* Fomentar la creación y uso de diccionarios de datos institucionales.	Mayor
Ambiente institucional	34	*23)* Concientizar sobre la relación laboral para aumentar la eficacia y credibilidad de la información.	Menor

	35	*24)* Enfatizar en el tema de ambiente institucional para contribuir en la generación de información efectiva y creíble.	Menor

Fuente: Elaboración propia

Tabla 9. Comentarios textuales de los usuarios finales ordenados de acuerdo con las DCCI (a)

DCCI	Categoría emergente	Comentario textual
Disponibilidad	Cuando se necesite	"Solo en el mes actual y no se pueden sacar reportes de meses anteriores". "La información proporcionada por las diferentes áreas. Se proporciona incompleta y en tiempo con una cierta diferencia de retraso a la fecha".
	Cuando resulte fácil de obtener	"En ocasiones tardamos un poco en tener la información, pero después de investigar se consigue". "Tenemos mucho apoyo por parte del servicio de Informática".
Confiabilidad	Recolectar o forma de recolectar	"Un pequeño margen al momento de capturar manualmente".
	Margen de error	"Si bien es de una fuente confiable, la falta u omisión de datos hace que no sea tan confiable y esté incompleta y en nuestro caso el margen de error casi tiene que ser cero". "Se realiza un chequeo de errores del sistema SAEH antes de enviar la base de datos a la oficina central".

		"Generalmente, el listado de asistencia mensual contiene inconsistencias que no lo hace 100 % confiable".
Completitud	Captura de datos requeridos	"Los sistemas contienen datos que para un hospital de tercer nivel no son necesarios y otros que no se incluyen y requerimos". "No detalla el tipo de cirugía que se va a realizar solo la cantidad de cirugías en SAEH". "Necesitamos que al sistema se le integren más opciones para la búsqueda de la información, ya sea en fechas o búsqueda de artículo por proveedor, etc.".
	Proporcionar la información requerida	"La falta de llenado adecuado de los formatos establecidos hace que la información que se busca y se captura sea incompleta". "No hay acceso a los datos después de la captura si la información es insuficiente".
	Información con el detalle requerido	"A veces no arroja información completa y detallada".

Fuente: Elaboración propia

Tables 9, 10 and 11 show the qualitative analysis associating emerging categories of the data according to the textual comments expressed by the users, these categories were associated with each dimension of information quality. The qualitative data was contrasted dimension by dimension with the results obtained from the quantitative analysis to reach a conclusion on the opportunity for improvement, which may be less or

greater. In the event that the qualitative data confirmed the result of the quantitative analysis indicating a greater opportunity for correction, a greater opportunity for improvement was concluded in the corresponding dimension.

Tabla 10. Comentarios textuales de los usuarios finales ordenados de acuerdo con las DCCI (b)

DCCI	Categoría emergente	Comentario textual
Usabilidad	Formato adecuado	"El formato actualmente comprende los recuadros de llenado muy pequeños. En algunos es prudente reestructurar para hacer más accesible su llenado". "No es un formato adecuado porque es un simple Excel lo que descarga mi sistema y sería más fácil y simple un formato práctico, tablas, gráficas etc.". "Se proporciona en el formato adecuado pero incompleto".
	Medio adecuado	"Es un poco obsoleto en la presentación de la información". "No, porque se utiliza y desperdicia mucho papel, sería más simple todo electrónico". "La información proporcionada por los diferentes departamentos son reportes impresos". "No es compatible con ningún programa de Office para imprimir reportes".

