Fingerprint Controlled Examination Screening System For Schools

Etuk, E.A., Asogwa,S. C. Ugwoke F. N. and Asuzu, I.H.
Department of Computer Science, Michael Okpara University of Agriculture, Umudike, Nigeria

Article Information	Abstract

The Fingerprint Controlled Examination Screening System is a critical system proposed and researched by researchers as the most viable means of addressing the growing problems in examination processes, particularly in higher education institutions. There are numerous records of problems that afflict schools, particularly higher education institutions, in our society today. One of the issues is the problem of examination malpractice caused by impersonation. Most institutions and examination bodies rely heavily on invigilators to manually compare students or examination candidates to images printed on paper in order to identify impersonators. This method is untrustworthy because humans may have difficulty distinguishing between look-alikes. Furthermore, this method may be time-consuming and necessitate more human effort. This research aims to solve this problem by utilizing a human physiologically unique feature known as the fingerprint, which has been shown in previous studies to be unique even between twins. This distinguishing feature is extremely reliable in identifying any individual, so it is proposed in this study as the most viable means of addressing the problem of impersonation during examination. The agile methodology was used to create the system. This method was chosen because it allows the researcher to divide the system into units or phases and plan, execute, and evaluate each phase separately before combining them all into one system. Microsoft C # was used in the development of the software because it is built on the robust features and characteristics of Object-Oriented Programming and has the flexibility provided by Microsoft Inc. Microsoft Access is the database management program used, and it is strong, secure, and compatible with the programming language of choice.

***Corresponding Author:** Etuk, E. A.: forgerals@yahoo.com

Introduction

An academic examination can be defined as the assessment of a person's Performance with a series of questions, problems, or a series to determine the amount of knowledge that the person has acquired, the quality and effectiveness of the skills the person has developed, and the extent to which the person can utilize it. (Gronlund, 2003). In the 16th century, the Jesuits introduced a form of written examination into their schools. This examination is governed by the *Ratio Studiorum,* held annually throughout their schools to determine whether school children are to be promoted to higher classes. The *Ratio Studiorum* which was formally drafted in 1599 but was revised in 1932 contains a code of rules for the conduct of school examinations (Woods, 2005).

The examination screening system is a combination of persons and or machines comprising of examiners/invigilators, students/candidates, examination center or hall, and candidate's verification sheet, working together to accurately identify and verify examination candidates before they start writing the examination. Proper screening of candidates ensures that the examination is conducted in a trusted manner.

Biometrics are features that (uniquely) identify a person based on his physiological or behavioral characteristics. It relies on something that a person is, for identification or verification, and therefore can accurately differentiate between an authorized person and a fraudulent imposter. The fingerprint is one of the most unique biometrics that differentiates people. Fingerprint Controlled Examination System is of two phases: Enrollment phase and Verification phase. The enrollment phase starts from the beginning of the semester and ends at mid-semester. On the other hand, the verification phase starts during the examination. This is when the system is used to quickly verify student's identify just before they gain access into the examination hall. Students place their finger on the scanner, if a match is found, the student is allowed

access, otherwise, the student is denied access into the examination hall. In most schools examination screening is done manually. At best the candidate's identity cards are examined one by one to determine the validity and suitability of examination candidates. The objective of the research is to develop a reliable fingerprint system for identifying and screening students for examination and to produce a system that will be used for fast in admitting students into the examination hall.

Concept of Biometrics and Fingerprints

Those human characteristics sometimes referred to as biometric identifiers like a fingerprint, facial pattern, iris pattern, voice, or DNA is considered unique to individuals and may be used in combination to ensure greater accuracy of verification or identification. Biometrics can also be seen as a branch of biology that studies biological phenomena and observations using statistical analysis. (Maria, 2019). Both the physiological and behavioral characteristics are used in biometrics. Biometrics can also provide a reasonable level of confidence in authentication individuals. Fingerprints consist of a series of ridges and furrows on the surface of the finger and patterns such as swirls, loops or aches surrounded the core which makes them distinctly different for each person Kumar and Ryu, (2009).

