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EMPOWERING Mainframe Teams

Whitepaper

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This whitepaper was prepared by **Mighty Mainframe** team.

CROZ is a Croatian-German biztech consultancy empowering the technology-enabled business transformation that results in unparalleled value creation.

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01

EXECUTIVE SUMMARY

Mainframe technology is here to stay, but the conversation around mainframes must evolve. A concerted effort is needed to dispel myths, foster knowledge exchange between generations, and reimagine the mainframe's role in today's digital economy. This requires a combination of strategic investments, holistic solutions, and a culture of continuous learning and adaptation. By prioritizing mainframe modernization, businesses can harmonize the old with the new, ensuring they tap into the best of both worlds. The costs, while considerable, can be justified with a forward-looking vision that values reliability, security, and scalability. By weaving mainframes into the tapestry of modern IT solutions, enterprises can drive innovation without sacrificing stability.

One of the most common problems customers are facing today is the skills gap; the lack of internal mainframe skills or resources. We see a threefold answer; in-place modernization that transforms mainframe workplace into fashionable cockpit ready for GenZ. Tactical or even strategic shift can be achieved by empowering mainframe teams with managed services. However, in the long run, we need to upbring a new generation of mainframers.

The absence of **mainframe modernization** created the silos in the past. The mainframe environment should be made compatible with modern technologies, platforms, and practices. Languages such as Java or Python can run on mainframes, containerization can simplify hybrid-cloud adoption, building API layer on top of mainframe can facilitate integration and adopting modern practices such as DevOps and Agile can bridge the gap between the mainframe and non-mainframe world. Mainframe modernization allows organizations to leverage their existing mainframe assets while participating fully in the digital economy while dramatically removing skills barrier for young generation.

In the **Managed Services model**, the customer typically retains ownership and management of the mainframe infrastructure. Moreover, by using the managed service, the customer team is empowered by CROZ experts and they can jointly enhance and optimize the mainframe infrastructure. Employing a "CROZ Mainframe Managed Services" provides true partnership, rather than mere outsourcing of certain activities.

The focus on **upbringing a new generation of mainframers** is pivotal, serving as a catalyst to draw the next generation of innovators to embrace and advance mainframe technologies. CROZ is helping customers by organizing specialized training, summer camps, and academic curricula, but mainframe boot camps have proved to be especially effective because they guarantee creating a new mainframe team for the customer, while providing attractive professional career challenges for Generation Z.

> *In the grand narrative of technological evolution, mainframes stand as a testament to enduring innovation. It's our collective responsibility to ensure they continue to thrive, adapt, and serve in an age defined by transformation. As we look to the horizon, the story of mainframes is far from over; it's simply evolving. And as technologists, we hold the pen.*

02

FUTURE-PROOFING MAINFRAME TEAMS

With 67% of Fortune 100 companies relying on mainframes, it's critical to fully understand the global challenges of the mainframe ecosystem. Past years have brought so much emphasis on cloud technologies, that a poorly informed bystander could've been under the impression that mainframes are soon to become obsolete. That, of course, was always far from reality. The vast majority of the world's largest banks, insurers, telcos and retailers are completely dependent on mainframes. And if the undisrupted flow of world transactions depends on successful mainframe systems and teams, we should spend some time noticing the problems and acting on the solutions.

Ever since our journey with mainframes started, we had numerous opportunities to gain pertinent insights by talking with our current and potential customers, vendors, business partners and colleagues. With huge thanks to everyone who has helped us along this journey to gain a comprehensive perspective on the state of the mainframe affairs, let's dive into the most important challenges and solutions we are facing today.

CHALLENGES

Existing experts are near retirement

The mainframe landscape has been shaped by a myriad of seasoned professionals, many of whom are now retired or are approaching retirement. These mainframe mavens, having dedicated years or even decades to building and fine-tuning enterprise-level mainframe systems, have left indelible marks on our industry. Many participated in the early construction of foundational enterprise systems based on mainframes, using languages such as Assembly Language, PL/I or COBOL, with comprehension of subsystems like CICS or IMS, a knowledge that is not widely taught today.