Facilidad de manipulación	Presentación de la información	"En mi caso, yo solo consulto y solicito a Informática algunos cambios, a mí no se me da acceso para manipular la información, siempre estoy en contacto con Informática". "Para poder cambiar un registro es necesario solicitarlo al área de Sistemas; es un proceso tedioso".
	Aplicable a más de una actividad	"La mayoría de las veces se batalla al necesitar la información, ya que dependemos mucho del departamento de Informática porque son quienes tienen que estar manipulando los sistemas para que se nos proporcione la información solicitada".
Relevancia	Captura de datos útiles	"Podrían tomarse decisiones con base en lo que arroje el sistema de Farmacia".
	Información útil para las actividades	"Por medio de la información proporcionada por el sistema podemos deducir si se pidió ese material, qué cantidad se pidió y demás".
	Toma de decisiones	"De acuerdo con el global de consulta generado por mes. Tanto en urgencias, consulta externa, egresos. Sirve para que el hospital solicite apoyo para gastos que son requeridos".
Seguridad	Mecanismos de inicio de sesión	"Se integró una clave con la cual nos permite la seguridad a no interferir otra persona ajena al sistema".

	Mecanismos de cierre de sesión	"Aunque utilizando el sistema se cierra y tengo que volver desde cero, ya que borra lo que se lleva adelantado". "Se tiene que cerrar manualmente".

Fuente: Elaboración propia

Tabla 11. Comentarios textuales de los usuarios finales ordenados de acuerdo con las DCCI (c)

DCCI	Categoría emergente	Comentario textual
Oportuna	Periodicidad óptima	"La información es proporcionada solo si es requerida del año en curso". "La información es proporcionada en fecha retrasada, por lo tanto, la información a enviar se retrasa". "Algunas veces tenemos retraso para la entrega de información que se nos requiere".
	Información actualizada	"La falta de apoyo o mala organización de algunas gentes provoca que la información no esté actualizada adecuadamente". "No está actualizada los días últimos de cada mes, ya que Contabilidad revisa el cierre y hasta que termina nos ponemos a actualizar la información".
Integrada	Catálogos institucionales de datos	"Catálogo de especialidades". "Catálogo de medicamentos".

	Diccionarios de datos institucionales	"Claves Servicio". "Clasificaciones del Nivel en el Estudio Socioeconómico" "Causes 2010".
Ambiente institucional	Relación laboral	"La falta de apoyo o mala organización de algunas gentes, la información no se actualiza adecuadamente". "Falta de comunicación entre enfermera con recepción de admisión para cambios de cama egresos, por ejemplo".
		"En algunas ocasiones, el departamento de Admisión manda al paciente, le dicen váyase derecho a archivo clínico y no le especifican a qué tienen derecho". "La información que es requerida de un paciente hospitalizado, ejemplo, en Ginecología y se habla a Admisión hospitalaria para solicitar información cuando la información se tiene que dar por recepción de Ginecología: falta de comunicación".

Fuente: Elaboración propia

Discussion

Through the analysis of the results expressed by the end users, specific information quality opportunities for computer systems were observed. The findings found are described below:

- Availability: the perception of end users indicated that computer systems are efficient in terms of access to information when needed and that such information is easy to obtain, however, this is not the case in its entirety, since some users The final ones stated that for some months of the year the information cannot be obtained in the systems. Finally, a lower opportunity for improvement in this dimension is determined.
- Reliability: it was found that there is certainty among end users regarding the information sources and data collection, however, some users state that there is a margin of error in data capture. In addition, they point out that the data is verified in the capture process, and that the information remains reliable despite the existence of omissions in the capture of some data. Consequently, there is an opportunity for greater improvement in data capture in terms of their margin of error.
- Completeness: the findings showed that for computer systems, end users mostly capture the required data, the system provides them with the information they require with the indicated detail. The foregoing contrasts with the opinion of some end users, who point out that in some cases more data is captured than required and that the system provides them with incomplete information. The quantitative and qualitative data differ, therefore, it cannot be determined if there is an opportunity for improvement in the Completeness dimension.
- Usability: according to the end users, the computer systems provide them with the data in the appropriate format and medium when they so require. However, it is pointed out that between departments the information is basically provided in print, when it is required in digital form. The quantitative and qualitative data differ from each other, therefore, it cannot be determined if there is an opportunity for improvement in the dimension.
- Ease of manipulation: the information provided to users was not presented as required; on the other hand, the information provided was applicable to more than one activity. In this sense, some end users expressed dissatisfaction with the impossibility of being able to update data after a considerable time had elapsed since their capture. Therefore, there is an opportunity for greater improvement in this dimension to present the information as required by some users.

