***Benghazi University***
***Faculty of Information Technology***
***software Engineering Department***

# *SE341*

# *Software Evolution & Maintenance*

## Part .5

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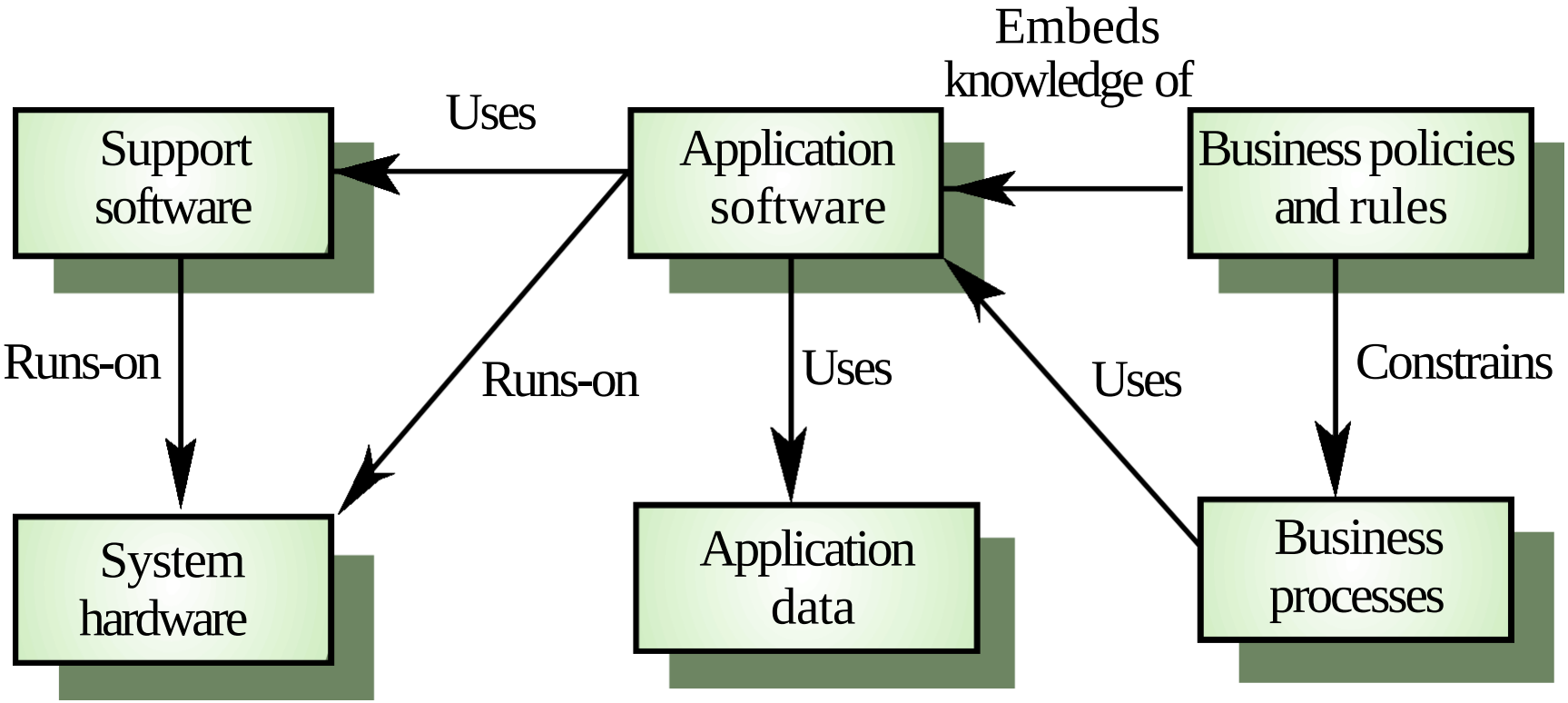
# Legacy systems

- Software systems that are developed specially for an organisation have a long lifetime
- Many software systems that are still in use were developed many years ago using technologies that are now obsolete
- These systems are still business critical that is, they are essential for the normal functioning of the business
- They have been given the name legacy systems

## Legacy system dilemma

- It is expensive and risky to replace the legacy system
- It is expensive to maintain the legacy system
- Businesses must weigh up the costs and risks and may choose to extend the system lifetime using techniques such as re-engineering.