Authentication, Identification, Screening and enrollment Mode of Biometric Systems

In authentication mode, a biometric system performs a one-to-one comparison of captured biometric features with a specific template stored in a biometric database to determine if an individual is a person they claim to be. This involves comparing two sets of data. The first data is captured and stored in a database during the enrollment mode, while the second data is presented by the user d the system. If the set of data is identical, the system gives a positive response, but if not identical, the system returns a negative response. (Uche, 2021). In identification mode, the biometric system performs a one-to-many comparison against a biometric database in an attempt to establish the identity of an unknown individual. During enrollment,

the biometric information of the individual is captured and stored in a database. Screening entails verifying whether the student meets the requirements for the examination.

Empirical Analysis of the Adoption of Biometric System

According to a survey carried out by Ping Identity, 92 percent of enterprises rank biometrics authentication as an effective or very effective to secure identity. Further 86 percent say it is very effective in securing data stored in the cloud Denver, 2019). Another survey reported by Peter (2018) in Spiceworks stated that 62 percent of companies are already using biometric authentication and about 24 percent of other companies plan to deploy it within the next two years. Biometrics is a rapidly evolving technology that has been widely used in areas like forensics, criminal identification, and prison security, and it has the potential to be widely adopted in a very broad range of civilian applications

System Development Methodology

The method used in this study is the agile methodology. This method employs an iterative and incremental strategy to deliver a system that can be easily changed or updated to suit users' needs. At the end of every iteration, a working system prototype is achieved, then the process is incremented to the next iteration.

Requirement Specification of the Proposes System

The requirements specification of a system is the functions that are expected from the system. In this study, the requirements specifications of the new system are in two categories which are listed below. The user should be able to edit, update students' details and also print confirmation slips. The system requirements include to capturing, storing, retrieve and generating reports users details

Object Modelling

The Unified Modelling Language (UML) diagram used to model the system objects is the class diagram, and it is shown below.
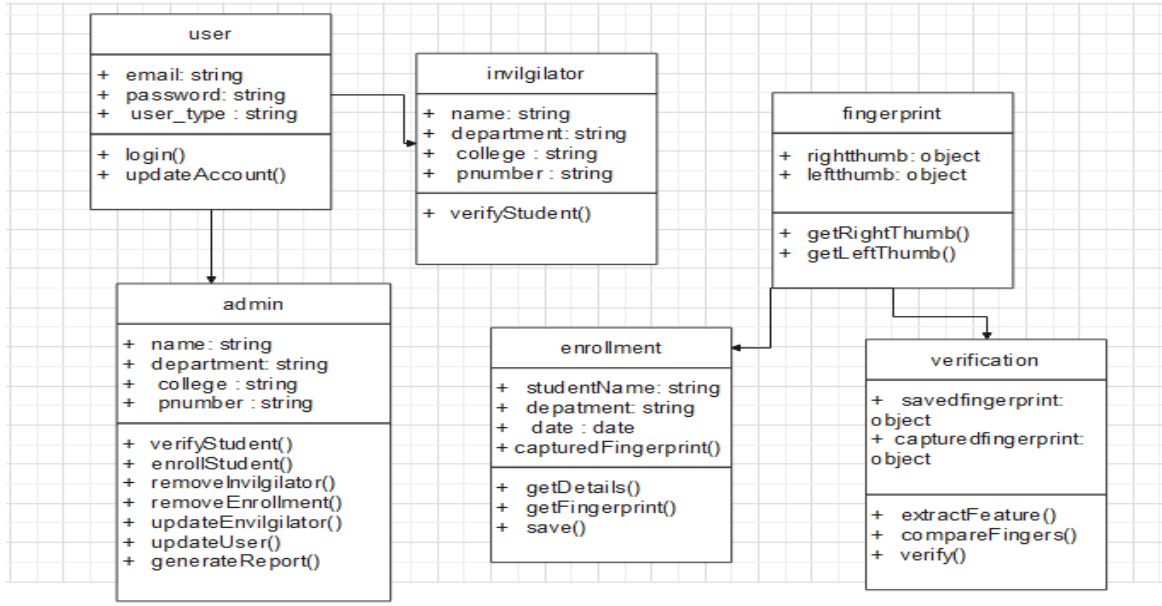
Fig. 1: Class Diagram of the Proposed System

