

## **Implementation of ISO 14298:2013 in a Valuable Document Printing Company in Lima, Peru**

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### **Abstract**

The objective of this article was to present the implementation of a secure print management system based on the ISO 14298:2013 standard (International Organization for Standardization 2013) in the company's operational processes in the graphic sector for printing valuable documents in Lima, Peru. The research method is deductive, and the type of study is action research. The result was to form the documentary system according to the ISO 14298:2013 standard, integrate the existing management systems ISO 9001, ISO 14001, and OHSAS 18001, obtaining the implementation and certification of the Management System under the criteria of the ISO 14298:2013 standard. One limitation is the incipient bibliographic information on the ISO 14298:2013 standard because the field is very specialized. This study can be useful for companies interested in implementing a Secure Print Management System.

### **Keywords**

Management System, ISO 14298: 2013, Graphic industry, Secure Printing and Valuable Document.

## **1. Introduction**

Torres et al. (2012) point out that the common goal of organizations is to enhance their products and/or services, thereby boosting their competitiveness, productivity, and in some instances, gaining recognition. This ensures their growth and survival in the market, where new needs emerge daily. Brotons and Sansalvador (2017) propose that a successful strategy for organizations is to implement a Management System that aids in quality, safety, environment, computer security, or printing security. The decision to adopt this strategy, crucial for achieving goals and continuous improvement of business performance, rests with top management (Castillo and Osorio 2011).

Introducing the secure print management system process allows control of the security of products, production processes, means of production, production facilities, information, and supply of raw materials; meets customer requirements; and confirms that the required degree of security is achieved and remains effective (Ingo 2009). Therefore, it is considered necessary to implement a Secure Print Management System to offer security features for valuable documents and meet customer requirements (García 2017).

Counterfeiting is a serious and critical problem for security printers, end users and authorities (Rojas 2018). Although the quality level of printing equipment, the quality of inputs, and document security mechanisms have increased, companies in this sector need to protect this highly secure industry through a system certification. Management and thus contribute to the fight against fraud. The International Dynamic Advisors (2019) maintains that national identity documents, passports, credit cards, checks, and banknotes have become high-tech products in terms of durability, security and functionality (Jamous et al. 2016 ); Therefore, it is essential to have standardised guidelines that allow the identification and control of the processes involved, combined with a security system that guarantees the valuable information contained in these documents (Kwang-Baek and Sungshin 2008).

According to the Security Printers of the European Federation for Digital Printing and Communication (Intergraf 2023), the secure print management system process implemented in Peruvian and Mexican companies are low compared to those implemented in Europe. Of the ISO 14298 certificates granted from 2008 to 2023, less than 200 correspond to Latin America, only 14.91% to Asia, and the rest to Europe.

There is a growing trend among companies to consider compliance with standards such as ISO 14298 as a requirement for doing business (Forbes 2014). Therefore, implementing and certifying a secure print management system provides the basic requirements for interacting and conducting business in today's security printing market (Signe 2017). Its adoption is a strategic decision for an organization. Its design and implementation in an organization are influenced by various needs, particular objectives, products provided, processes used, security environment, cultural issues, legal limitations, risk assessment and the size and structure of the organization (International Organization for Standardization 2013).

### **1.1. Valuable Document Printing Company in Lima, Peru**

For confidentiality reasons, the company in this study will be called “graphic sector company”; it is a private company dedicated to printing documents of Peruvian value. The leadership that it obtained from its beginning in the printing of valued species and cash management covered areas of communication, information management and logistics, where the combination of technology and experience allows for providing comprehensive solutions to clients of private institutions. Moreover, for the public, the products are printed under maximum security printing systems, highlighting the intaglio or intaglio high relief among them (Instituto Peruano de Economía 2017). In this sense, the company in the graphic sector, with 22 years of experience, has developed an organizational culture and has based its structure on some management system models (ISO 9001, OHSAS 18001, ISO 14001). However, it is necessary to have a management system that ensures compliance with the needs of its clients regarding the printing security of the products provided.

