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Visitor Management System Design and Implementation during the Covid-19 Pandemic

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Abstract: In today's computer technology environment, the effect of IT plays a significant part in all real-time systems. Various management systems are in place to help the company organization achieve profit, standards, and future commercial growth. The VMS is important for monitoring how many visitors are there, what the objective of the facility visit will be, and who will be put in the block listed record due to rule violation. This technology also protects the building's overall security. The goal of this system is to synchronize the organization's business and visitors in order to achieve a wonderful connection among organizations globally. The background was compiled from many papers that discussed similar subjects and were connected to the system. In addition, the limitations and analyses of the present system have been addressed in order to demonstrate the organization's demands for a new system. In part three, we will go through the project planning, covering the feasibility study, Gantt chart, and software methodology in specific stages. Stepping on functional and nonfunctional requirements of the system, it is covered in the same chapter, as well as the system steps in the implementation part of section four, and finally with clear and direct conclusion and recommendations in section five with future work of the visitor management system, which will be added after the system is implanted in the organization and other related organizations.

Keywords: Visitor Management System (VMS), Implementation, Covid-19.

1 Introduction

The term "visitor management system" refers to a system that keeps track of visitors' actions in an organization or public institution. It can quickly offer users with the required output and information, as well as track arriving and outgoing visitors. However, VMS is also capable of streamlining the registration process and providing visitors with accurate and integrated data [1, 2].

The system is the most frequent kind of impression management in business. The initial impression presented to various levels of organization visitors is the policies and procedures that are adopted towards workplace visitors in the organization, and numerous measures are in place to guarantee proper safety and security surrounding the visitor office [3].

Every company need a plan for directing people to its location. These precautions would prevent the visitor from injuring oneself while inside the business [4]. The Human Resource department and most human resources professionals who have an arrangement or capacity to

remain in contact with one design guest access strategies[5]. The coronavirus epidemic has engulfed the majority of the world's nations. COVID -19 is distributed mostly by respiratory droplets that contaminate surfaces and hands. then transmit the virus to the respiratory system of another person. Severe illness is more likely in the elderly, those with cardiopulmonary co-morbidities, and immunological deficiencies. The human way of life is negatively impacted. Most individuals are apprehensive about receiving visitors or welcome them into their homes. Better sanitization of dwellings is required to keep us secure from illness. To address this issue, we devised a new smart system that would automatically manage guest access into homes or businesses. This system comprises of many devices that are connected and work together to give the best possible infection prevention. It maintains track of visitors, their physical state as they enter the premises, and safety equipment, among other things. We have briefly described the design, operation, and software implementation of this system in this research article [3]. The section secretary should prepare and schedule any visitors who want to visit

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the firm. Every visitation will be recorded and registered in the log book, and the front desk clerk may request the guest's identify and take a picture in order to prepare the admission badge. The visitor badge should be worn at all times until the visit is completed. It is critical that businesses seek out competitive advantages and acknowledge the source of such advantages in the form of employee knowledge [6, 7]. No photographs will be taken without the consent of the security department, and no photographs of guests will be published in order to maintain personal anonymity and to follow the corporate protocol for safeguarding their guests by all means. For most businesses, the guest should have a positive image of the hospitality provided and the professional service provided, beginning with the first step into the visiting room and continuing through the direction to his destination until he returns and attempts to leave the firm [8].

Regardless of whether a person's job involves direct contact with guests (e.g., salespeople, taxi drivers, phone client service delegates) or indirect contact (e.g., construction laborers, bookkeeping office), all members of an organization must appreciate the role guests play in helping the organization achieve its goals. Many organizations constantly convey a "Guest is usually essential" message in office gatherings, authoritative letters (e.g., inside communications), and corporate preparation programs to ensure that everyone understands the guest's task. To drive home the importance of visitors, the message often includes examples of how visitors influence the organization. The visitor gate-pass management system is intended to replace traditional visitor registration and visitor information management activities in the premises. Using this system, we will be able to speed up the registration process, determine who is still inside the premises after the meeting, and notify the system[9, 10]. Finally, the business visitor should be treated properly by the secretary up to the front desk, where he should be directed and given the company safety induction, which explains the danger and hazard that may arise if the rules and procedures are not followed.

