

# PDF, Acroforms, XFA & Charles Babbage

Or How the Musings of a 19<sup>th</sup> Century English  
Mathematician Remain Relevant Today

# Agenda

- Charles Babbage Envisioned Data Processing and Forms Processing
- Time Eventually Proved the Power of Combining Both Ideas
- Advantages and Characteristics of Digital Interactive Forms
- PDF Remains An Ideal Way to Implement Digital Interactive Forms
- Interactive PDF Comes in Two Flavors: Acroforms and XFA
- Each Behaves Differently Inside of Adobe Acrobat / Reader
- Demo
- Question Time

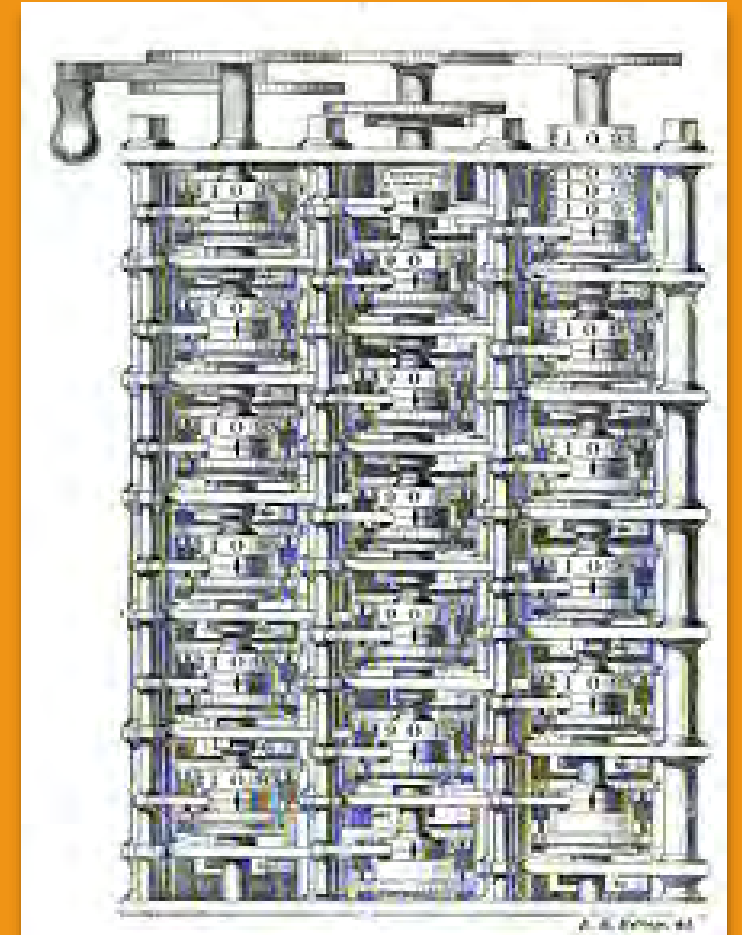
# Who Was Charles Babbage?

- Born 1791 - Died 1871
- English Mathematician, Philosopher, Inventor, and Mechanical Engineer
- 1822 - Inventor of the First Mechanical Computer, the Difference Engine
- 1832 - Also a pioneer in Operations Research where He Expounded Upon the Usefulness of Forms
- 1837 - Proposed the First General Purpose Computer, the Analytical Engine



# The Difference Engine - Considered the World's First Mechanical Computer

- Proposed in 1822
- Produced Accurate Mathematical Tables Calculated to the 20<sup>th</sup> Place
- Prototype was a 6 Digit Calculator Made of Toothed Wheels and Operated by a Hand Crank
- Led to the Analytical Engine a General Purpose Computer Proposed in 1837
- The Analytical Engine Program Controlled by Punch Cards