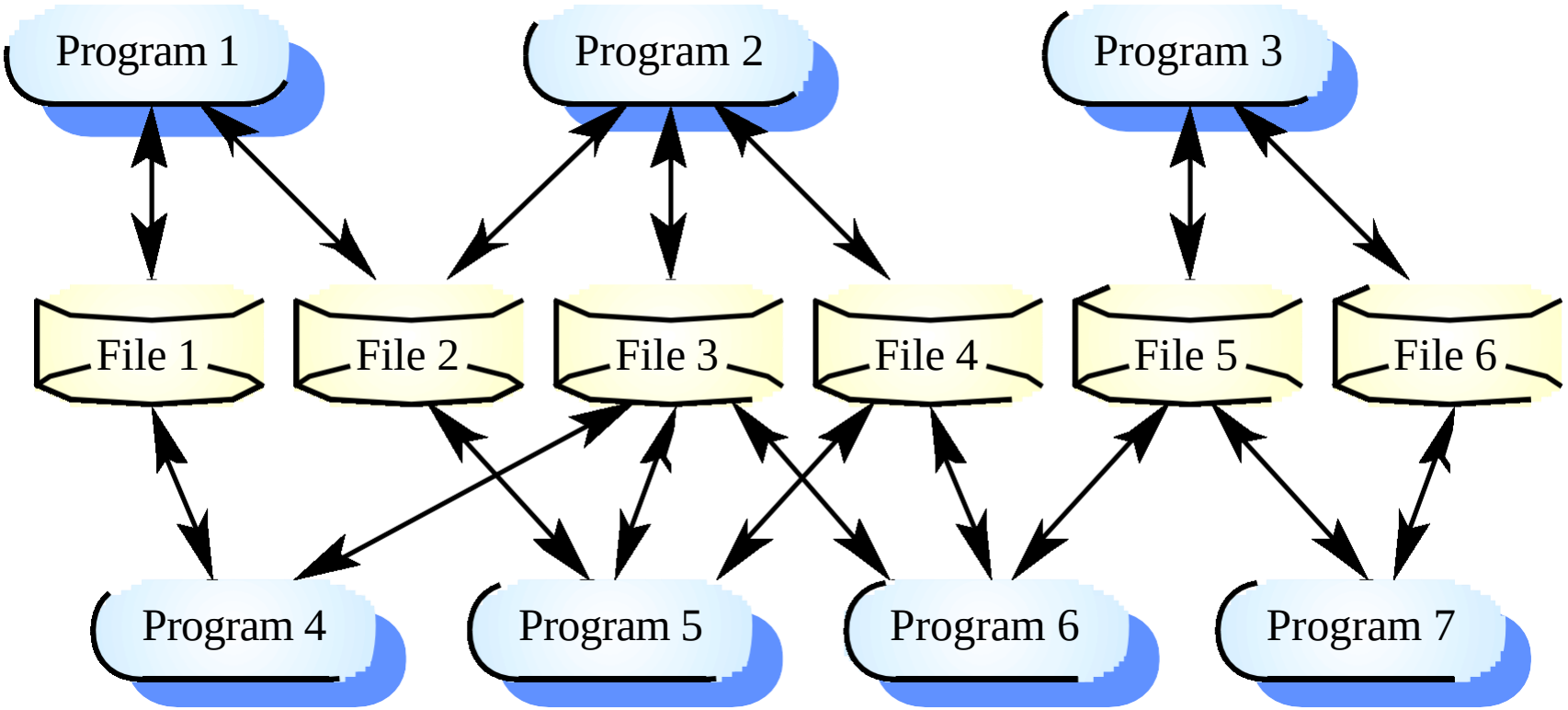
# Legacy system components



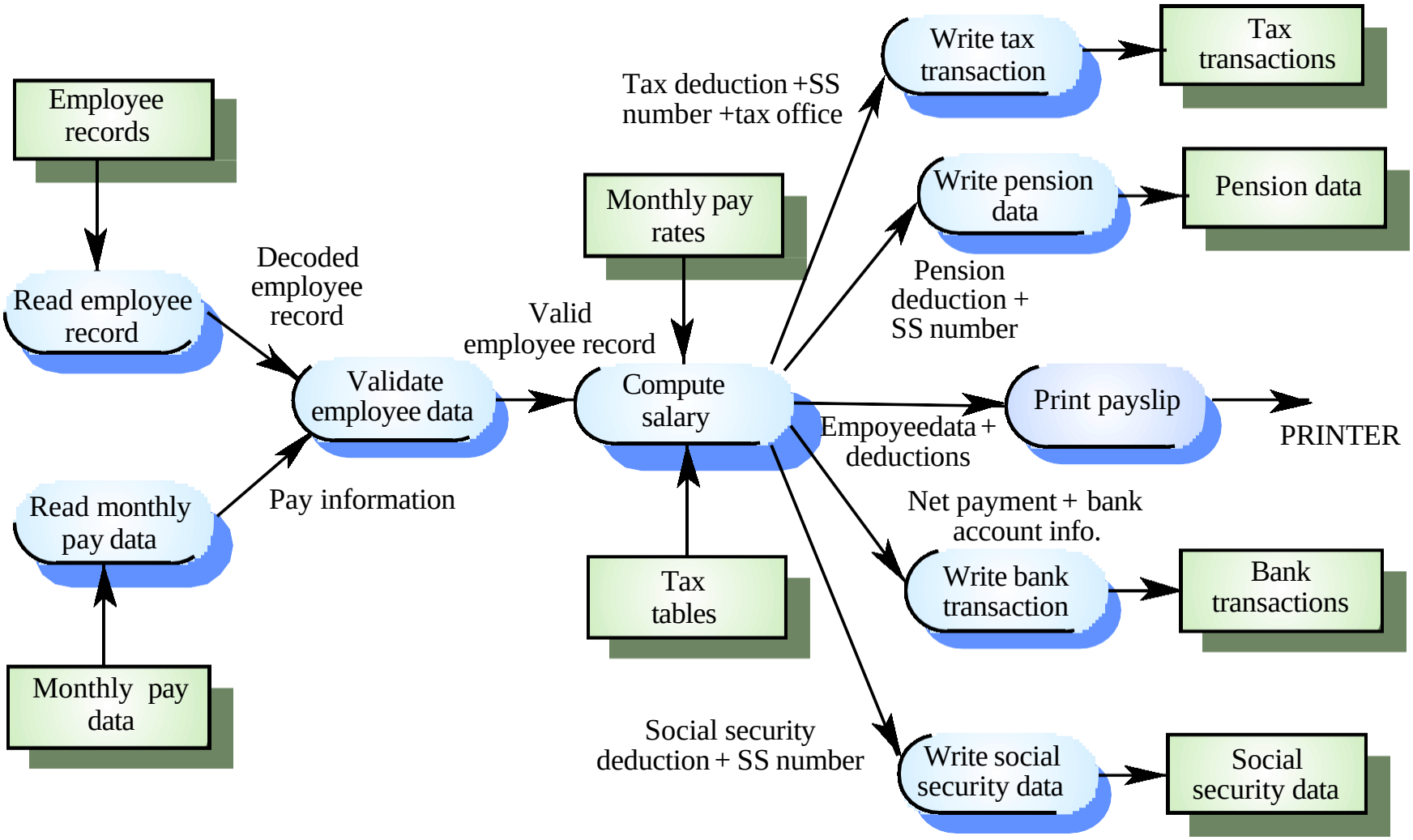
## Legacy system components

- System hardware - may be mainframe hardware
- Support software - operating systems and utilities
- Application software - several different programs
- Application data - data used by these programs that is often critical business information
- Business processes - the processes that support a business objective and which rely on the legacy software and hardware
- Business policies and rules - constraints on business operations