1.1 Research Problem

The starting The globe is under a state of emergency as a result of the covid-19 epidemic. Corona viruses are a kind of virus that may cause illnesses such as respiratory and gastrointestinal problems. The epidemic has had an impact on the whole food chain, exposing its vulnerability. Border closures, trade restrictions, and technology have all played a part in dealing with the COVID crisis [3]. In recent years, there have been substantial flaws in the systems utilized to facilitate guest access on a regular basis [10, 11]. Many businesses have lost a large number of consumers as a result of bad treatment of various visitor groups as a result of delays in completing the entrance access procedure, which has a negative influence on financial and business management. Going back to the departmental issue, our visitors are waiting in the visitor room for their turn to complete the entry process by checking the e-mail notification, visitor details, requester level with approval, registration progression, and receiving the access badge under the existing manual system. Other department managers complained that they had missed the meeting time, particularly if the visitor had a restricted arrival time and had come for advice (Time VS Cost). Other concerns include dealing with erroneous manual systems in the part dealing with visitor accountability [12]. The entire lengthy process is carried out by one employee (Visitor Room Officer) for each individual visitor, resulting in a slew of issues ranging from overcrowding in the office, which may result in a security breach, officer pressure, which may influence his decision to direct / guide the visitor to his proper destination, and document control and missing information required for registration. During the briefing Visitors cannot verify the availability of the employee from the visitor's location, which is one of the system's drawbacks. Admin will have a difficult time manually booking an employee. The system does not allow you to block a bothersome visitor(s). As a result, during the project's system analysis phase, the current system is extensively inspected and any flaws are exposed [8].

1.2 Research Objectives

- 1. Keeping track of visitors' arrival, presence, and departure on the premises and taking appropriate action.
- 2.To Improving the health and safety of employees in the workplace.
- 3. To make it easier for diverse types of visitors to enter at a high level of hospitality.
- 4. Individualize the visitor's treatment based on their level of access.
- 5.To improve visitor guidance and orientation so that they can securely arrive at their destination.
- 6. To promoting the use of touchless access solutions.
- 7.To ensure that people and surfaces come into contact as little as possible.
- 8.To be prepared in the future for unforeseeable circumstances.

1.3 Research Scope

The study will be carried out in private companies, namely in the security department. The goal of the research is to emphasize the contractual participation of visitors. Because few studies on similar or comparable themes have been undertaken before, particularly during the COVID 19 period,



it was deemed that additional study on this area was necessary. This study will provide a clear picture of the options for improving the visitor's access system, as well as various opportunities to improve the visitor's categorization in order to treat them with the highest level of hospitality possible without causing any delays or causing company business issues.

1.4 Research Significance

This research will aid private companies, ministries, organizations, and establishments in adequately managing their visitors' records in comparison to the pen and paperbased system now in place; and in the event of an emergency, it will assist police/security in criminal investigation via: Visitors' information will be recorded, including their name, location, fingerprints, and instant photographs, which may be utilized to swiftly identify a suspect. Providing a list of visitors who came to the organization/ministry on a certain day, week, month, or year. Creating a daily security report based on application visitor check-in and check-out data. The research will help to improve the process of allowing visitors to enter private companies. Furthermore, the study will benefit the company's business via the proposed visitor system, which will allow them to schedule their appointment in advance with a clear necessity and purpose of visit, as well as which category they will visit. The results to be examined include an increase in corporate business, as well as safety and security for both the organization and its guests. Positive impression management is being developed. Increase the amount of engagement and collaboration that has been fostered across departments.

2 Literature Review

2.1 Theoretical Background

Private companies and organizations should be concerned about their guests' safety and security measures, and they should implement a tracking system for each individual visitor who may visit the firm for whatever purpose. By offering a visitor management system, the guest will be able to pre-register in order to get clear and direct instructions to his destination inside the premises, which will be equipped with the necessary safety and security measures. There are various notions linked to organization visitors in the literature; the fundamental concept is the interaction of business visitors with the visitor management system used, which includes a tracking system.