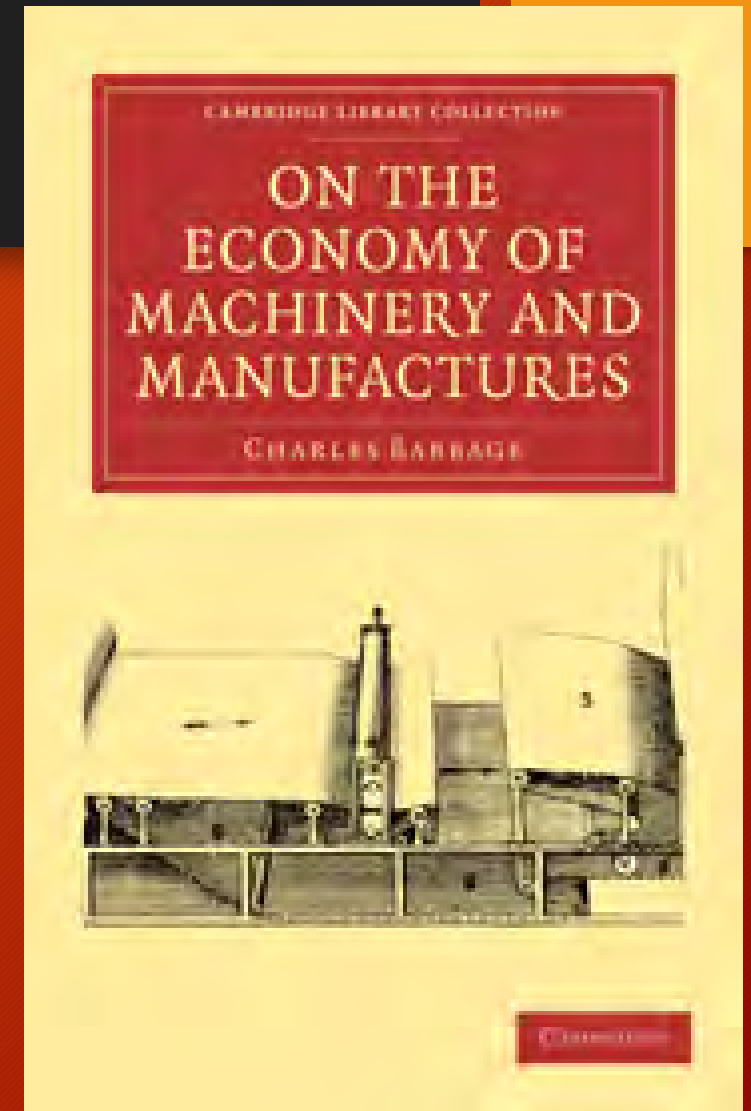
# Features of the Difference Engine

- Babbage's Difference Engine
  - Hand Crank Operated
  - Produced Accurate Results for Calculation Tables, not a Forms Processor
  - Took Up a Room , Weighs 5 tons and is 11 feet long.
  - Had a printer
  - 2 Working Replicas Produced from Babbage's plans
    - London (1991)
    - Seattle (2008)



# Saw the Usefulness of Preprinted Forms for Operations Research

- ...it is advisable to have prepared beforehand the questions to be asked, and to **leave blanks for the answers**, which may be quickly inserted, as, in a multitude of cases, they are merely numbers. **Those who have not tried this plan will be surprised at the quantity of information which may, through its means, be acquired**, even by a short examination.
  - *On the Economy of Machinery and Manufactures*, Charles Babbage, 1832 (Google Books, pg. 114)



# The Analytical Engine - A Device We Would Recognize Today

- In 1837 Babbage Proposed a Successor to the Difference Engine Called the Analytical Engine
  - Steam Powered
  - Used Punch Cards to Represent Data and Encode Processing Instructions
  - Separation of Memory Storage and Processing Instructions Foreshadowed von Neumann
  - 90 Feet Long by 30 Feet Wide
  - Had a printer
  - Was Never Built

# Technology Had to Catch Up to the Vision

- Babbage was Proven Right with the Advent of Modern Data Processing
- Data on Printed Forms was Rekeyed onto Punch Cards and Later into Data Terminals by Legions of Workers
- All this Data was Processed by a Mainframe





## Devices Got Personal

- Electronic Computing Devices Eventually Got Small and Affordable
- Individual Users Could Afford a Computer of Their Own
- Much More Powerful and With More Memory Than Those Early Behemoths



# Software Got User Friendly

- No Need to Wait for IT or a Developer to Create a Form
- Created from Popular Word Processing and Desktop Publishing Applications - the form to the right was created using Adobe InDesign
- Possible to Scan a Hardcopy as Well
- Problem Was If Other People Did Not Have the Authoring Tool, They Could Not Use the Form

The image shows a screenshot of a web-based application form for the University of Minnesota Twin Cities. The form is titled "FRESHMAN APPLICATION FOR ADMISSION" and includes sections for Personal Information, Contact Information, and Ethnicity & Race. The form is designed with a clean, professional layout, featuring a dark red header with the university logo and the text "Fall 2016". The form fields are clearly labeled and include dropdown menus, checkboxes, and radio buttons. The form is presented on a white background with a light gray border.

University of Minnesota Twin Cities  
**FRESHMAN APPLICATION FOR ADMISSION**  
Scholarship consideration | University Honors Program consideration  
Apply online to Minnesota today at [www.uofminn.org/apply](http://www.uofminn.org/apply)

**Personal Information**

Name:  First  Middle  Last

Social Security number (optional)       Date of birth (optional if 18 or older)       Month   Day   Year

Gender (optional)  Male  Female Providing your gender is voluntary and will not be used in a discriminatory manner. This question complies with the U.S. Department of Education's standards for gender data collection.

**Contact Information**

Address:  Number and street  City  State/Province  ZIP/Postal code

Cell phone:                  I give permission to the University of Minnesota to send me updates via text messaging. (Standard message charges apply.)

Home phone:             Other phone:

Email address:  Important information about your application will be sent to this email address. Please provide the email address you check regularly.

**Ethnicity & Race** Providing the information below is voluntary and will not be used in a discriminatory manner. These questions comply with the U.S. Department of Education's standards for ethnic and racial data collection.

**ETHNICITY**

Are you Hispanic or Latino?  Yes  No

**RACE**

Please select one or more that apply.