# Legacy application system



# Legacy system example – Payroll system



## Legacy system management

- Organizations that rely on legacy systems must choose a strategy for evolving these systems
  - Scrap the system completely and modify business processes so that it is no longer required;
  - Continue maintaining the system;
  - Transform the system by re-engineering to improve its maintainability;
  - Replace the system with a new system.
- The strategy chosen should depend on the system quality and its business value.

## Legacy system categories

- Low quality, low business value
  - These systems should be scrapped
- Low-quality, high-business value
  - These make an important business contribution but are expensive to maintain. Should be re-engineered or replaced if a suitable system is available.
- High-quality, low-business value
  - Replace with COTS, scrap completely or maintain
- High-quality, high business value
  - Continue in operation using normal system maintenance

## Business value assessment

- Assessment should take different viewpoints into account
  - System end-users
  - Business customers
  - Line managers
  - IT managers
  - Senior managers
- Interview different stakeholders and collate results

## Issues in business value assessment

- ✧ The use of the system
  - If systems are only used occasionally or by a small number of people, they may have a low business value
- ✧ The business processes that are supported
  - A system may have a low business value if it forces the use of inefficient business processes
- ✧ System dependability
  - If a system is not dependable and the problems directly affect business customers, the system has a low business value
- ✧ The system outputs
  - If the business depends on system outputs, then the system has a high business value

## System quality assessment

- ✧ Business process assessment
  - How well does the business process support the current goals of the business?
- ✧ Environment assessment
  - How effective is the system's environment and how expensive is it to maintain?
- ✧ Application assessment
  - What is the quality of the application software system?

# Factors used in environment assessment

| Factor | Questions |
|---|---|
| Supplier stability | Is the supplier still in existence? Is the supplier financially stable and likely to continue in existence? If the supplier is no longer in business, does someone else maintain the systems? |
| Failure rate | Does the hardware have a high rate of reported failures? Does the support software crash and force system restarts? |
| Age | How old is the hardware and software? The older the hardware and support software, the more obsolete it will be. It may still function correctly but there could be significant economic and business benefits to moving to a more modern system. |
| Performance | Is the performance of the system adequate? Do performance problems have a significant effect on system users? |
| Support requirements | What local support is required by the hardware and software? If there are high costs associated with this support, it may be worth considering system replacement. |
| Maintenance costs | What are the costs of hardware maintenance and support software licences? Older hardware may have higher maintenance costs than modern systems. Support software may have high annual licensing costs. |
| Interoperability | Are there problems interfacing the system to other systems? Can compilers, for example, be used with current versions of the operating system? Is hardware emulation required? |

