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Motion Picture Industry Pension Plan: A Database Design Case

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ABSTRACT

This teaching case addresses the design of a database that fulfills the complex requirements found at the Motion Picture Industry Pension Plan, an actual entity. With the goal of challenging students to think analytically and to apply information systems concepts and tools to real world situations, the case study was appropriately structured to reflect the complexities they are likely to encounter in actual practice. Expected student deliverables from the case include data flow diagrams, the database design, a sample data dictionary, a flowchart, and pseudo-code. Student feedback from field trials in two sections of an upper division Systems Analysis and Design course reveal that the case is effective in teaching system analysis and data design skills. Teaching notes, a discussion of teaching strategies for the case, and an appropriate case solution, including data flow diagrams (DFDs), an entity-relationship diagram (ERD), and a sample data dictionary, are available through the *Journal of Information Systems Education* website.

Keywords: Systems analysis & design, Data flow diagram, Data dictionary, Entity-relationship modeling/diagram, Normalization, Structured English

1. INTRODUCTION

Case studies that realistically reflect the intricate data processing requirements encountered in businesses are essential in teaching systems analysis and database design courses. A common hurdle instructors face is the selection of case studies that provide realistic and challenging specifications as well as yield appropriate learning experiences for the students without being excessively complex. It is also beneficial if the case scenario is of interest to students. This case focuses on the design of an information system that supports the operations of the Motion Picture Industry Pension Plan (MPIPP) that provides pension administration services for the unionized employees in the movie and TV industries. Although this case assignment accurately reflects the bulk of the requirements found within the MPIPP's application, some system requirements and operations have been either excluded or simplified to make the case more manageable for a classroom environment.

Students need to master the practice skills necessary to develop data flow diagrams, data modeling, and normalized data design that replicate real world conditions such as found at the MPIPP.

The case objectives are to: i) reinforce theory learned in a systems analysis and design course with simulated experience using real world user settings, ii) enhance student skills in recognizing end-user requirements and to develop data flow and entity relationship diagrams, and iii) provide practice experience in building a data dictionary, drawing a system flowchart, and writing samples of pseudo-code in Structured English.

2. ORGANIZATIONAL BACKGROUND

The collective bargaining agreement establishing the MPIPP was signed on October 26, 1953, by various employers in the motion picture and allied industries and over 40 unions and guilds representing employees working in this industry. MPIPP was created to provide retirement benefits for entertainment-based union craft people other than actors, directors, musicians, or writers who already were receiving such benefits through the various entertainment guilds, e.g., Screen Actors Guild. MPIPP's Department of Labor Form 5500 filed for 2017 lists $3.8 billion in assets with 87,147 participants of which 15,933 are currently receiving retirement benefits.

An agreement establishing the Motion Picture Industry Health Plan (MPIHP) had previously been signed in October 1952. MPIHP was created to provide health insurance coverage for the same union members that MPIPP covers. Although the two Plans merged in 1990 and are collectively known as the Motion Picture Industry Pension & Health Plans, they remain two separate legal entities that share occupancy at their

headquarters in Studio City, CA. The Plans are governed by two separate Boards of Directors appointed in equal number by the participating unions and industry employers (https://mpiphp.org/home/aboutmpi). Although MPIPP and MPIPH share a common database, the scope of this case is limited to MPIPP's requirements so that it is suitable for a teaching case and not overly arduous.

The union members that are participants in MPIPP include most of the behind-the-scene workers involved in film and television development. Their names and job titles appear in the credits shown at the end of movies and TV shows and include such curious occupations as: gaffer (the head electrician), best boy (chief assistant to the gaffer), boom operator (handler of the long pole with a microphone attached to the end), key grip (person in charge of maintenance and positioning of equipment on a set), dolly grip (grip responsible for positioning the small truck that rolls along tracks and carries the camera, camera technician, and occasionally the director), property master (person responsible for purchasing/acquiring all the props used during production), wrangler (animal handler), and foley artist (creator of incidental noises such as footsteps) (https://www.thoughtco.com/what-people-in-movie-credits-actually-do-3966739).