Activity Diagram

This diagram is a behavioral diagram that depicts the behavior of a system and portrays the control flow from a start point to a finish point, showing the various decision paths that exist while the activity is being executed. The diagram below shows the activity diagram for fingerprint verification.
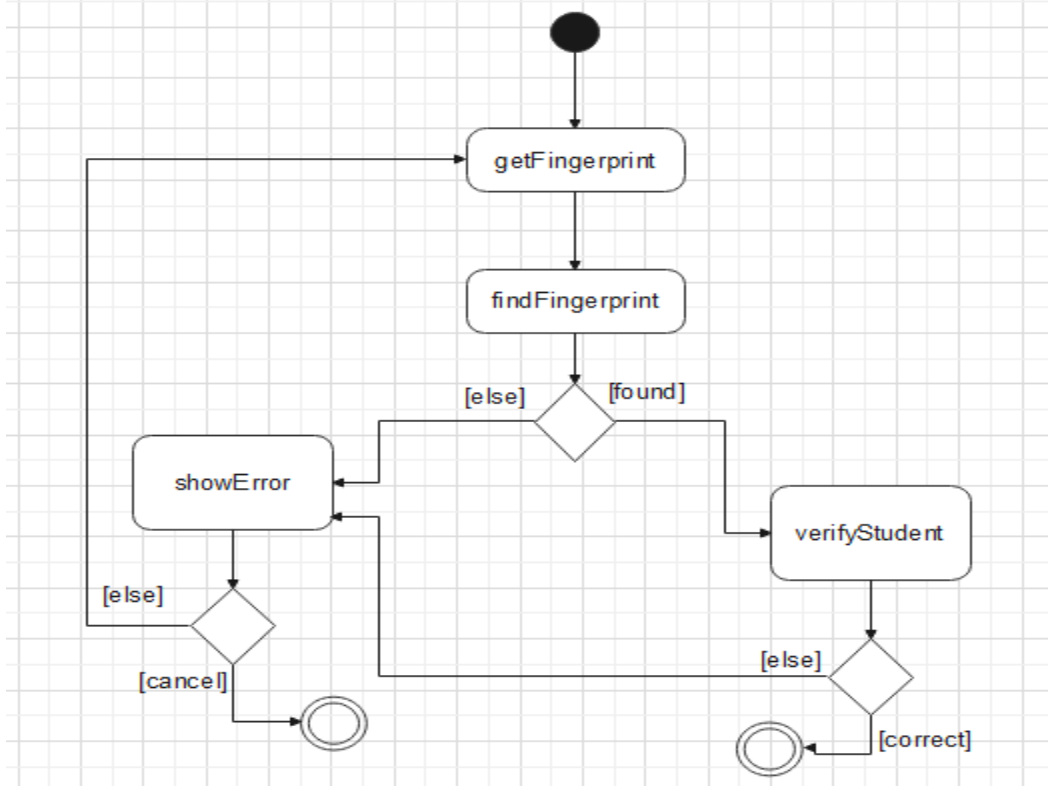