2.1.1 Security Gate:

The visitor(s) must register at the security gate or at reception in this security gate module. They must be validated after registering, or else admin may add them. Visitors might be of two types: personal visitors and official visitors; both must provide the necessary information. If a visitor wishes to book an employee, they may do so from their own location by

checking the person's availability. Friedberg proposes STPA-SafeSec, a consolidated investigation method for wellness and security based on STPA and STPA-Sec [11], which may be utilized to select the ideal alleviation strategies ensure framework security and security. The methodology's advantages include unified wellness and security thought when selecting suitable relief strategies, as well as the ability to coordinate the most fundamental framework segments for a top to bottom security examination (for example infiltration testing). The examination identifies probable framework flaws caused by a specific security or wellbeing powerlessness, as well as improved alleviation strategies [11]. Propose a method for identifying and formally categorizing health and safety requirements. This technique is based on the STPA system and is combined with showing, discernibility, and formal verification using the Event-B formal strategy. The goal is to provide essential needs so that we can avoid unfavorable structure conditions. Using the Event-B language and the Rodin toolkit, they demonstrate and test that these fundamental prerequisites totally relieve the undesirable framework states [12].

2.1.2 Tracking System:

Increasing the importance of tracking visitor trends across several associations is a critical aspect in the growth of the global guest the executive's framework promotes. The framework for guest the executive is a realistic structure that promotes companies to address guest growth on their premises. The executive's framework for guests is a product-based structure that captures, screens, records, and recovers visitor data in order to manage guest flow throughout the workplace/building. The executive's frameworks for visitors are accessible with various characteristics, including photo ID or unique finger impression filtration, auto-distinguishing evidence of repeated guests, and computerized preenlistment of expected registrants. The visitor the board framework generates access cards with pre-approved access and restrictions on offices based on the kind of guest [1].

The framework of the executive guest communicates to visitors how to use the contact screen, empowers guests to self-register, and communicates warnings to staff. The guest the board architecture eliminates human error and ensures a higher degree of execution and security of the reason [9]. As a result, the designed information system should dependably give trustworthy information that increases customer confidence and objectivity while also possessing the necessary features to sustain efficiency [13, 14]. Information technology has become critical for businesses seeking to improve performance, gain a competitive edge, or just survive in today's economic climate [15, 16]. These advancements have been driven by a competitive advantage built on the efficient use of information and knowledge [14, 15].



2.1.3 Administration:

In The administrator may connect to this administration module from the administrator side and then add a visitor, employee, or another administrator to the system. The administrator may amend his or her profile and, if necessary, change the password. Then, from the administrator's side, the administrator may prevent an employee or guest from gaining access to the system. This administrative side allows you to examine the visitor list, employee list, and booking data [17].

2.1.4 Access System:

In addition to physical limits limiting institution entry to one location, institutions have discovered the necessity to improve their method for registering who enters and exits the office. The fundamental approach is constrained since it is modest and provides little information other than name and time. There are a few PC-based frameworks available that provide a wealth of data to enhance both security and frontoffice performance. Many frameworks feature a booth-like state in which a visitor just looks at oneself in a manner similar to the clipboard approach, but the framework may capture substantially more data fast. This additional information may include an image of the visitor, the reason he is there, where he is going, a time stamp, and so on [10, 18].

2.1.5 Hosting visitors:

From the employee side, he or she may login to this host employee module and view a list of visitors who have registered with them. Employees may then choose whether or not to accept or reject the request. In this module, the employee may amend his or her profile and, if necessary, change his or her password. The employee might request that the unpleasant guest be banned from the company [17]. Has always been a part of running a company. Organizations did, in fact, legitimize a visit by demanding that participants make a record in an anteroom book. While the rest of the corporate world improved, the time spent inviting and supervising visitors remained remarkably unchanged for a long period. The reasons behind this were complicated. With a cover of duties, office the executives, and IT, it was often unclear who had the responsibility. Differences in processes and requirements across many organizational domains made presenting a unified framework difficult. The few existing on-premise innovation solutions were expensive to implement, and offices did not have a dedicated budget for this kind of work. These challenges compelled VMS to migrate to the cloud, where it became known as Software as a Service, or SaaS. A product authorizing model is used in a cloud-based SaaS where a guest the board application is supported by a third-party provider who makes it available to customers through the web.

2.1.6 Attack-Fault Trees

A technique for handling of attack shortfall trees (AFT) with dynamic entry points that enables the consideration of progressively complicated diverse advance circumstances.