### **1.2. Objectives**

The objective of this research is to implement a secure print management system based on the ISO 14298:2013 standard (International Organization for Standardization 2013) in the company's operational processes in the graphic sector for printing valuable documents in Lima, Peru. To achieve this objective, the following steps are carried out:

1. Diagnose the company's operation in the graphic sector for the complete management system design under standard 14298:2013.

2. Implement the management system documents that meet the requirements of standard 14298:201, monitoring the dissemination and use of the documentation generated to ensure the system's implementation.
3. Perform the internal audit by self-assessing conformity with the requirements of the implemented system to identify and correct deviations before the certification audit.

## **2. Literature Review**

The Universitat Oberta de Catalunya (2014) indicates that the need to implement continuous improvement in processes and services arises from the growth of commerce and societies. This is why some quality standards are beginning to be applied in companies of all the productive sectors. The International Organization for Standardization (ISO) is considered the most prominent organization worldwide in the creation of voluntary standards (De Vries, 2002), making it an independent organization without government members (Bureau 2017).

ISO standards: High-level structure is the arrangement that has been made to the content of ISO standards, which consists of creating content with the same elements for each of the standards issued so that they are easily incorporated, based on elementary elements, texts and vocabulary, which gives value to the new systems that are created and is an excellent way to facilitate implementation, as well as for the users of the systems (De Vries, 2018). This structure is defined in the directives of ISO/IEC, Part 1, ISO Consolidated Supplement, 2014 (Forbes, 2014).

In this way, the standards ISO 9001:2015 (Quality Management Systems), ISO 27001:2013 (Information Security Management Systems), and ISO 14298:2013 (Secure Printing Management Systems) raise elements in addition to the high-level structure due to the objective sought by each of the standards, with the exception that their text or common definitions are not eliminated (International Organization for Standardization 2014).

ISO 14298:2013 is a security standard highly recognized by producers of valuable documents that employ added security features designed to protect against falsifying their characteristics. "security printers" (International Dynamic Advisors 2024).

Signe (2017) mentions that an organisation that issues valuable documents must comply with the principles of: security, compliance with customer requirements and security confidence. On the other hand, International Dynamic Advisors (2016) establishes that the activities necessary to comply with the security of printing processes, according to the requirements of the ISO 14298 standard, require five essential elements to cover: consider the interested parties; identification of security requirements and additional requirements that affect the product; the product/service; waste management and infrastructure management.

According to the International Organization for Standardization (2016), the responsible technical committee ISO/TC 130 addresses printing and graphic technologies standardisation. This field covers all phases of the process, where graphic elements (image, text, line art, pattern and others) are created, manipulated, assembled, communicated and finally delivered electronically as digital products or physically to substrates using inks, toners and others, marking or functional materials, and finished as required by the final applications (Van Renesse 1996).

Hatto (2013) states that ISO/TC 130 standards include, among others, terminology, evaluation of visual appearance and product quality, data exchange, process control, management, conformity assessment, impacts on environments, as well as requirements and tests of related materials, equipment and systems (Mir-Mauri and Casadesús -Fa 2011). The CEN Workshop Agreement (CWA 14641:2009 printing security management system) was the basis for developing ISO 14298. ANSI/ Naspo \*SA-2013 and INTERGARF were developed simultaneously with this standard. However, The European Federation for Printing and Digital Communication (2019), in CWA 15374, specifies the requirements for providers of products that include security functions or services that guarantee the physical security of printed materials manufactured by a printing company. Security printing, for example, produces inks, foils, and security paper. The National Association of State Procurement Officers (NASPO) indicates that the CWA standards have the purpose of standardizing the terminology, test methods and specifications to be used in the field of printing and graphic technology (Porrás-Santiago 2018)

The ISO indicates that the ISO 14298:2013 standard, like ISO 9001 and ISO 27001, is structured in 10 points and an annexe. It complies with the high-level structure and serves to integrate other management systems. Annex A of the ISO 14298:2013 standard establishes the specific controls for security printing that companies in this sector must comply with (International Organization for Standardization, 2013).