This brings about a critical challenge. With such a significant number of mainframe experts retiring, there is a void in experience and expertise, with the next generation needing to quickly gain the necessary skills. Their soon-to-come career conclusions propose the question of succession planning. Mainframe departments need to bridge the gap in knowledge and experience, which leads us to our next critical point.

Lack of relevant skills in-house and talent shortage in the market

As seasoned mainframe professionals leave the workforce, current staff members, already tasked with maintaining and operating existing systems, are stretched to their limits. To expect these professionals not only to keep the system running but also to absorb and make sense of the departing expertise, modernize the operations, and concurrently develop new skill sets is not only unrealistic, but it could also lead to serious productivity and system stability issues.

Where can we find individuals skilled in the z/OS enterprise environment in today's market?

The answer is, **they are hard to come by.**

Industry statistics suggest that only a small percentage of today's computer science graduates have mainframe skills. Furthermore, modern curricula often neglect technologies and programming languages that are critical to many mainframe operations. This leads to a knowledge gap in the market, making it difficult to find individuals who are ready to step into a mainframe role.

Even though the mainframe has evolved, and it runs all the up-to-the-minute technologies, it takes a significant amount of time to foster enthusiasm and gain experience for young people who have not had previous mainframe experience.

However, there are approaches that we can, and must, consider addressing this. This includes innovative training programs, strategic partnerships with educational institutions, promoting mainframe careers to the younger generation, and leveraging advancements in AI and automation to streamline our operations.

The complexity of working with mainframe

Mainframes, given their architectural complexity and robust functionality, present a unique challenge to IT professionals. Historically, mainframes have been using, what's often referred to, as legacy technology. However, their capabilities are far from being confined to just legacy operations.

In the present digital era, mainframes are opening to newer technologies and integrating with the larger, diverse IT ecosystem. They can support modern languages like Java, Python or GO, facilitate web services, support AI, and integrate with cloud architectures and DevOps practice across heterogenous IT systems, all while continuing to provide unparalleled scalability, reliability, and security.

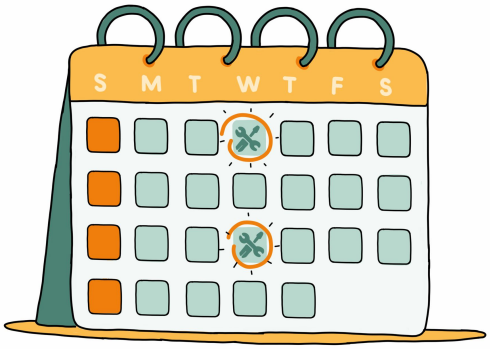
However, this newly acquired versatility, while advantageous, also adds to their complexity. The mainframe environment is no longer just about mastering specific areas like security protocols, backup processes, middleware configuration, transaction systems, or database management. It now demands a wider breadth of knowledge, encompassing both traditional mainframe skills and an understanding of modern IT practices and trends. For instance, understanding distributed systems and cloud architectures, knowledge of DevOps practices in a mainframe context, the ability to work with APIs for mainframe and non-mainframe communication, and expertise in modern programming languages are increasingly becoming necessary.

It now demands a wider breadth of knowledge, encompassing both traditional mainframe skills and an understanding of modern IT practices and trends.

Keeping mainframe hardware and software up-to-date

The scarcity of skilled professionals not only affects our ability to innovate but also threatens the basic integrity and stability of our existing mainframe operations. This leads to an inability to harness the full potential of newer versions of mainframe systems, which offer substantial benefits ranging from enhanced security measures to improved stability and support for modern features and functionalities.

Staying current with hardware and software updates is not just about leveraging the latest features or performance improvements; it's also about mitigating risk. Failing to apply timely updates can leave systems vulnerable to security threats, potentially causing data breaches and service disruptions.



Keep mainframe hardware and software up-to date!

Similarly, software stability is directly influenced by its support status, and a robust maintenance schedule is crucial for operational efficiency. Regular system maintenance includes tasks like system checks, tuning, debugging, and software updates. However, when resources are stretched thin, such regular maintenance is often overlooked, leading to the potential for system degradation over time. When software versions become outdated, they often lose vendor support, which means no more security patches, updates, or technical help in case of issues. This puts the organization at risk of system failure, increased downtime, and can even lead to compliance issues.