3. OPERATIONS AND DATA REQUIREMENTS

MPIPP collects contributions from entertainment production companies based upon the hours worked and the salaries earned by the covered union workers. These monies are invested by outside fund managers engaged by MPIPP to guarantee that sufficient funds will be available to pay the union workers' monthly benefits when they retire or if they become disabled. Vested participants become eligible to receive retirement benefits from two different pension plans: the defined-benefit Basic Pension Plan (BPP) and the defined-contribution Individual Account Plan (IAP).

The BPP is a retirement plan where employee benefits are computed using a specified formula that considers factors such as length of employment, hours worked, and salary history. In defined-benefit plans, employees can calculate exactly what their future retirement payments will be, in advance, based upon their employment history before reaching the age of retirement (https://www.investopedia.com/terms/d/definedbenefitpensionplan.asp).

The IAP is a defined contribution retirement plan that is tax deferred, like a 401(k). Usually, employees contribute a pre-tax fixed amount or a percentage of their paycheck to an individual account held in their name to fund their retirement. Unlike a typical 401(k) plan, the IAP at MPIPP is unique in that it is funded exclusively by employer contributions. The term defined-contribution plan alludes to the fact that only the formula for the contributions is known in advance and the actual amount of funding that will ultimately be available at retirement is uncertain since the rates of returns on IAP investment accounts are not predictable into the future (https://www.investopedia.com/terms/d/definedcontributionplan.asp).

This case documents the database requirements for MPIPP's operations from initial employer contributions through the participant vesting and benefit accrual process. The case does not deal with the final pension benefit calculations nor the monthly or lump sum payments generated once pensions are awarded. The benefit calculation process is quite complicated involving complex actuarial tables and multiple pension options (joint and survivor, ten-year certain, etc.). The benefit payment process is essentially a payroll system with various withholdings, direct deposit or check generation, and so on. Eliminating the benefit calculation and pension payment requirements was necessary to keep the scale of the case manageable.

3.1 Employers (Production Companies)

Any employer planning to commence a movie, television production, or commercial using union tradespeople must first contact MPIPP and request an Employer application package which consists of the Employer Profile Form and copies of the Collective Bargaining Agreements (CBAs). The Employer Profile Form includes information regarding the company's legal name, DBA's if any, federal tax identification, address, city, state, zip, country, contact name, phone, email, and current status like new, active, inactive, suspended, or bankrupt. There are separate CBA agreements for the BPP and for the IAP (copies of which are available at https://mpiphp.org/home/trustagreements). The CBAs document participation rules, reporting requirements, contribution rates for various categories of work, benefits, arbitration guidelines, as well as other legal specifications and definitions.

Once MPIPP receives the completed Employer Profile Form along with the executed and notarized CBA's, the CBA's are cosigned and executed by MPIPP. The employer is assigned a unique Employer ID and the employer profile information is entered into the system. In the motion picture industry it is not unusual for an employer to notify MPIPP in regards to changes in their profile information. For example, an employer may legally change its name or may relocate to a different address. It is necessary to keep track of these changes and to maintain proper records of the history of such information in the database.

Each CBA is assigned a CBA ID and the system records the agreement type (BPP or IAP), sign date, effective from date, and effective through date. The system will maintain a history of all CBAs that have ever been in effect for any employer. Employers who have signed a CBA are sometimes referred to as signatory employers or just as signatories.

Each of an employer's movies or show titles that are in production must be registered with MPIPP. The system assigns a unique Production ID when the titles and start dates are entered into the system. Production titles often change, and these updates must be reported to MPIPP to be tracked. Also, when new productions commence, these new titles likewise must be reported to MPIPP by the employers.

3.2 Local Unions and Union Codes

Local Unions, often referred simply as Locals, are branches of larger national or international employee unions. Locals are organized to represent the union's members from a particular geographic area, a large company, or a business sector. Each Local functions independently, maintaining their own Constitution and By-Laws, elections, dues structure, membership meetings, and more. Locals negotiate labor contracts regarding wages, work rules, and grievance

procedures that are contained in the CBA agreements. The Locals associated with MPIPP represent tradespeople such as art directors, cinematographers, costume designers, electricians, make-up artists, painters, plumbers, drivers, camera operators, set designers, casting directors, security officers, plasterers, and other entertainment related jobs. A Local Number is assigned by the national office. For example, IBEW Local 40 is the Hollywood, CA, branch of the International Brotherhood of Electrical Workers. The Local Number is not necessarily unique as more than one national union may use the same number. Hence, to maintain distinguishability, the MPIPP system automatically assigns a separate and unique Local ID when a new Local Union is added to the database. The system will maintain data including Local name, address, contact information, as well as a history of all CBA contracts that a Local has endorsed.