Fig. 2: Verification Activity Diagram

Block Diagram of the Proposed System

System block is the abstract model that describes the structure, behavior, views of a system and conveys information about the elements that make up a system. The diagram below shows the structure of the new system.
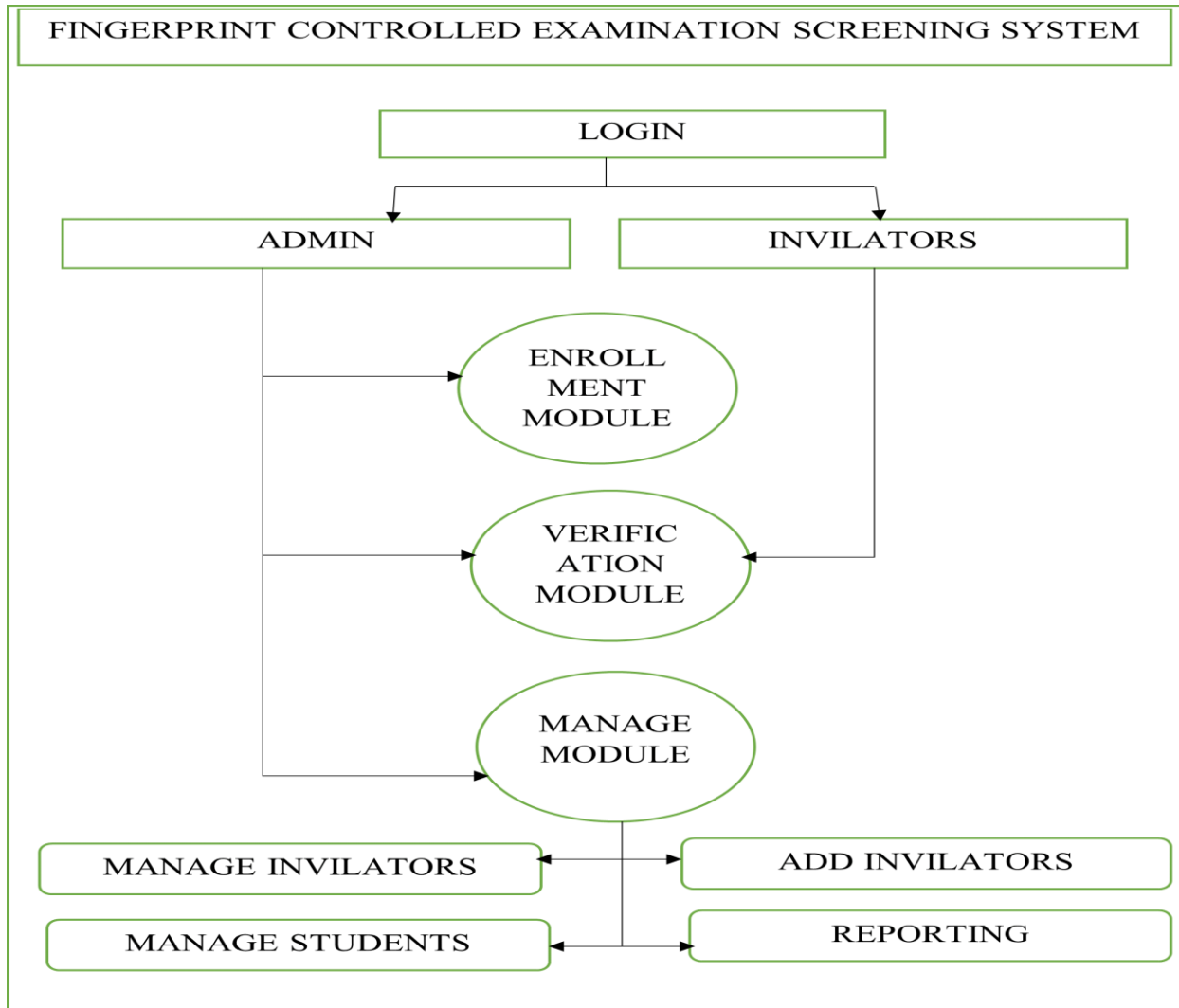
Fig. 3; Proposed System Block Diagram

System Design and Implementation
Overview of the System Design
System design is the process of defining the elements of a system such as the architecture, modules, components, different interfaces, and data so that the system can satisfy certain requirements. It is a phase that bridges the gap between the problem domain and the solution to the problems. It emphasized translating design specifications to performance specifications

Input Design

The input design is the process of converting a user-oriented description of inputs into a programmer-oriented specification. It includes specifying how end-users and system operators direct the system is performing actions. The design of input focuses on controlling the amount of input required, controlling errors, avoiding delay, avoiding extra steps, and keeping the process simple. The error raising method is also included in the software, which helps to raise error messages while the wrong entry of input is done. In design input mechanisms, the following are considered.

Student Enrollment Input Design

STUDENT ENROLLMENT

SURNAME [   ]   FIRSTNAME [   ]   LASTNAME [   ]

EMAIL [   ]   LEVEL [   ]

DEPTMENT [   ]   COLLEGE [   ]   GENDER [   ]

PASSPORT

[SELECT IMAGE]   [RIGHT FINGER]

[RESET]   [LEFT FINGER]