Managing the costs of running the mainframe

Maintaining older systems is indeed a costly endeavour, regardless of the domain. The costs encompass a variety of aspects, each significant in its own right. The procurement of new hardware, a critical aspect of mainframe modernization, often involves a substantial capital investment.

The extension of vendor support also entails considerable costs, especially for both hardware and software components. These costs typically escalate over time as older versions become more expensive to support due to their outdated architecture and compatibility issues. Transitioning from an older version to a significantly newer version of a mainframe system is rarely a straightforward process. It requires careful planning, execution, and testing to ensure the new system functions as expected. This process consumes a considerable amount of resources, including processor time and memory, which can lead to an increase in operational costs.

Software licensing, particularly for software under the Monthly License Charge (MLC) scheme, can also add to the overall expense. During a prolonged migration, you might have to run two versions of the same software concurrently for an extended period, leading to an increase in MLC costs. Comprehensive and systematic testing is vital during this period to ensure that applications and data behave consistently between the old and new software versions. The testing phase can be both time-consuming and resource-intensive, further adding to the costs.

Furthermore, it's important to consider the hidden costs such as downtime during migration, potential business disruptions, training for staff to handle the new systems, and potential loss of efficiency during the transition period.
Therefore, when planning for mainframe modernization, it's crucial to conduct a thorough cost-benefit analysis. The focus should not just be on immediate acquisition costs but also the ongoing operational and maintenance costs, along with potential future savings from increased efficiency and modern capabilities. Effective project management and resource planning are vital to ensure the modernization process is carried out most cost-effectively and efficiently possible.

Mainframe modernization and breaking the silos

It's essential to recognize the potential of mainframes as part of a modern IT landscape. Mainframes, often seen as legacy systems, indeed possess robust features that are time-tested for enterprise-grade workloads, including high levels of security, reliability, and processing power. Unfortunately, many organizations fail to utilize the full potential of today's mainframe. They keep mainframes isolated from modern technologies, effectively creating silos that hinder integration and innovation.
This isolation does not only limit opportunities in application development and response to market demands but also impacts an organization's ability to attract and retain talent, particularly from the younger generation who are keen on working with diversified tech stacks.

The answer to both issues is mainframe modernization. The mainframe environment should be made compatible with modern technology standards and platforms. For instance, modern programming languages such as Java, Python, and JavaScript can run on mainframes, and they offer better compatibility with contemporary development practices. The integration of mainframe systems with other platforms can be achieved by using modern interface protocols, such as RESTful APIs, which allow different systems to communicate and share data efficiently. This might involve considerable work initially, considering the significant differences between mainframe and modern systems.

The long-term benefits are worth it: improved operational efficiency, increased agility, and enhanced ability to innovate.

Furthermore, mainframe systems can also benefit significantly from the integration of modern technologies like artificial intelligence and machine learning, enhancing capabilities in data analysis, predictive analytics, and automated decision-making.

Additionally, adopting modern practices such as DevOps and Agile can bridge the gap between the mainframe and non-mainframe worlds, making these systems more adaptable and easier to integrate. Containerization, for instance, has also emerged as a promising approach to make applications portable across different systems, including mainframes.

Raising the level of communication between mainframe and non-mainframe teams is essential. These teams must understand each other's language, tools, and methodologies to work together effectively. Efforts to foster this mutual understanding could include cross-training and collaborative projects.

Mainframe modernization and breaking the silos allow organizations to leverage their existing mainframe assets while participating fully in the digital economy. By fully leveraging and integrating the potentials of mainframes with the new-age technological landscape, businesses can ensure they are well-positioned to meet evolving market demands, and drive innovation. It also makes the mainframe environment more attractive to younger IT professionals who are more familiar with these modern technologies and methodologies.

> By fully leveraging and integrating the potentials of mainframes with the new-age technological landscape, businesses can ensure they are well-positioned to meet evolving market demands, and drive innovation

RISKS OF A NEGLECTED MAINFRAME SYSTEM

Downtime

The main risk, often realized in situations where system management is compromised, is an increase in system downtime. The system ceases to work partially or in full if there is inadequate care for it, either because, for instance, versions are not kept up-to-date or there is no investment in optimization, which falls under preventive maintenance. Additionally, experienced experts or teams need significantly less time for system recovery than individuals who lack knowledge, skills, and experience.