The authors demonstrate a possible transformation of dynamic entry points into stochastic event automata that enables the use of the UPPAAL model checker for statistical verification. The methodology incorporates quantitative examination of AFTs and consideration of a few health security situations, for example, as-is and possible that situation, resulting in the identification of the most dangerous situations and selection of the countermeasure [19]. An inquiry based on a combination of STPA and NIST SP800-30 rules. The examination is founded on the convergence of a framework-based approach geared toward health and a segment-based methodology geared toward hazards and vulnerabilities. The authors illustrate how to adapt wellness and security workflows and the areas they must cover. A proposed technique that incorporates elements of two current methodologies, STRIDE and FMEA. These health and security professionals are divided into two groups by a combination organize based on the first equal exercises, which results in a consolidated health and security risk inventory. The joining of findings is also addressed in the second section of the two methodologies for assessing influence on the security side and likelihood on the health side. The methodology focuses on minimizing effort by immediately addressing shared characteristics of independent appraisals, on utilizing the joined list to bring to light issues that have a high impact or probability on both territories, and on facilitating multidimensional choices made by addressing security and well-being together.

2.1.7 Visitor Management System Process

The Integrated Process Approach is being used to develop the Visitors Management System for APU Accommodations [20]. It is a technique for developing products that is used by venture capitalists. It is a widely used invention for development[10]. It is a taught method for supervising errands and commitments in a development organization. The Common Unified Process approach is a web-enabled article-based development method that was launched. RUP provided online rules and templates for all phases of program development. The Reasonable Integrated Process is ideal for a broad variety of organizations and enterprises because it captures the best practices in software development in a framework that is adaptable to a wide variety of projects. RUP is appropriate for both small and large development teams. RUP is an IBM product development methodology. It teaches a systematic approach to the process of software development. RUP divides the development process into four phases: inquiry and structure, use, testing, and organization; each step is divided into separate cycles that must be completed before progressing to the next level of development. The Unified Process provides an orderly technique for developing software systems; it also prevents



resource waste and significantly reduces development expenses [21].

2.1.8 Visitor key Issues:

There is a departure of contributed researchers and experts in the subject, with unique aptitude and targeted investigation on crucial topics like validity, legacy, and visitor experience. It is, in any event, difficult to determine the factors that impact the analysts' choice of subjects - are they identified by previous experts indicating gaps, by individuals identifying potentially acceptable zones for investigation based on their personal motivation, or by more broad influencers? For example, the various worldwide research greatness and quality plans are likely to have determined the movement of focuses in views and methods capable of meeting individual high-appraised diary demands and, therefore, institutional scholastic wants. Similarly, a few viewpoints that may be relevant for investigation, for example, the lack of articles including youngster and youth audiences, may be predicted due to the strict moral and honesty criteria in power equivalent to leading research with under-18s in several scholastic foundations. While this is manageable, see Tchetchik, Fleischer [22], who overcomes the challenges by organizing family center events. Regarding 18s' use of National Parks guided by GPS following frameworks, it is likely that the extent of investigation into this sector collecting has been constrained. The growing need to demonstrate the estimation of research and related yields in terms of significance to colleges and industry areas can be seen, for example, in the development of previously unexplored perspectives that are likely to be of pertinence to industry, for example, gallery guest intentional commitments [23].

2.2 Analysis and Limitation of Existing System

2.2.1 Illegible Handwriting

The visitor may be too quick or too sluggish while filling out the guest data in the visitor log book, and illegible handwriting may result in security breaches as well as the necessity to return to the record in the future [2, 17].

2.2.2 Confidentiality

If a visitor puts down his or her information, all subsequent visitors will be able to read all of the information that was written down, which reduces personal confidentiality and may be utilized in an acceptable manner.

2.2.3 Time-Consuming

The whole procedure will take time, from the moment the request is initiated to the time it reaches the front desk clerk, particularly if there has been no previous information that the visitor would be visiting the premises.

2.2.4 ID Verification

Because manual logs do not have the capability of capturing a personal picture, the front desk staff will not be able to identify a visitor if their identification (IDV) has not been confirmed or is unclear. Additionally, owing to the large volume of visits, the front desk employee may get distracted.

2.2.5 No Reporting

The company places a high value on the hospitality of guests, as well as the services they give, such as having enough space and having workers who are trained to deal with tourists, particularly during peak periods.

2.2.6 Trademark

Organizations who care about the design of the visitor room and have an excellent front desk but also have an outdated registration system will convey to visitors that the firm does not care about them via their use of place formality.