As mentioned earlier, within the Locals there are different categories of workers based on each line of trade. Each category of worker is assigned a unique identification number that MPIPP calls the Union Code. Each Union Code is further refined into subclasses based on distinctive differences within each work category and assigned a Class Code. Further, the salary requirements, known as Scale, are different for daily employees (Schedule A) and weekly employees (Schedule B). The CBA specifies the appropriate salary for Schedule A and B employees for each type of work (Union Code/Class Code combination) and the required pension benefit contribution requirements for work performed during a date range. Entries with the same salary and contribution rates for the same period are assigned a common Rate Group ID by MPIPP to help simplify the contribution collection process for the employers and for MPIPP.

3.3 Report of Contributions

Once a company is signatory, it can employ MPIPP affiliated union workers to produce films, television series or movies, commercials, and other media projects. At the end of each month, each signatory employer must submit a report to MPIPP detailing the hours worked and compensation paid to union workers. Along with this report, the employers must include a payment for the contributions due as required and documented in the CBAs. Procedurally, there are two forms used for this purpose. They are the i) Report of Contributions Participant Detail Sheet (Figure 1) and the ii) Report of Contributions Coversheet (Figure 2).

The Report of Contributions Participant Detail Sheet itemizes the hours worked and salary earnings by each employed worker. Employers are required to contribute to the IAP based upon a percentage of the employees' compensation (approximately 6%). The form also includes the employee last name, first name, social security number, Union Code, Class Code, Scale (salary per hour), Schedule (A or B), and hours worked, salary earned, and IAP contribution. Multiplying the hours worked times the Scale yields the Salary earned. Multiplying the Salary times the IAP percentage rate yields the required IAP contribution.

The Report of Contributions Coversheet includes the name of the employer, the Employer ID, the Client Company name and Client ID (these two fields are assigned and used by payroll companies – see Figure 2), the production title, the Production ID, number of weeks included in the report, period from date,

Figure 1. Report of Contributions Participant Detail Sheet for Rate Group 43
(Adapted from https://mpiphp.org/src/assets/files/forms/employer_accounts/Forms/RG-43_Detail%20Sheet.pdf)

Figure 2. Report of Contributions Coversheet
(For instructions see https://mpiphp.org/src/assets/files/forms/employer_accounts/Forms/
InstructionsForSubmittingContributions.pdf)

and period through date. The coversheet also shows the BPP contribution rate ($4.4130) to be applied. The total amount due for BPP is calculated by multiplying total number of hours worked by the employees during the period multiplied by the BPP rate. The employers are required to provide one set of reports for each Rate Group of covered employees who worked during a month. Figures 1 and 2 are adapted forms that are used by employers for reporting work within Rate Group 43.

Large employers typically have their own internal payroll systems that are utilized to pay the union employees and other individuals working on a production. Smaller employers usually contract with an outside payroll agency to generate the production payroll.

Each set of Report of Contribution Detail and Coversheet remitted by an employer is reviewed by the MPIPP employees for accuracy and completeness. A report that is incorrect is returned to the employer with the errors noted for correction and resubmission. When the data on the Contribution Detail matches the totals of the Contribution Coversheet, the information on the reports can be posted to the database.

Typically, an employer will submit multiple sets of Report of Contribution, one for each Rate Group, but remit only one payment to cover the entire batch for that month from that employer. The system assigns a Batch ID covering all related Contribution Report sets from that employer. The information associated with each batch that is captured in the database includes: the payment type (check or funds transfer), payment number (check number or bank transfer number), payment date, payment received date, payment amount, deposit date, deposit reference number, clear date, bounce date, batch status, status date, and update date. If the employer had no covered employees working during a month, then the CBA requires that the employer submit a Report of Contribution Coversheet with the No Covered Employees for the Month box checked. If an employer files a late report, then the employer may be assessed interest and liquidated damages. The deposit date and deposit reference number are also added to the database later when the check is deposited at the bank. If a payment bounces, that information is captured in the system and the employer is

notified to reissue the payment by sending a coversheet adjustment invoice.