Castro (2012) establishes that among the essential elements for printing security management in companies in this area are the focus on processes, leadership by Management, the context of the organization, risk determination, appropriate physical access control mechanisms, and determining the security requirements required for valuable documents.

ISO 14298 contains standardized fundamental rules allowing process identification and adequate security management, guaranteeing that the documents issued comply with the required security. It helps organizations to properly manage the processes that involve secure printing, minimize the threats to which products are exposed (Zulberti 2022), control access to information, have access control to the facilities and critical areas of the Company, guarantee the safety of the products during all stages, production, storage and delivery, control the waste generated, control the use of machinery (Rodriguez 2014) and equipment once its useful life has ended, in conclusion, ensure compliance with the requirements of the clients (David et al. 2023).

The security of valuable documents includes preservation and shipping, waste management, identification and traceability, infrastructure, and work environment, among other elements (Leonelli et al. 2021). Therefore, the ISO 14298:2013 Standard adapts and favors compliance with the security requirements of the Company's clients in the graphic sector for printing valuable documents (Amidor 2002).

### **3. Methods**

The research method used is deductive, and the type of study is action research. The methodology is used to implement a Secure Print Management System based on the ISO 14298:2013 standard (International Organization for Standardization 2013), which was developed to guarantee the security of the company's valuable documents in the graphic sector in Lima, Peru.

The investigation consists of 3 phases: *Phase 1. Diagnosis*: During this phase, a detailed study of the organisation's functioning is carried out to complete the management system's design; *Phase 2. The implementation* consists of the preparation of the management system documents that meet the standard's requirements, including the dissemination to key personnel of the knowledge of the standard to be implemented and throughout the phase, the dissemination is monitored. Moreover, the documentation generated will be used to ensure the implementation of the system *in Phase 3. Internal audit*: A self-assessment of conformity with the requirements of the implemented system is carried out to identify and correct deviations before the certification audit. Figure 1 shows the 3 phases for the implementation of the secure print system based on the ISO 14298:2013 standard (International Organization for Standardization 2013)

<b>Phase 1. Diagnosis</b>		<ul style="list-style-type: none"> <li>- Exhaustive review of activities, processes, equipment and facilities.</li> <li>- Interviews with those responsible for all areas of the entity.</li> <li>- System Design - Work Plan and Project Execution Schedule.</li> <li>- Presentation meeting to the management of the organization</li> </ul>
<b>Phase 2. Implementation</b>	<i>Training</i>	<ul style="list-style-type: none"> <li>- Training in Standard Requirements for Designated Personnel</li> <li>- Talk/Awareness raising for staff*</li> </ul>
	<i>Document Development</i>	<ul style="list-style-type: none"> <li>- Prepare system documentation, delivery of documents to the organization for review and approval: manuals, organizational chart, process map, procedures/process sheets, necessary formats.</li> </ul>
	<i>Follow-up</i>	<p>Periodic monitoring visits, according to the work plan to verify the effective implementation of the system and make the necessary adjustments.</p>
<b>Phase 3. Internal Audit</b>		Document audit and audit at the client's facilities.
<i>Certification Audit</i>		<ul style="list-style-type: none"> <li>- Support and advice during the audit/evaluation</li> <li>- Advise on the preparation and delivery of the Corrective Action Plan</li> </ul>

Figure 1. Phases of the Implementation of the ISO 14298:2013 standard in the valuable document printing company

#### 4. Results and Discussion

The company in the graphics sector began with the generation of a detailed plan of activities, taking as a starting point that it has documented processes for its ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2007 management systems, including the activity of reviewing your documents in order to identify their usefulness for the documentation required by ISO 14298:2013. The plan includes the activities to be carried out by the person responsible and the estimated time for their execution. In it, we observe that the implementation of the secure printing management system is carried out through four phases, which are described below.