2.3 The need of a new system:

There are several arguments in favor of using a Visitor Management System rather to a human log book, some of which are stated below:

2.3.1 Security

The Visitor Management System ensures your organization's security is effective and efficient. Unlike a manual log book, where visitors get used to inputting their personal information, which is often inaccurate and only for the purpose of filling out, the electronic log book allows for the secrecy of the visiting list, which can be accessed by all trilling guests. The visitor management system will validate all visitor data by transmitting an on-time password (OTP) as well as the precise appointment time, reducing the number of bogus visitor entries.

2.3.2 Accuracy & Reliability

OTP is used to verify the visitor's records in Visitor Management Software. As a result, the visitor's information is accurate and there are no prospects of having it corrected. This ensures that the information is sufficiently validated and consistent to be utilized for future purposes.

2.3.3 Pre- registration

The system has a great opportunity to provide preregistration for company guests instead of manual handwriting in daily logs where the visitor tries to fill up, where the implementation of the visitor management system will allow the front desk/security to have a prior notification for the expected guest, reducing the crowdedness inside the visitor room.



2.3.4. Effective Monitoring

The tracking system will be very useful since security officials will not be able to monitor each individual visitor that enters the organization. The tracking system will indicate each individual visitor the precise moment they must depart the premises by sending a message to security officers.

2.3.5. Enduring Impact

Visitors to the organization should feel valued as soon as they enter the visitor room; of course, the traditional registration system will give the opposite impression, but how the visitor feels important by interacting with the new system from the time of arrival until the time of departure is critical.

3 Research Methodology

3.1 Project Planning

Project planning is the process of developing objectives and defining targets, as well as the procedures necessary to attain those goals [24]. The endeavor the officials design taking into consideration the following factors: process that structures the errand the board as a result of their experience the administrators coordinating progress [25]. Project planning as a process has been set up in this way. It is important to decide early on what, when, how, and with whom the main exercises will be carried out in order to meet the goals that have been defined. At this time, there is an inescapable organization task that is refined by all phases of the undertaking's advancement, with the qualifications being the degree of detail, the magnitude of the endeavor, and the number of people involved. Orchestrating lays the groundwork for future exercises by drawing on the lessons learned in the past. There is a driving force behind this paper: to investigate the endeavor condition for organizing, to consider the rationale behind masterminding, to concentrate on the periods of errand orchestrating, to survey the portions of preparing for the endeavor, and to discuss the role of dynamic in adventure masterminding.

3.1.1 Feasibility Study

A feasibility study is used to determine the viability of an idea, for example, verifying that work is genuine and really feasible, as well as economically viable. It informs us if the effort deserves the intrigue; on occasion, an attempt may be impractical. There are several explanations for this, including the need for such a large number of resources, which not only protects those advantages from doing diverse duties, but also may cost more than an association would recover by conducting an unprofitable endeavor [26]. A feasibility analysis study (FSA) determines a project's likelihood of success; hence, perceived objectivity is a critical component of the analysis's validity for possible financial experts and loaning creations.

4 Software Design and Implementation

4.1 Use Case diagram

Use case diagrams serve a critical role in UML visualization. Prudent demonstrating is critical for achieving the most effective and appropriate framework engineering. The study makes reference to the need of thoroughly examining use case summaries. A suitable model of usage cases is provided, and its evolution for average links between use cases is shown. Two formal examination and verification procedures are discussed in detail. The first, which is based on a state study, is indicative of a model checking strategy. The next one refers to iconic reasoning via the use of formal procedures for ephemeral justification. The straightforward but delegated example of usage case scenario verification is discussed [28, 29].

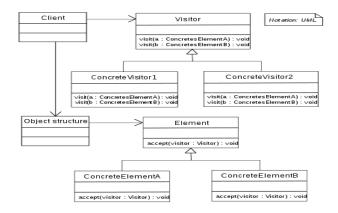


Figure 1. Use case diagram

The Unified Modeling Language (UML) is a standardized general-purpose demonstration language for object-oriented software engineering. UML makes use of a variety of realistic documentation techniques to create visual representations of article-structured programming frameworks [30]. UML unifies procedures from data demonstrating, business demonstrating, object demonstrating, and segment demonstrating and may be used across the product development lifecycle and across a variety of execution technologies.