3.4 Participants

When MPIPP receives contributions on behalf of a covered union employee, that individual becomes a participant in both the BPP and the IAP pension plans. New participants are normally identified when a Report of Contributions Detail Sheet lists a contribution on behalf of an individual that is not in the MPIPP database. The MPIPP staff emails the designated union contact and requests validation that the worker is a union member and requests that the union have the individual complete the Participant Information Sheet. The individual's legal name, SSN, date of birth, gender, marital status, address, email, and phone numbers are included on this form. The system is required to maintain current and former participant addresses. It is also possible for a participant to have more than one address active at a time. This requires that each address has mailing category flags that indicate it is to be used for pension correspondence, pension payment, or beneficiary designation. When a new participant is entered into the database, a unique Participant ID is assigned to that person. New participants are sent copies of plan booklets and a Beneficiary Designation form that is to be completed and returned.

3.5 Beneficiaries

A participant can designate one or more beneficiaries. The beneficiaries may be entitled to financial payments if the participant dies before or after commencing their pension. A beneficiary's last name, first name, middle name, gender, SSN, date of birth, address, effective from date, primary/secondary code, percentage, effective through date, update date, relationship, email, and phone number are captured by the system. Beneficiaries are designated as primary or secondary and benefit percentage allocation. The benefit allocation percent must add to 100% across all primary beneficiaries. Likewise, the benefit allocation percent must add to 100% across all secondary beneficiaries. Periodically, the system will send a notification to the participant listing the participant's current beneficiaries and request a confirmation of these beneficiary designations. Historically, there had been situations where a participant had divorced and remarried but neglected to revise his/her beneficiary designation before expiring, thus resulting in lawsuits.

3.6 Qualified Domestic Relations Order (QDRO)

A Qualified Domestic Relations Order (QDRO) is a legal document that allocates a portion of a participant's pension benefit to an ex-spouse. Once the court awards a QDRO and MPIPP receives a copy of it, the ex-spouse's legal name, SSN, date of birth, gender, address, email, and phone number(s) are entered in the system as well as the percentage and/or the dollar amount of the participant's pension benefits that he/she is entitled to receive. Any correspondence sent to a participant who has a QDRO agreement in effect must also be sent to the associated QDRO individuals.

3.7 Basic Pension Plan

In mid-February of each year, the annual rollup processing is done. The system retrieves all detail contribution entries for each participant for the previous year and creates a Basic Pension Summary entry in the database. If the participant works 400 hours or more in the previous year, then the year will count as a Vesting Year. When a participant earns five Vesting Years without incurring a Permanent Break in Service, then that participant will become vested in the BPP and will be entitled to retirement and/or disability benefits. If an unvested participant works less than 200 hours in a year, then that year is considered a Break in Service year. When the Break in Service counter exceeds the Vesting Year's counter, then a Permanent Break in Service occurs and all Basic Plan Summary entries are forfeited. If a participant earns a Vesting Year, then the Break in Service counter resets to zero. See Tables 1 and 2 for clarifying examples.

Year	Hours	Vesting Year	Vesting Count	Break Year	Break Count	Outcome
2012	500	1	1	0	0	
2013	450	1	2	0	0	
2014	150	0	2	1	1	
2015	0	0	2	1	2	
2016	600	1	3	0	0	
2017	430	1	4	0	0	
2018	440	1	5	0	0	Vested

Table 1. Vesting Example

Year	Hours	Vesting Year	Vesting Count	Break Year	Break Count	Outcome
2013	500	1	1	0	0	
2014	450	1	2	0	0	
2015	150	0	2	1	1	
2016	250	0	2	0	1	
2017	160	0	2	1	2	
2018	0	0	2	0	3	Permanent Break

Table 2. Permanent Break in Service Example

3.8 Individual Account Plan

MPIPP's accountant (Miller, Kaplan and Arase LLP) audits the contribution reports as well as other financial documents (bank statements, investment reports, etc.) and prepares the annual audited financial statements for both Pension Plans. The auditor calculates the total net IAP contributions collected (total contributions for all participants less the administration expenses of MPIPP) for the previous year. The auditor next calculates the net investment return (investment income or loss less any administration fees) for the previous year. These two amounts (IAPNetContribution and IAPReturn) are used to determine the IAP Allocation which is reported to MPIPP.