##### **Phase 1: Diagnosis of the company's operation in the graphic sector for the complete management system design under standard 14298:2013**

The specific activities carried out are identifying and studying the organization's critical processes and detecting strengths, risks and areas for improvement. During the identification and study of the company's critical processes, verification questionnaires were used, made up of a series of questions referring to the requirements of the ISO 142098:2013 standard and its annexe; 12 interviews were carried out and with the help of the different checks list compliance with the requirements of the standard was identified. The actions to be taken derived from the diagnosis were preparing, presenting, and implementing system documents, the evaluation of suppliers, and the internal and external audits. Table 1 shows the activities developed in the diagnosis phase, and Figure 2 shows the results obtained from the diagnosis carried out.

Table 1. Activities developed in phase 1: Diagnosis

No.	Activity									
		S1	S2	S3	S4	S5	S1	S2	S3	S4
<b>Implementation of the ISO 14298:2013 Secure Print Management System</b>										
<b>1</b>	<b>Phase 1- Diagnosis</b>									
1.1	Review of Processes and Procedures		12	19	26	3	10	17	24	30
1.2	Control of Documentation and records		6							
1.3	Documented Information		6							
1.4	Shopping		6							
1.5	Competence, training and awareness			13						
1.6	Internal audit			13						
1.7	Customer satisfaction			13						
1.8	Tracking and measurement				20					
1.9	Management review				20					
1.10	Sales				20					
1.11	Production/service provision					27				
1.12	Human Resources					27				
1.13	Risks					27				
1.14	Communication						3			
1.15	Nonconformities and actions to take						3			
1.16	Infrastructure						3			
1.17	Monitoring and measurement resources							10		
1.18	Continuous improvement							10		
1.20	Presentation of Diagnosis and Project Execution Strategy									30

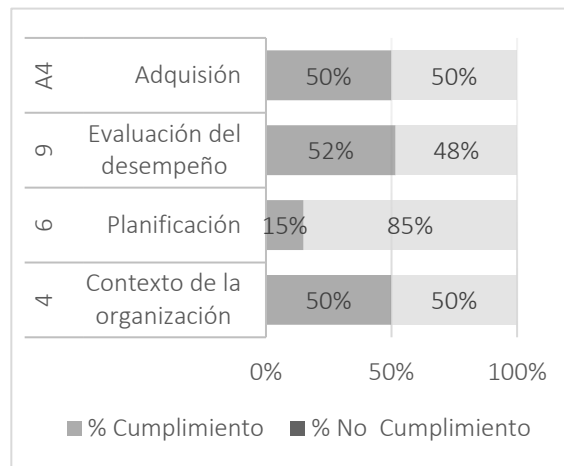


Figure 2. Results of the diagnosis of compliance with the requirements of the ISO 14298:2013 standard

**Phase 2: Implementation of the document management system that meets the requirements of standard 14298:2013**

In this phase, they carry out three essential activities: training the organization's staff; documentary development according to the diagnosis carried out; the identified documents were prepared, and the *existing ones were complemented; monitoring the implementation and use of the documents and records of the management system.* During this phase, the system was reviewed by general management. This activity is carried out twice a year, and all the implemented management systems are reviewed (ISO 9001; ISO 14001 and OHSAS 18001). On this occasion, it was carried out for the first time for the ISO 14298:2013 standard. Three critical activities are carried out to carry out the implementation stage: a). Training; b). Document development and c). Monitoring (Table 2).

Table 2 1. Activities developed in phase 2: Implementation

No.	Activity																	
		S1	S2	S3	S4	S5	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
<b>Implementation of the ISO 14298:2013 Secure Print Management System</b>																		
<b>2</b>	<b>Phase 2- Implementation</b>																	
2.1	Training/Participation	2	8															
2.2	Document Development			15	22	29	5	12	19	26	3	10	17	24	31			
2.3	Follow-up			15	22	29	5	12	19	26	3	10						

**2.1 Training**

During this stage, the following activities were carried out: 1) Training in the requirements of the standard/system: This consisted of training all company personnel in the requirements of the standard to be implemented, carried out as the first phase to the heads and supervisors of the area and as a second phase to all operational personnel. 2). Raising awareness among staff: This activity consisted of disseminating information about the importance of implementing the secure printing management system through screens, policy delivery and publication in wall newspapers located within the production plant. This activity was planned in conjunction with the SIG Coordinator to guarantee the participation of all staff according to the established dates and the details of activities (Table 3).

