Plonsky, T., & Herber, D. R. (2025). Alignment of Agile and MOSA Priniciples in Systems Engineering

MOSA-2 Principle: Employ Modular Design

Key	GREEN - Strongly aligned.	YELLOW - Partly aligned	RED - Misaligned

Prompt: Are the MOSA principles, Establish an enabling environment, aligned with the agile manifesto principle, Our highest priority is to satisfy the customer through early and continuous delivery of valuable software?

MOSA Des.	Agile Des.	MOSA	Agile Manifesto Principles	Author's Rationale for Alignment or Misalignment	ChatGPT	Gemini	Copilot	Author Score	ChatGPT	Gemini	Copilot	Average Score
M2	A1	**Employ Modular Design:**	**Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.** A customer value principle that prioritizes the utmost importance of customer satisfaction. The incremental, iterative process of delivering a product, often in small increments, is important for soliciting and incorporating customer feedback into the next revision of the product.	The AM principle strongly aligns with and supports the MOSA principle. The MOSA principle describes the physical characteristics of a cohesive, encapsulated, self-contained, and highly binned product. The goal of the MOSA principle is to quickly deploy modular units. The MOSA principle includes software and hardware modular units; the AM emphasizes the importance of satisfying the customer's needs through iterative and incremental delivery of modular units. Therefore, within the MOSA program, the modular units are designed to be interchangeable with other modular units within the host system. The next revision of modular units improves upon or adapts to changing requirements and interchanges with existing modular units without intentionally impacting the other components or functionality	"Faster & Continuous Delivery of Value: Agile emphasizes delivering valuable software early and often. MOSA's modular design allows for incremental development and integration, enabling faster deployment of functional components. Incremental & Iterative Improvements: Agile delivers software in small, functional increments. MOSA enables systems to be developed, tested, and deployed in modular pieces, ensuring continuous system enhancement without requiring a full redesign. Customer-Centric Approach: Agile prioritizes customer satisfaction through frequent delivery. MOSA's modular design ensures that new capabilities can be integrated based on user needs, keeping systems up to date with evolving requirements. Reduced Time-to-Market & Flexibility: Agile reduces delays by iterating rapidly on working solutions. MOSA allows for plug-and-play capability, reducing development cycles and enabling rapid fielding of new technologies. Conclusion: Both principles prioritize delivering value early, continuously, and efficiently—making MOSA's Employ Modular Design highly aligned with Agile's focus on early and continuous software delivery."	Yes, there's a strong alignment between the MOSA principle "employ modular design" and the Agile Manifesto principle "Our highest priority is to satisfy the customer through early and continuous delivery of valuable software." Here's how they connect: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on breaking down complex systems into smaller, independent modules with well-defined interfaces. This promotes flexibility, maintainability, and reusability. * **Agile: Customer satisfaction through early and continuous delivery:** * This principle emphasizes delivering valuable software to the customer frequently and incorporating their feedback to ensure satisfaction. **Alignment Points:** * **Enabling Early and Continuous Delivery:** * Modular design facilitates early and continuous delivery by allowing for the independent development and testing of modules. This means that individual modules can be completed and released to the customer as they become available, rather than waiting for the entire system to be finished. * Individual modules can be tested and verified much faster than a monolithic system. * **Facilitating Incremental Value:** * Modular design allows for the delivery of incremental value to the customer. Each module can represent a specific feature or functionality, and these modules can be delivered and integrated into the system over	Yes, the MOSA principle "Employ modular design" aligns well with the Agile Manifesto principle of prioritizing customer satisfaction through early and continuous delivery of valuable software. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Early and continuous delivery of valuable software**: This principle stresses the importance of delivering working software frequently and iteratively, ensuring that customers receive value as early and continuously as possible. It encourages responsiveness to change and prioritizes customer satisfaction. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and timely delivery of value to customers. MOSA's focus on modular design supports the Agile principle of early and continuous delivery by enabling the development of independent, functional components that can be integrated and delivered incrementally. This modular approach allows for more frequent releases and faster response to customer feedback, aligning with the Agile goal of satisfying customers through continuous delivery of valuable software. In summary, employing modular design according to MOSA principles supports Agile practices by facilitating early and continuous delivery of valuable software, ultimately enhancing customer satisfaction.	1	1	1	1	1.00