Long application delivery lifecycle

On the mainframe, if it has not already been hit by the wave of modernization, which it probably hasn't considering the lack of staff, all processes that would speed up the cycle of launching applications or their new versions on the market are done through more or less manual activities, more prone to errors, and therefore bugs. Reduction in the scope of testing, inability to maintain, disrupted work continuity, and inability to modernize, all make progress extremely slow.

Inability to keep pace with market need

And ultimately, you lose a step in the market. Opportunities, availability, and innovation decrease. And everything starts over. Of course, to address all challenges and avoid risks, solutions always exist. The question is just, what is the most appropriate response? What will truly help? Not short term. Not apparent. But something that will respond to user needs in the long term.

Jeopardized business continuity / Operation risk

Business continuity is also significantly disrupted, which is particularly noticeable in organizations that have direct interaction with end users, such as financial institutions, health insurance, and public or state institutions. In fact, a disruption of operations has a direct impact on the functioning of the city/area/state.

Customer retention

Retaining a customer or even attracting new ones under conditions where IT infrastructure does not meet business continuity requirements is practically impossible. Unless they are forced, they will opt for other options (companies) available in the market.

Revenue loss

Losing customers equals revenue reduction, and not just in the short term but as a result not of bad business but of poor business support from the IT system.

POSSIBLE SOLUTIONS

Let's explore the possible responses to the presented challenges.

01 Outsourcing

Outsourcing your mainframe infrastructure usually means everything (hardware, software, and operations) is handed over to the outsourcing provider. This can significantly restrict flexibility if business or technology adjustments are required. Moreover, it usually means that in-house personnel are not needed any more or they are being transferred to an outsourcing provider.

02 Empowering Mainframe Teams

Managed Services offers the possibility to empower existing in-house teams with external resources. Jointly, they form a long-term symbiotic partnership between the user and the managed service provider. This model avails a broader spectrum of external experts, which can be pivotal for platform enhancements, in-house staff development through knowledge transfer, and filling operational gaps, covering a vast range of system activities.

03 Hiring New Staff

Building new teams with freshly hired personnel is obvious, but usually not a viable solution since there are simply not enough candidates with mainframe skills on the market. Usually, mainframe customers must organize themselves specialized education for young graduates to gain mainframe skills. Such an education requires significant time since it necessitates foresight and planning so that the newcomers, besides acquiring the requisite knowledge, get adequate time to acquaint themselves with the system and its operational procedures.

04 Freelancers

Ad-hoc requirements, especially during intensive projects, can be addressed by hiring freelancers either on a short-term or long-term basis. While this might be efficient, you can’t build a robust core team with freelancers. Moreover, many freelance specialists in the market are often retired professionals who typically shun sustained, long-term commitments. Thus, this approach isn't always conducive to mitigateing operational risks.

05 Migration to other platforms

Migrating from a mainframe is arguably one of the most intricate, expensive, and time-consuming endeavours. Transitioning to alternative systems or cloud platforms is a herculean task. The migration process is fraught with substantial risks and invariably demands a consortium of experts from diverse domains. Meticulous planning, a willingness to revamp the modus operandi of enterprise systems, and a paradigm shift in thought processes are prerequisites. Furthermore, from a mainframe CTO's perspective, migrating off a mainframe doesn't merely involve a technical transition. It necessitates a cultural shift, understanding the nuances of the new environment, and ensuring the existing workforce is aptly retrained. The overarching goal is not just technological adaptation but ensuring that the new system aligns seamlessly with the organization's strategic objectives and future growth trajectories.

Don’t risk neglecting a mainframe system!

03

EMPOWERING MAINFRAME TEAMS WITH MANAGED SERVICES

Think of managed services as a helpful friend you bring in when your mainframe starts acting up. You know, those tech-savvy buddies who can work their magic and save the day. Usually, CROZ experts take responsibility for certain parts or the whole mainframe infrastructure. Most often, the customer team remains in place, while CROZ specialists are handling part of the activities, acting as a part of the customer team. The managed services model generally fills the skill gaps, reduces costs, improves service quality, and frees internal teams to shift the focus from daily operations to more strategic goals.