Table 3. Activities developed in training (phase 2: Implementation)

No.	Activity									
		S1	S2	S3	S4	S5	S1	S2	S3	S4
	<b>Training: Implementation of the ISO 14298:2013 Secure Print Management System</b>									
<b>2.1</b>	<b>Training/Participation</b>	2	8							
2.1.1	Training in Standard/System Requirements for Management Representatives	2	8							

**2.2 Document Development**

During the development stage, the entire documentary support of the management system was fully prepared and delivered to the GIS coordination for review and approval. This included reviewing the existing documents of the implemented management systems and their suitability for complying with ISO 14298:2013 (Table 4).

Table 2. Activities developed in documentation (phase 2: Implementation)

No.	Activity																	
		S1	S2	S3	S4	S5	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
<b>Documentation development: Implementation of the ISO 14298:2013 Secure Print Management System</b>																		
2.2	<b>Document Development</b>			15	22	29	5	12	19	26	3	10	17	24			31	
2.2.1	Preparation of Documentary Support of the Management System			15	22	29	5	12	19	26	3							
2.2.2	Presentation of the initial Document System and Necessary Formats/Records											10	17					
2.2.3	Implementation of Modifications in Processes and Formats Associated Records			15	22	29	5	12	19	26	3	10						

Within this stage, general management carried out the system review. This activity is carried out twice a year, and all the implemented management systems (ISO 9001, ISO 14001, and OHSAS 18001) are reviewed. On this occasion, it was carried out for the first time for the ISO 14298:2013 Standard.

**2.3 Follow-up**

During this stage, the following activities were carried out: a). System Settings / System Documentation and b). Meeting by Management (Table 5).

Table 5 3. Activities developed in follow-up (phase 2: Implementation)

No.	Activity																	
		S1	S2	S3	S4	S5	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
<b>Implementation of the ISO 14298:2013 Secure Print Management System</b>																		
<b>2.3</b>	<b>Follow-up</b>			15	22	29	5	12	19	26	3	10						
2.3.1	Monitoring and adjustments to the system/System documentation			15	22	29	5	12	19	26	3	10						
2.3.2	System Review Meeting by Management													24	31			

2.3.1 System Settings / System Documentation

This is when the personnel in the areas of the generated or updated documents begin to implement them and generate the evidence requested in each of them. In the same way, users identify new modifications to the documented information so that the documents reflect the activities as they are carried out or as they should be carried out. 2.3.2. Review by management, required in point 5.1 of the standard, according to the company's quality manual in the graphic sector for printing valuable documents, the integrated management system is reviewed at planned intervals every six months, as requested in procedure GG-P001 Management review. The decisions and actions derived from this Review are recorded in the GG-R001 Report for Review by the management group.

During the first Review of the secure print management system, the following information was reviewed: 1). Follow-up actions on previous management reviews; 2). Possible changes were made to internal and external issues that



are relevant to the Security Impression Management System, the needs and expectations of interested parties, and risks and opportunities.; 3). Planning a list of changes to be made within the company that could affect any of the management systems; 4). Review the policy and objectives, including the level of compliance with the objectives. Considering the necessary changes in the Security Impression Management System objectives for GIS revisions; 5). Performance and effectiveness of each management system, including customer feedback regarding their level of satisfaction as well as trends in results, relevant communications from interested parties, including customer complaints and grievances, performance indicators management, supplier performance, results of internal and external audits, security impression performance including trends in non-conformities, preventive measures, corrective actions, monitoring and measurement of results, audit of results and customer feedback; 6). Effectiveness of actions taken to address risks and opportunities; 7). Recommendations for improvement and opportunities for continuous improvement, and 8). Adequacy of resources (International Organization for Standardization, 2013 p. fifteen). If any of the points are not considered, it must be completed in a subsequent meeting in such a way as to ensure that all information is reviewed at least once a year, as requested by ISO 14298: 2013 (International Organization for Standardization, 2013, p. 14).