When the IAP Allocation amounts are received by MPIPP, then the IAP Annual Rollup process begins. The MPIPP system retrieves all contribution detail entries for the previous year and creates an Individual Account Summary entry in the database for each participant. If an unvested participant works over 400 hours, then they become vested in the IAP. Next, the auditor amounts are then distributed to IAP vested participants on a pro rata basis. An IAP vested participant X's allocation of the IAPNetContribution for the previous year is determined by the formula $[(\sum X\text{'s IAP contributions})/ (\sum \text{All IAP vested contributions})] * (\text{IAPNetContribution})$ where only the IAP contributions for the previous year are summed. The participants' allocation of the IAP contributions are recorded in the database in the newly created IAP Annual Summary entries.

The IAPReturn is similarly allocated for IAP vested individuals. The formula employed is $[(\sum X\text{'s IAP prior balance}) / (\sum \text{All IAP vested prior balances})] * (\text{IAPReturn})$

where the prior balance is determined by summing all IAP contributions and IAP returns for prior years before the previous year. This amount is recorded in the IAP investment return field in the annual IAP Annual Summary record that was just created for that participant.

MPIPP prepares various Excel files to the specifications of its actuary (Rael and Letson) documenting the participants' demographics. MPIPP also supplies the audited financial statements to the actuary. The actuary prepares an annual report for MPIPP with recommendation on the appropriate contribution rates to be collected that assures the pension fund solvency. Thereafter, MPIPP prepares and distributes Annual Statements to each non-retired active participant documenting their BPP and IAP activity for the year and their year-end balances.

4. ASSIGNMENT

This case focuses on the information system development concepts of i) data flow diagramming and ii) database design. For completeness, data dictionary, system flowcharting, and Structured English areas are also covered. It provides a platform to aid students in transforming concepts and tools learned in class into actual practice through analysis and design of a system that will support the MPIPP in its efforts to collect funds from production companies earmarked for providing pension benefits of MPIPP affiliated union members. More specifically, based on the information provided in Section 3, students are required to submit a report that should cover the following outputs:

1. A set of data flow diagrams (DFD) at Context and Level 0 showing the data sources/sinks, data flows, processes, and data files involved, and one of the processes at Level 0 of your choice further exploded to Level 1.
2. An entity-relationship diagram (ERD) connecting all the files showing cardinalities.
3. A database design showing all tables with their attributes meeting the 3rd normal form (3NF).
4. A data dictionary (DD) showing the data attributes and field types of a subset of two files of your choice in (2) before normalization.
5. A system flowchart illustrating the BPP Annual processing.
6. A Structured English description of the IAP Allocation process.

The DFDs and ERDs submitted by students should demonstrate their ability to extract relevant data from the specifications provided in the case. The diagramming conventions followed must be consistent with Rosenblatt and Tilley (2017), Dennis, Roth, and Wixom (2019), or Valacich and George (2020). These textbooks are considered classic staples in the field of systems analysis and design.

5. CONCLUSIONS AND FINAL REMARKS

The Motion Picture Industry Pension Plan case was field tested by the authors in two sections of their upper division System Analysis and Design class. Professor observation, anecdotal comments from students, and formal feedback from student evaluations reveal this case to be an effective instrument for

teaching data flow diagramming and database design. The case offers significant challenges for students' analytical skills. Of the three cases analyzed in this class, the MPIPP case was rated as the most difficult by students. Yet 93% of students were able to successfully complete the case assignment. Some classroom discussion concerning pension administration operations including the difference between defined benefit retirement plans and defined contribution retirement plans was required when the case was initially introduced.

The requirements articulated in the case are accurate depictions of the real requirements included in the MPIPP Plan's actual information system. To keep the case tractable, not all of the actual requirements were included. As mentioned in the case, the pension benefit calculation and pension payment requirements were not included as they are extremely complex. Also, the actual MPIPP system automatically calculates interest and liquidated damages as penalties for employers who submit late reports. The system then automatically generates invoices for these penalties that are sent to the offending employer. Further, the actual contribution collection process has more elements than outlined in the case since it also includes contributions made by employers to provide health insurance benefits administered by the MPIHP. It may also include contributions to fund employee training programs and other special circumstances detailed in the CBAs.

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