4.2 Implementation:

4.2.1 Home page:

The main page of the Private Companies visitor management system is the initial stage in the visitor registration procedure, as we may log into three separate categories, each with a dropdown menu and two sub-categories. This facility has a limited user group that is permitted to register for visitor admission, such as managers and their secretaries, as well as important personnel who interact with suppliers/vendors.



4.2.2 Register Visitor:

Secretaries or Managers may fill out this form on the register visitor page, which Secretaries or Supervisors may fill out this form on the register visitor page, which contains the fields CPR, full name, business, mobile, e-mail, and the place / destination necessary to visit. It also has an image section that may be inserted by the requester or in the visiting room when the visitor arrives. Setting up a visitor sign in registration system allows you to track all visitors that enter and exit your office. A record of people who enter and exit your company is essential for a variety of reasons.

4.2.3 Visitor List:

All of the recorded visits will display in the guest list section with a single click, offering detailed information for the whole visitors' process from start to finish. These may display the system history day by day as well as previous records in order to offer statistics in many categories such as statistics by department, firm, or requester.

4.2.4 Edit Visitor

This section of edit visitor enables the requester to change the visitor's information/details as required for the purpose of rectification or to add additional details such as the visitor arrived with his laptop or needs to enter by automobile to conduct business.

4.2.5 Validate

The validate (V&V) page consists of two phases. In the first step, the system will request validation prior to printing the visitor badge. Additionally, the system will issue a QR code for the visitor, which the system will retain for future use. Step two is to validate the visitor before sending it to the last step, which is badge printing.

4.2.6 Modify Visit

In the field of modify visit, the requester has the option of changing the visit timing and the people/department expected to meet because, in some cases, the visitor is required to attend more than one meeting on the same day with a related subject, especially if they are traveling to attend meetings and returning on the same day.

- 4.2.7 Maintaining the safety of your visitors at the COVID-19 PANDEMIC
- 1. Using visitor pre-registration, you may save time at checkin. Before their arrival, visitors are pre-registered and have signed self-certification for visitor track and trace.
- 2. Enable the touchless sign-in feature. A touchless visitor management system equipped with motion sensors, speech recognition, and temperature scanning can effortlessly sign guests in with a QR code scan when checking in.
- 3. Make your visitor management method more automated. After a visitor signs in, your visitor management system prints a pass, the host is alerted through SMS and email, the visitor is told which room they are in, and the meeting begins on time. There is no human touch.

5 Conclusions and Recommendations: 5.1 Conclusion:

The conclusion is intended to assist the reader in comprehending the study requirements after the completion of the project investigation. The conclusion is not just a summary of the study findings or a restatement of the concerns, but also a synthesis of the major subject points discussed and proposed topics for future research. The conclusion of this study paper is that we effectively suggested our idea, which has the potential to be very beneficial to humanity during pandemic times. The product is built on the Internet of Things and Artificial Intelligence, and it has the potential to be a game changer in both industries [31]. COVID 19 is a novel virus that may soon get a vaccine. However, this is not the last virus to threaten civilization, and as humans, we must learn to live with communicable infections. This kind of gadget has the potential to aid us not just in the current epidemic, but also in the future. Given that the firm places a high premium on visitor relations and safety in order to increase sales and production, the suggested system would assist the company in simply achieving this goal by allowing visitors to grant their visit in very precise time with no registration wait. The visitor management system will enable users to pre-arrange visit needs, allowing for a more efficient planning of events and commercial relationships, which are all desired. The approach is quite beneficial for requesters, particularly those who have been harmed by the previous system's arrangement procedure.

5.2 Recommendations and Future Work:

Recommendation may be described as counsel on the study method in a certain situation, the full supply a thought of proposal and ideas providing an advantage guide lines covering the difficulties solutions, and beneficial outcome. The suggestion might be persuasive and tailored to the particular condition that has arisen. In this perspective, the unambiguous example of the paper-based plan is inextricably linked to precise facts and cannot be theorized about since it is only a supposition. Visitor management systems are recommended for the company and, more specifically, for the concerned users because they will shift them to a more straightforward and accurate process, which is especially important when there is a high demand for visiting the company, while also enhancing business relationships between companies worldwide. However, this system is highly suggested for managers and secretaries who contact with guest arrangements on a regular basis in order to manage their visitors from their initial impression of the company to identifying and monitoring them. I would advocate implementing a visitor control system to boost the premises' safety and security.



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Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present study.

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