- • Relevance: in this dimension it was found that the end users' appreciation of the captured data is really useful, as well as the information provided, while the information provided helps them to support decision-making, as well as to increase the quality of information. the services provided. This confirms an opportunity for minor improvement in the dimension.
- Security: The findings showed that computer systems have effective login mechanisms, according to some end users, while automatic logout mechanisms need to be implemented. Consequently, there is a further improvement opportunity in the dimension to implement automatic logout mechanisms.
- Timely: it was found that the information is provided with the optimum frequency and that it is updated on the date that is required. However, according to some users, the systems only provide information for the current year and it is not updated at the end of each month, generally due to a lack of coordination between the institution's staff. The quantitative and qualitative data differ from each other, therefore, it cannot be determined if there is an opportunity for improvement in the appropriate dimension.
- Integrated: this dimension showed that the perception of end users points to the need to implement institutional data catalogs and dictionaries in computer systems. The foregoing denotes an opportunity for greater improvement in this dimension.
- Institutional environment: it was found that end users state that they are aware of the fact that the employment relationship and the institutional environment are important in the effectiveness and credibility of the information. However, some end users state that more organization is needed to manage information between departments. It is concluded that there is an opportunity for minimal improvement in this dimension.

Those interested in continuing this research could direct their work to the formation of human capital in the area of information quality and the impact it would have on software development, the evaluation of shared data culture, address information systems integration schemes , study methodologies for integration and interoperability between computer systems, which is not an easy task. The foregoing with the premise of balancing the balance between the knowledge and technologies generated, on the one hand, and, on the other, practice, that is, managing and transferring the knowledge and

technology produced to societies that deserve it. According to Bawden and Robinson (2018), this philosophy regarding information quality is generally not carried out. Finally, we will mention that our study was limited to institutions in the health sector of the state of Tamaulipas.

Conclusions

The results obtained in this research are summarized in specific information quality opportunities that show the opportunity to obtain information quality in the development and maintenance of the systems considered in this work. The use of efficient systems promotes advantages in terms of responsiveness, responsibility and reliability in the provision of services, and the lack of quality improvement in health care can create negative perceptions of patients that impact the motivation to seek the medical care offered. In this sense, the analysis of the data provided by end users of the systems allowed subjective and realistic feedback; In addition, the textual comments of these ratify the situation in terms of quality of information existing in the systems used in the provision of state public health services considered in this study.

It is striking that in the considered literature no works of this type were found, which points to a certain originality in the area of information quality in computer systems. One recommendation is that those in charge of designing, developing or acquiring information systems place special emphasis on the quality of information provided by the system, in order to obtain greater advantages in the services provided or in decision-making, and that there must be a broader perspective on the information that is produced and used. In this sense, it is considered that more planning should be done in computer systems due to the vitality they represent for organizations. The list of specific information quality opportunities for information systems and the questionnaire can be used in different sectors besides the health sector. The foregoing under the science research paradigm of information systems design, with the explicit purpose of creating new mechanisms that people can use to change and improve the world in which we live.

Future lines of research

In our case, specific opportunities are offered for DCCIs in which, according to end users, medical institutions in the health sector should pay special attention. In order to ratify and consolidate the results of the research and under the premise that information systems are an exciting world where borders change daily, the following is suggested as future work: design and apply three questionnaires aimed at management personnel , developers and those in charge of the systems area, respectively, based on the DCCI defined here, to enrich the results obtained by contrasting the responses of the main stakeholders. It is recommended as future work to extend this study to other states of the Mexican Republic to compare results.

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