In the Managed Services model, the user typically retains ownership and management of the mainframe infrastructure, meaning the user remains the owner of the hardware and the equipment remains in the user's system room. Similarly, the user continues to be the contract holder for the use of software licenses, maintaining a direct relationship with the vendor from whom the software was acquired.

Moreover, by using the managed service, the customer team is **empowered** by CROZ experts and they can jointly enhance and optimize the mainframe infrastructure. Employing a "CROZ Mainframe Managed Services" provides true partnership, rather than mere outsourcing of certain activities. It offers multifaceted advantages beyond routine maintenance and incident resolution. CROZ experts go the extra mile by actively enhancing and optimizing your mainframe infrastructure, transforming it into a strategic asset. They not only keep the system running smoothly but also collaborate closely with your in-house team, sharing their expertise and empowering them with new skills. By leveraging their expertise, you gain access to innovative solutions such as implementing API layers for seamless integration, introducing modern DevOps tools and best practices, upgrading system components, and fine-tuning performance.

And here's the cherry on top: they can even optimize costs by replacing specific tools with more efficient alternatives.

This collaborative approach fosters knowledge transfer and ensures that your organization remains in control of its mainframe environment while benefiting from the provider's deep insights and best practices. This partnership not only ensures the smooth functioning of daily operations but also paves the way for continuous improvement and innovation in your mainframe environment, ultimately enhancing your organization's overall efficiency and competitiveness

KEY BUILDING BLOCKS OF MAINFRAME MANAGED SERVICES

Let’s describe the basic components of a typical CROZ Mainframe Managed Services offering:

Onboarding

Onboarding services essentially include an analysis of the current state of z/OS, z/VSE, z/VM, Linux on IBM Z systems and associated subsystems or software products such as DB2 for z/OS, CICS, MQ for z/OS, IMS products and their high-availability functionalities e.g. Parallel Sysplex, DB2 Data Sharing, CICSPlex, MQ Queue Sharing, GDPS for which managed service services are desired. This is done to view settings, management processes, utilization, used functionality, and to get acquainted with user teams in any way connected to the subject infrastructure. The result of the onboarding service is well-documented analysis results, which are a good starting point for further work with the system, whether it's classic incident or operations support or any other activities that would be covered by additional service requests. Similarly, along with the analysis results, the user is presented with suggestions for improving system management and operation.

Operations support

Operations support is a cornerstone of mainframe managed services, ensuring the seamless running of mainframes and their associated products. At its heart is the concept of "Run the Bank" daily operations, which encompasses a gamut of activities:

- **Monitoring and Maintenance:** This starts with a standard review of logs, and then delves deeper into monitoring the system's current state. Tools like the RMF subsystem and OMEGAMON are invaluable here. Regular system upgrades with PTFs ensure that everything remains up-to-date, minimizing operational hitches.
- **Data Management**: Activities range from creating backup copies with tools like HSM, RMM, and OAM, to regular database upkeep with IBM DB2 and IMS DB.
- **Development and Deployment:** The mainframe world is not static. Whether it's old-school legacy methods or modern zDevOPS approaches, development, testing, and deployment processes remain central. This includes harnessing the power of the CI/CD pipeline, orchestrated by popular DevOpS tools such as GitLab, GitHub, and Jenkins.
- **Security:** Ensuring the safety and security of mainframe operations is pivotal. This is achieved by working with security subsystems like IBM RACF and CA Top Secret.

But operations support isn't just about the nitty-gritty of day-to-day operations. It goes beyond mere incident management. It's a comprehensive offering tailored to bridge skills gaps or availability challenges an in-house team might face, ensuring robust support for the entire production environment, and even extending to development and testing environments.

What Does Operations Support Entail?

Mainframe managed services rely heavily on operations support to keep the systems and their related products functioning smoothly. A key part of this support is ensuring daily operations run without a hitch, which involves a wide range of activities.