[ENROLL]

initialized count to 1

Read right thumb form reader

is count = 2? — No → increase count by 1

Yes

initialized count to 1

Read left thumb form reader

is count = 2? — No → increase count by 1

Yes

Process student details
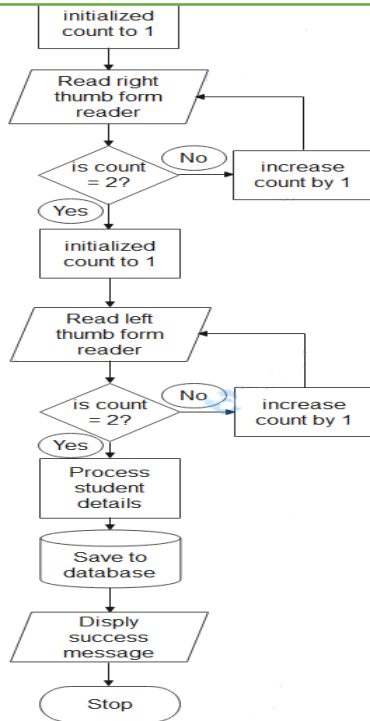
Save to database

Disply success message

Stop

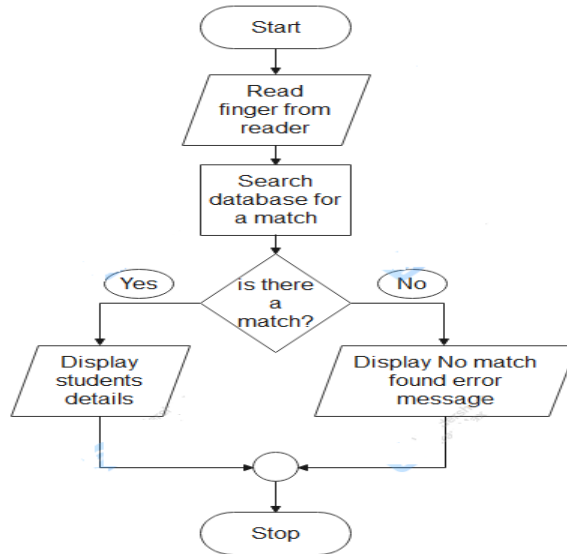Fig.5 Enrollment Flowchart

ii Verification Flowchart

Fig. 5; Verification Flowchart

Output Design

Output design is a process of specifying the necessary system outputs in a format that conveys information to the end-users according to requirements. It is the most important and direct information source to the user and should be designed in an effective and efficient format in other to improve the relationship between the system and the user and help in decision making. The following are considered in the design of the output design.

Fig. 6: Enrolled Students Output Design

4.4.2 Student Verification Output Design

Fig. 7: Comment and Reply Design

Database Design

The Database is very crucial for every information system, as it is used to store data and results of processing. Data are stored in a logical table that corresponds to different entities that make up a system. This includes the user table

Entity- Relationship Model

An entity-relationship diagram (ERD) is a high-level model that describes the data elements or entities in the new system, and the relationship that exists among them. The entities identified in the new system include users (admin and invigilator), enrolled students, department, level, and course. These entities have attributes and relationships in the new system as shown in the diagram below.
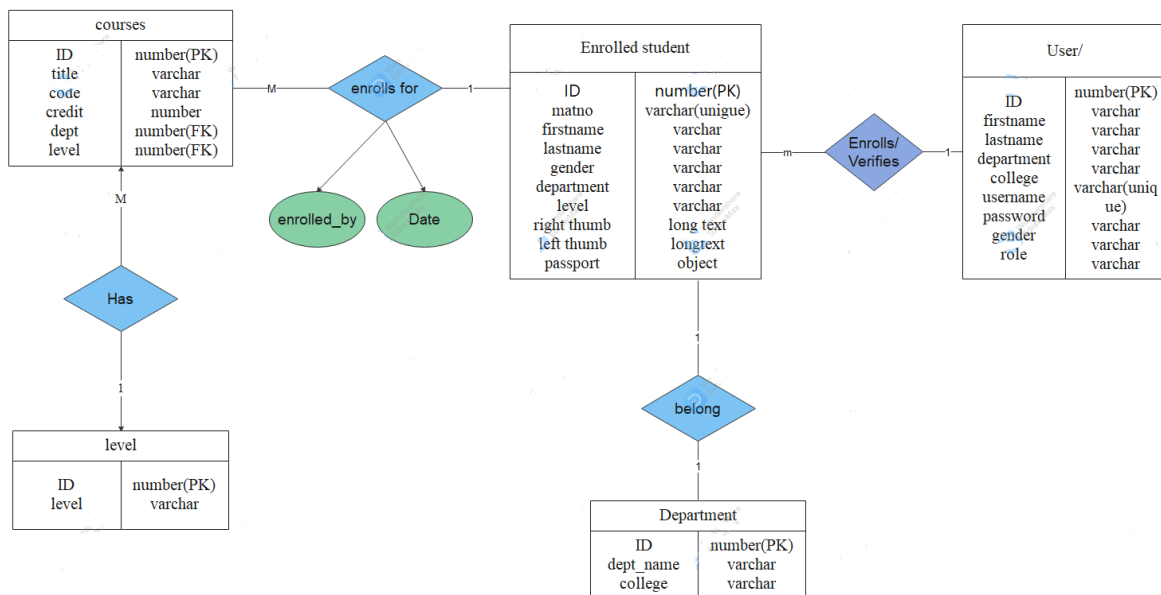