# Factors used in environment assessment

| العامل | الأسئـــــــــــلة |
|---|---|
| استقرار المورد | هل المورد لا يزال موجودًا؟ هل المورد مستقر ماليًا ومن المرجح أن يستمر في الوجود؟ إذا لم يعد المورد يعمل ، فهل يقوم شخص آخر بصيانة الأنظمة؟ |
| معدل الفشل | هل الجهاز به نسبة عالية من الإخفاقات المبلغ عنها؟ هل يتعطل برنامج الدعم ويفرض إعادة تشغيل النظام؟ |
| العمر | كم عمر الأجهزة والبرامج؟ كلما كانت الأجهزة وبرامج الدعم أقدم ، كلما أصبحت قديمة. قد لا يزال يعمل بشكل صحيح ولكن قد تكون هناك فوائد اقتصادية وتجارية كبيرة للانتقال إلى نظام أكثر حداثة. |
| الأداء | هل أداء النظام ملائم؟ هل مشاكل الأداء لها تأثير كبير على مستخدمي النظام؟ |
| متطلبات الدعم | ما هو الدعم المحلي المطلوب من قبل الأجهزة والبرامج؟ إذا كانت هناك تكاليف عالية مرتبطة بهذا الدعم ، فقد يكون من المفيد التفكير في استبدال النظام. |
| تكاليف الصيانة | ما هي تكاليف صيانة الأجهزة وتراخيص برامج الدعم؟ قد يكون للأجهزة القديمة تكاليف صيانة أعلى من الأنظمة الحديثة. قد يكون لبرامج الدعم تكاليف ترخيص سنوية عالية. |
| التوافقية | هل توجد مشاكل في ربط النظام بأنظمة أخرى؟ هل يمكن استخدام المجمعين ، على سبيل المثال ، مع الإصدارات الحالية من نظام التشغيل؟ هل مضاهاة الأجهزة مطلوبة؟ |

# Factors used in application assessment

| Factor | Questions |
|---|---|
| Understandability | How difficult is it to understand the source code of the current system? How complex are the control structures that are used? Do variables have meaningful names that reflect their function? |
| Documentation | What system documentation is available? Is the documentation complete, consistent, and current? |
| Data | Is there an explicit data model for the system? To what extent is data duplicated across files? Is the data used by the system up to date and consistent? |
| Performance | Is the performance of the application adequate? Do performance problems have a significant effect on system users? |
| Programming language | Are modern compilers available for the programming language used to develop the system? Is the programming language still used for new system development? |
| Configuration management | Are all versions of all parts of the system managed by a configuration management system? Is there an explicit description of the versions of components that are used in the current system? |
| Test data | Does test data for the system exist? Is there a record of regression tests carried out when new features have been added to the system? |
| Personnel skills | Are there people available who have the skills to maintain the application? Are there people available who have experience with the system? |

# Factors used in application assessment

| العامل | الأسئـــــــــــلة |
|---|---|
| القابلية للفهم | ما مدى صعوبة فهم الكود المصدري للنظام الحالي؟ ما مدى تعقيد هياكل التحكم المستخدمة؟ هل المتغيرات لها أسماء ذات مغزى تعكس وظيفتها؟ |
| التوثيق | ما هي وثائق النظام المتوفرة؟ هل الوثائق كاملة ومتسقة وحديثة؟ |
| البيانات | هل يوجد نموذج بيانات واضح للنظام؟ إلى أي مدى يتم تكرار البيانات عبر الملفات؟ هل البيانات التي يستخدمها النظام محدثة ومتسقة؟ |
| الأداء | هل أداء التطبيق ملائم؟ هل مشاكل الأداء لها تأثير كبير على مستخدمي النظام؟ |
| لغة البرمجة | هل المعالجات الحديثة متاحة للغة البرمجة المستخدمة في تطوير النظام؟ هل ما زالت لغة البرمجة مستخدمة لتطوير النظام الجديد؟ |
| إدارة اعدادات التطبيق | هل يتم إدارة جميع إصدارات جميع أجزاء النظام بواسطة نظام إدارة الاعدادات؟ هل يوجد وصف صريح لإصدارات المكونات المستخدمة في النظام الحالي؟ |
| بيانات الاختبار | هل توجد بيانات اختبار للنظام؟ هل يوجد سجل لاختبارات الارتداد التي يتم إجراؤها عند إضافة ميزات جديدة إلى النظام؟ |
| مهارات الموظفين | هل يتوفر أشخاص لديهم المهارات اللازمة للحفاظ على التطبيق؟ هل يوجد أشخاص لديهم خبرة في النظام؟ |

## System measurement

- You may collect quantitative data to make an assessment of the quality of the application system
  - The number of system change requests
  - The number of different user interfaces used by the system
  - The volume of data used by the system

**H.W-3**

What are :

COTS

(Commercial Off The Shelf)