- **Infrastructure Monitoring:**
  This is proactive and can encompass CPU, memory, disk, and more. It's an integrated component of the CROZ Problem and Incident Management procedures.
- **Administration Ownership:**
  To guarantee environmental integrity, proactive maintenance, and accountability.
- **Upgrades & Patching:**
  This involves system enhancements and patching in tandem with the customer. It might also involve representing the customer in the IBM PMR process.
- **Availability:**
  Ensuring high availability is a shared responsibility.
- **Task Management:**
  This includes the delegation of tasks across the CROZ team and managing them via the Managed Services Web-based Support Ticket System.
- **Window Management:**
  Both for deployments and maintenance.
- **Client Communication:**
  This is maintained through regular weekly calls and daily interactions.
- **Documentation:**
  Keeping records up-to-date is crucial.

In the end, it's all about pre-emptive maintenance, continuous enhancement of systems, and clear communication. Operations support ensures the mainframe environment remains optimized, efficient, and effective.

Incident support

Incident Support is a crucial process for any organization. Incident Management aims to minimize disruption to the business by restoring service operations to agreed levels as quickly as possible.

The focus of Incident Support is to provide triage of all reported incidents and apply the necessary remedies. The CROZ experts collaborate closely with the client's team and any 3rd party which may be involved (for example, networking, security, vendors...). Note that in an Incident-only support model, the client retains responsibility for production operations of the environment under support, and maintains their own front-line/customer (or employee) facing help desk.

A 24x7 helpdesk along with the necessary Support Request Management and ticketing processes are made available, and this includes the CROZ Case Management System and incident support team. During the onboarding phase, we also discuss requirements for a Service Level Agreement(SLA). Together with the client, we decide on the required level of SLA (24×7 service availability or 8×5, etc.).

While operations support is typically provided during a client's core business hours, Service Level Agreements (SLAs) can be tailored based on individual business requirements, ensuring every client gets precisely what they need. Additionally, we define items such as Target Time to Action, Target Resolution time, Incident Severity Levels, etc.

Enhancement Request

To make full use of Managed Services, we always allocate part of the contractual budget for additional services that go beyond operations/incident support. It may include consultancy, customization of specific infrastructure components, performance optimization, integration with other parts of the information system or even software development. Additionally, it may include the installation and implementation of new system components or the upgrade/migration of existing components.
Consultancy services typically consist of architecture review, advising on best practices, helping in new system design, or integration with existing systems. Enhancement Service Request hours can be contracted monthly and accrued within the current support year.

In summary, our focus is on optimizing and refining your mainframe environment to ensure it aligns with your business's evolving needs and objectives.

WHY CHOOSE CROZ MAINFRAME MANAGED SERVICES?

Let's describe the basic components of a typical CROZ Mainframe Managed Services offering:

01 Empowering Mainframe Team

Our collaborative approach fosters knowledge transfer and ensures that your organisation remains in control of its mainframe environment while benefiting from the provider's deep insights and best practices. This dynamic collaboration enhances your organization's efficiency, giving you the competitive edge you've been looking for.

02 Transparent Terms

Our package emphasizes a proactive approach. We continuously monitor user requirements and technological advancements to suggest relevant technological upgrades and tool alternatives, enhancing the efficiency and value of your mainframe platform while streamlining costs.

03 Contract Structure

Our Managed Services contracts are designed for clarity and simplicity. Monthly fees are set based on specific criteria: SLA requirements, allocated hours for Incident and Operations support, and any industry-specific services. Additional requirements, such as specialised consultancy or system integration, are also accommodated within the contract framework.

04 Transparency in Agreement

We prioritize transparency in all our engagements. Every aspect of our contract is delineated explicitly, ensuring there are no hidden charges or ambiguities. This approach facilitates predictable operational budgeting and streamlines the process for additional requests.

MANAGED SERVICES VS. OUTSOURCING

Mainframes are still a critical part of the IT infrastructure for many large organizations. They are used to run mission-critical applications, such as those for financial transactions, customer service, and inventory management.
As a result, the decision of whether to outsource or manage mainframe services is an important one. There are pros and cons to both approaches, and the best option for a particular organization will depend on its specific needs and requirements.

Understanding Outsourcing and Managed Services

Outsourcing is the process of contracting with an external provider to perform a specific task or service. In the case of mainframe services, this could involve the entire mainframe infrastructure, or just specific tasks such as operations, maintenance, or security.

Managed services is a more comprehensive approach to outsourcing. A managed services provider (MSP) takes responsibility for the overall management of the mainframe infrastructure, including operations, maintenance, security, and upgrades.