Fig. 8; Entity Relationship Diagram

System Implementation, Security and Programming Language

System implementation is simply translating the user requirements specifications into a functional or practical system to satisfy the user's needs. C# is used

in developing the application. The system uses a strong hashing technique for security.

Conclusion

Biometric features such as fingerprint have gained support and usage worldwide because it is more

unique and can be used in identifying individuals. As the backbone for the new system, this feature makes the new system more appropriate for use during examination screening because it is based on the use of what we are (fingerprint) and not what we have. The

researchers have successfully achieved it objectives of developing a secure means of authenticating students for examinations and by doing this has contributed to the reduction in the rate of examination malpractices in schools.

References

Ashbaugh, D.R. (1999). Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology; CRC Press: Boca, FL,

Babler, W.J. (1991). Embryologic Development of Epidermal Ridges and Their Configurations.In Dermatoglyphics: Science in Transition; Plato, C.,

Garruto, R.M., Schaumann, B.A., Eds.; Birth Defects: Original Article Series; March of Dimes: New York; pp 95-112.

Beavan, C. (2001). Fingerprints: The Origins of Crime Detection and the Murder Case That Launched Forensic Science; Hyperion: New York.

Berry, J. and Stoney, D.A. (2001). History and Development of Fingerprinting. In Advances in Fingerprint Technology, 2nd ed.; Lee, H.C., Gaensslen, R.E., Eds.; CRC Press: Boca Raton, FL; pp 1-40.

Caplan, J.and Torpey, J. (2001). Eds. Documenting Individual Identity: The Development of State Practices in the Modern World; Princeton University Press: Princeton, NJ.

Chapel, C.E. (1941). Fingerprinting: A Manual of Identification; Coward McCann: New York.

Chatterjee, S.K. (1962). Endoscopy. Fingerprint and Ident. Mag., 44(3), 3-13.

Cole, S.A. (2001). Suspect Identities: A History of Fingerprinting and Criminal Identification; Harvard University Press: Cambridge, MA.

Cummins, H. and Midlo, C. (1943). Finger Prints, Palms and Soles:An Introduction to Dermatoglyphics Dover: New York.

De Forest, H.P. (1938). The First Finger-Prints File in the United States. Finger Print and Ident. Mag, 19, 16-20

Faulds, H.A (1922). Manual of Practical Dactylography. London: The "PoliceReview"Publishing Co., Ltd.

Felsher, I.M.A. (1962). Quick Look at Dermatoglyphics.Ident News. 12(7), 6-12.

Finger Print Publishing Association. Finger Print Magazine 1919, 1(1), cover photo.

Galton, F. (1892). Finger; MacMillan: New York.

Gronlund, N. (2003). How to make achievement tests and assessments. 5th edition, NY: Allyn and Bacon

Maria K., (2019). What is biometrics? 10 physical and behavioral identifiers that can be used for authentication. Pp23

Peter (2018). Biometrics in the workplace common place, but are they secure?. Retrieved from: https://community.speceworks.com/security/articles/

Uche, V., (2021). What is Biometric Authentication and Verification? Pp42

Woods, T. E. (2005). How the Catholic Church Built Western Civilization. Washington: Regnery Publishing; ISBN 978-7-59698-32-1.