**Phase 3: Internal audit through self-assessment of conformity with the requirements of standard 14298:2013 to identify and correct deviations before the certification audit**

This phase included the following activities to be carried out according to what was planned in Table 6: internal audit planning; execution of an internal documentary audit at the client's facilities; resolution of internal audit findings; request for certification offers; and selection of a certifying house by the company in the graphic sector.

Table 6. Activities developed in phase 3: Internal Audit

No.	Activity												
		S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
<b>Implementation of the ISO 14298:2013 Secure Print Management System</b>													
<b>3</b>	<b>Phase 3- Internal Audit.</b>												
3.1	Set the day and time for execution of the Internal Audit			20	27								
3.2	Internal Audit Planning + Preparation of Internal Audit Plan					3	10						
3.3	Internal Audit Execution + Delivery of Internal Audit Report										10	17	
3.4	Resolution of Internal Audit findings											20	27

Table 7 summarizes the internal audit findings, identifying 16 findings corresponding to 3 non-conformities, 8 observations, and 5 opportunities for improvement. The company in the graphics sector decided to generate a request for corrective actions for all the findings (Table 7).

Table 7. Summary of internal audit findings

Clause	N.c.	obs	Oh
4 Context of the organization		2	
5. Leadership			
6. Planning			
7. Support		1	2
8. Operation	2	3	2
9. Performance evaluation		1	1
10. Improvement	1	1	
<b>Total</b>	<b>3</b>	<b>8</b>	<b>5</b>

The proposal for improvements derived from the results of the internal audit and certification implemented in the graphics sector to achieve certification of the secure printing management system are: a). Purchase of hard drives for backup from security camera recordings; b). Installation of security mechanisms in critical areas of the company; c). Preparation of confidentiality contracts for clients and suppliers; d). Application for licenses to use specialized software; e). Create restricted areas to safeguard the client's specifications in information technology; F). They were modifying operational procedures such as risk assessment, job profiles, and procedures for safeguarding critical areas. These improvements were substantially reflected in the certification audit since zero non-conformities were found in the secure printing management system, achieving the research objective.

## **5. Conclusions**

This research allowed us to review information concerning the printing industry, specifically in the printing of valuable documents and the different management systems based on an international standard, to select one of them that contributes to the companies in this sector in the security of the products provided. It is concluded that implementing a secure printing management system based on the ISO 14298:2013 standard in the operational processes in the company in the graphic sector for printing valuable documents in Lima, Peru, to obtain the ISO 14298 certification: 2013 of the implemented system will give more value to its commercial management, and to achieve greater recognition in business lines by clients. The management system certification shows that the company has achieved a homogeneous scheme of providing products and services that meet the security requirements offered or requested by customers. On the other hand, it offers clients a service guarantee that the work is controllable and always in search of client satisfaction and continuous improvement.

### **5.1 Research Limitations**

The limitations are as follows: the system has been designed based on its current processes and conditions due to the peculiarity of the process: printing of valuable documents; bibliographic information is scarce, which makes it a limitation for developing this work. Having sufficient resources to implement this type of management system becomes another limitation since it implies having physical controls to ensure the processes comply and deliver safe products. However, the results of this research can help other researchers to follow the methodology used.

### **5.2 Recommendations for Future Research**

Carry out studies on production control methods; improve productivity through the use of machinery and equipment used in printing valuable documents; Research raw material specifications; implement security methods used to preserve the integrity of documents throughout the entire production chain and study other production processes used in graphic printing: offset, intaglio, digital, are the recommendations.

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