The main difference between outsourcing and managed services is the level of involvement of the organization. With outsourcing, the organization retains responsibility for the overall management of the mainframe infrastructure, and the MSP is simply a contractor. With managed services, the MSP takes on a more active role in managing the infrastructure, and the organization can focus on its core business activities.

The Mechanics of Outsourcing

Outsourcing usually involves transferring the complete mainframe infrastructure, including hardware, software, data, and personnel, to the provider. This provider then assumes responsibility for the entire management spectrum, from operations to upgrades. While outsourcing can be cost-efficient, benefiting from economies of scale and mainframe specialization, it might also curtail control over the infrastructure, potentially reducing flexibility and visibility.

Operational Focus of Outsourcing Providers

Outsourcing providers predominantly emphasize operations. Their expertise ensures smooth mainframe infrastructure management. However, their focus might not extend to generating new business value, concentrating more on fulfilling the organization's existing needs.

The Comprehensive Nature of Managed Services

Managed services promise a broader spectrum of mainframe management. Beyond operational facets, they aid organizations in bolstering their IT prowess. MSPs identify and rectify improvement areas, leveraging their resources and expertise.

Security and Compliance in Managed Services

Managed services providers are typically very focused on security and compliance. They have the expertise and resources to ensure that the mainframe infrastructure is secure and compliant with all applicable regulations. This can be a major advantage for organizations that are concerned about security and compliance.

Disaster Recovery and Business Continuity

Managed services providers can also help organizations to improve their disaster recovery and business continuity capabilities. They can help organizations develop and implement disaster recovery plans, and they can provide the resources and expertise to recover from a disaster.

A COMPARATIVE ANALYSIS: OUTSOURCING VS. MANAGED SERVICES

The following table summarizes the key differences between outsourcing and managed services:

Outsourcing	Managed Services
Focuses on **operational aspects** of managing the infrastructure	Focuses on improving IT capabilities and providing strategic advice
Can lead to a loss of control over the infrastructure	Provides more visibility and control over the infrastructure
Not as focused on security and compliance	More focused on security and compliance
Not as focused on disaster recovery and business continuity	More focused on disaster recovery and business continuity

UPBRINGING NEW MAINFRAMERS

Up to this point, we delved into the various service models available, such as managed services and outsourcing, evaluating each of the unique sets of advantages and challenges. We've discussed the operational aspects of mainframes, including security, compliance, and disaster recovery and explored the challenges in recruiting new mainframe professionals due to the overshadowing allure of newer technologies and the steep learning curve associated with mainframe technology.

Previously, we had analysed the challenges that mainframe customers are facing today. Probably the biggest challenge is the ***"skills gap"***. The mainframe landscape has been shaped by a myriad of seasoned professionals, many of whom are now retired or are approaching retirement. This brings about a critical challenge. With such a significant number of mainframe experts retiring, there is a void in experience and expertise, with the next generation needing to quickly gain the necessary skills. We want to round this issue up with some practical solutions for the **upbringing of new mainframers.**

An essential challenge

The fact that mainframe technology is so backwards compatible can make it difficult to hire mainframe developers. The necessity of comprehensive understanding and proficiency in both legacy and modern languages and systems implies a lengthy learning cycle for prospective mainframers.

Mainframes being perceived as relics of the past leads to a scarcity of courses on this technology in academic curricula, and subsequently, a lack of interest among fresh graduates to pursue careers as mainframers.

This scenario creates a precarious situation for companies that rely heavily on mainframes, compelling them to devise innovative strategies and outreach programs to tap into untapped talent pools, such as mid-career technologists, and to invest in internal training initiatives to cultivate mainframe expertise from within.

Even though hiring mainframe developers is a challenge, it is also essential because the backward compatibility of mainframe technology is also one of its core strengths.

This compatibility is pivotal for large users who prefer mainframes, as it ensures that newer versions of the software can run older versions, maintaining a continuum in operational flow. Overall, the challenges of hiring mainframe developers are outweighed by the benefits of using mainframe technology. Mainframe systems are reliable, and secure, and can process large volumes of transactions quickly and efficiently.