American Indian or Alaska Native For scholarship consideration purposes, please indicate if you are enrolled in a federally recognized American Indian tribe.  Yes  No

Asian

Black or African American

Native Hawaiian/Other Pacific Islander

White

Freshman admission policy and deadline information is provided on our website: <http://admissions.tl.uvm.edu>. If you have any questions, please visit us on the website or contact us at 612-625-2008 or 1-800-752-1000.

# Digital Interactive Form Advantages

- Fields and Controls Enable Direct Data Entry
- Provide Assistance in Entering Data
- Can Validate and Complete Information Based on User Response
- Can Be Prefilled with Personalized Information
- Portable Across a Variety of Platforms and Devices
- Scale Nicely
  - Can Be Simple - Complete and Send
  - Can Be Complex - Add Business Rules, Intelligent Routing
- Accessible to Persons with Disabilities

# Digital Interactive Forms are Accessible to Persons With Disabilities

- Role, Value, and State for Forms Objects
- Logical TAB Order Can Be Specified
- Logical Read Order Can Be Specified
- Responsive to Platform Accessibility Settings
- Work with Assistive Technology



# Along Comes PDF

- Produced from Popular Applications
- Renders the Look and Feel of the Form as Designed in the Original Application
- Can Also Use a Scanned Paper Copy to Produce a Background for an Interactive Form
- Platform and Software Independent
- No Need to Have the Authoring Tool to View the Form
- Eventually Supported Interactive Form Objects
- Adding 2D Barcodes Facilitates a Paper to Electronic Workflow

The screenshot shows a web-based application form for the University of Minnesota Twin Cities. At the top, there is a maroon header with the university's logo and the text 'Fall 2016'. Below the header, the text reads 'University of Minnesota Twin Cities FRESHMAN APPLICATION FOR ADMISSION'. Underneath, it says 'Scholarship consideration | University Honors Program consideration' and 'Apply online to Minnesota today at [www.uofminn.org/apply](http://www.uofminn.org/apply)'. The form is divided into several sections: 'Personal Information' with fields for Name (First, Middle, Last), Social Security number (optional), Date of birth (optional if 18 or older), and Gender (optional) with radio buttons for Male and Female. 'Contact Information' includes fields for Address (Number and street, City, State/Province, ZIP/Postal code), Cell phone, Home phone, and Other phone, along with an email address field. 'Ethnicity & Race' section includes a question about being Hispanic or Latino and a list of race options with checkboxes. At the bottom, there is a small note about freshman admission policy and a URL for more information.



# Not All Interactive PDFs Are The Same

## PDF Forms

- Introduced November 1996 with PDF 1.2 (Adobe Acrobat 3)
- Created and Edited with Adobe Acrobat and Popular Word Processing and Desktop Publishing Tools
- Interactive Capabilities with Form Field Objects Known as AcroForms

## XFA Forms

(Don't be Fooled by the .pdf Extension)

- Introduced April 2003 with PDF 1.5 (Adobe Acrobat 6) as XFA 2.1
- Created and Edited Exclusively with Adobe LiveCycle Designer
- Two Varieties: Static and Dynamic
  - Static - Interactive Forms
  - Dynamic - Interactive Forms That Conform to Accommodate Different Amounts of Data



# Acroforms and XFA Properties

## Acroforms aka PDF Forms

- Can Be Viewed in Acrobat / Reader
- Can Be Edited Using Adobe Acrobat
- Static Format
- Interactive Forms Objects
- Supports Scripting (1 language)
  - JavaScript for Acrobat
- Accessible to Persons with Disabilities

## XFA Forms

- Can Be Viewed in Adobe Acrobat / Reader
- Cannot Be Edited Using Adobe Acrobat
- Can Be Static or Dynamic
- Interactive Forms Objects (More than Acrobat)
- Supports Scripting (2 languages)
  - JavaScript (Uses the XFA Object Model)
  - FormCalc
- Accessible to Persons with Disabilities
  - Static - Supports Most Standard PDF Accessibility (The XML can be modified to pass more checks)
  - Dynamic - JAWS for Windows Only (Just like [Aria-controls](#))



# Comparing the PDF Forms Editors

## Acrobat

- PDF Editing on Mac and Windows
- Cannot Edit a PDF Form Saved in Designer
- Does Not Create Dynamic Forms
- Maintains the PDF Format

## Designer

- PDF Editing Windows Only
- Can Edit a PDF Form Saved in Acrobat
- Can Create Dynamic Forms
- Turns Every PDF into an XFA
- PDF saved in Designer, can no longer be modified with Acrobat



# A Quick Demonstration

- Microsoft Word to PDF to Acrobat
- Add Form Fields and Objects with Acrobat
- Test with a Screen Reader
- Open the Same Form in LiveCycle Designer
- Add a Form Field and Object with Designer
- Save to Static PDF
- Save to Dynamic PDF
- Test Each with a Screen Reader

# Questions Welcome



# Thank You

- We Are Exhibiting at Accessing Higher Ground
- PDF Development and Forms Programming
- Section 508 and 504 Accessibility Compliance for PDF
- Sponsor TalkingPDF.org
- [www.appligent.com](http://www.appligent.com)
- @appligent