CROZ'S EDUCATIONAL INITIATIVES IN MAINFRAME TECHNOLOGY

We have many years of experience in the education and training of engineering experts. In our education centre, we have held 1000+ courses on over a hundred topics specifically designed to prepare IT experts for any challenge ahead.

CROZ stands out in the field of mainframe technology education, focusing on cultivating proficient mainframe specialists. We conduct extensive training programs and boot camps, meticulously structured to provide a balanced blend of theoretical insights and hands-on experience in mainframe technologies such as z/OS and DB2.

The effectiveness of CROZ's educational programs is evident from the positive feedback received from participants worldwide. Attendees from various sessions, including those from South Africa, Egypt and Saudi Arabia have expressed appreciation for the comprehensive learning experiences provided by CROZ.

They highlighted the structured content, clarity in concept explanation, the supportive learning environment, and the expertise of very responsive instructors, instrumental for ensuring a fruitful learning journey.

These reflections validated the impact and quality of our educational programs in mainframe technology. CROZ remains committed to enhancing the skills and knowledge of aspiring mainframe specialists, playing a crucial role in sustaining and progressing mainframe technology in today's evolving IT domain. We do that by covering a variety of learning modules, suitable to various needs.

Specialized Training

At our education centre, learn@CROZ, we offer specialized training tailored to meet the diverse needs of our clients in the realm of mainframe technology. Our courses are meticulously designed to either be specific, focusing on individual needs such as installation, configuration, and utilization of "Z/OS Connect," or comprehensive, encompassing a range of topics within a specialized curriculum.

Cooperation with Educational Institutions

CROZ actively engages in meaningful partnerships with esteemed universities across Croatia, Germany, and beyond, to develop and deliver mainframe educational content. Our goal is to create a rich learning environment, facilitating the exchange of knowledge and expertise to cultivate a deeper understanding and proficiency in mainframe-related disciplines. By collaborating with educational institutions, we aim to enhance understanding and skills in this field, ensuring that mainframe technology continues to be a relevant and valued part of today's technology ecosystem.

Knowledge Transfer Workshops

Our specialized workshops are designed to bridge the gap between theoretical understanding and practical application of various technologies and software tools. While specialized courses are crucial, they often emphasize the extensive capabilities of technology, sometimes overlooking the practical aspects of its application. Recognizing this, CROZ conducts personalized workshops where our seasoned consultants lead participants through the best practices, sharing insights and experiences garnered from global projects. These workshops aim to facilitate a deeper understanding and practical knowledge, enabling participants to implement learned technologies effectively and efficiently.

Mainframe Summer Camps

For organizations aiming to engage and inspire the next generation of engineers in the field of mainframes, we offer structured summer programs. CROZ is responsible for developing comprehensive learning materials, curating relevant courses, and facilitating hands-on training sessions. A pivotal component of these programs is the mentorship provided by our experienced professionals, who guide the students through the intricate landscape of mainframes, ensuring a smooth and enlightening introduction to this essential technology.

Mainframe Bootcamp

Our Mainframe Bootcamp is a meticulously designed program, tailored to meet the specific needs of individual or multiple clients, ensuring a comprehensive learning experience over several months. Here is how it works:

Candidate Selection Process

CROZ employs a thorough selection methodology, incorporating interviews and evaluations, to identify individuals who are motivated and exhibit a high level of aptitude. This meticulous approach is crucial due to the extensive and resource-intensive nature of the program, ensuring the suitability and capability of each participant.

Educational Framework

We formulate diverse and inclusive curricula, covering multiple aspects of mainframe technology. Each curriculum integrates specialized courses with practical training, providing a hybrid learning model that merges conventional classroom learning with online materials for independent study.

Practical Application

Participants are provided with practical exercises to apply and refine the knowledge gained during the courses, fostering a deeper understanding and proficiency.

Ongoing Mentorship

Upon completion of the Bootcamp, participants, while dealing with real-world scenarios, receive consistent mentorship and advice from experienced CROZ mentors, assisting them in overcoming technical challenges and facilitating their career progression.

Job Parachute

Addressing concerns regarding the longevity and relevance of mainframe technology, we provide a 'Job Parachute' to all participants. This assures sustained employment opportunities either within CROZ or with our partners, mitigating the risk of job loss and reinforcing confidence in the specialization.