M2	A2	**Employ Modular Design:**	**Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.** Developers frequently review and incorporate updates into prototype software code to remain focused on the customer's vision and help prevent mistakes from becoming major faults in the final product. The principle's word choice of "deliver" and not "release" suggests that the delivered software code is not the production version. Instead, the delivered code encourages reviews and learning opportunities for internally delivering unfinished products.	The AM principle partially aligns with and supports the MOSA principle by emphasizing the importance of quickly delivering modules in a short timeframe; however, the MOSA principle does not dictate a specific timeframe. The MOSA principles include software and hardware modules. Hardware modules are inherently more challenging to manufacture, test, and update due to the time required to produce the physical hardware, acquire materials, and conduct tests. Manufacturing working hardware is a challenging expectation.	"Incremental & Iterative Development: Agile emphasizes frequent delivery of working software in short cycles. MOSA's modular design enables incremental system upgrades and component-based development, allowing for faster integration of new capabilities. Flexibility & Rapid Integration: Agile promotes short development cycles to quickly respond to changing needs. MOSA allows for plug-and-play modular components, making it easier to integrate and deploy new capabilities without waiting for an entire system overhaul. Improved Maintainability & Upgradability: Agile reduces risk by continuously refining software. MOSA's modular approach ensures that systems can be updated and sustained over time, rather than requiring long, monolithic development cycles. Key Difference: Agile focuses on delivering fully functional software within weeks or months, whereas MOSA's modular design focuses on long-term flexibility and sustainment rather than rapid, frequent releases. Some MOSA-based systems, particularly in defense and large-scale engineering, may have longer development cycles than Agile's preferred short iterations. Conclusion: MOSA's modular design supports the spirit of Agile's frequent delivery by enabling faster integration and incremental deployment. However, MOSA	Yes, the MOSA principle "employ modular design" is very well aligned with the Agile Manifesto principle "Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This focuses on breaking down complex systems into smaller, independent, and interchangeable modules with well-defined interfaces. * **Agile: Frequent delivery:** * This emphasizes delivering working software in short, iterative cycles to provide rapid feedback and value to the customer. **Alignment Points:** * **Enabling Short Iterations:** * Modular design makes it feasible to develop and test individual modules in parallel. This allows teams to complete smaller pieces of functionality within short iterations, aligning perfectly with the Agile principle. * Individual modules can be completed, and tested, much faster than a large monolithic program. * **Facilitating Incremental Releases:** * With modular design, teams can release individual modules or sets of modules as they are completed. This supports frequent releases and provides the customer with incremental value. * **Simplifying Integration:** * Well-defined interfaces between modules reduce the complexity of	Yes, the MOSA principle "Employ modular design" aligns well with the Agile Manifesto principle of delivering working software frequently. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Deliver working software frequently**: This principle focuses on delivering working software at regular intervals, ranging from a couple of weeks to a couple of months, with a preference for shorter timescales. This frequent delivery ensures that customers receive valuable updates and feedback is incorporated rapidly. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and timely delivery of value to customers. MOSA's focus on modular design supports the Agile principle of frequent delivery by enabling the development of independent, functional components that can be integrated and delivered incrementally. This modular approach allows for more frequent releases and faster response to customer feedback, aligning with the Agile goal of delivering working software frequently. In summary, employing modular design according to MOSA principles supports Agile practices by facilitating the frequent delivery of working software, ultimately enhancing customer satisfaction.	0.5	0.5	1	1	0.75
M2	A3	**Employ Modular Design:**	**Simplicity--the art of maximizing the amount of work not done--is essential.** Developers subdivide a project into several smaller tasks to increase the quality of their work. People are more likely to accomplish simple tasks more efficiently. Teams avoid unnecessary work by simplifying processes that add value to delivered products.	The AM principle strongly aligns with and supports the MOSA principle by simplifying the work to expeditiously deliver modular products to the customer. The MOSA principle directs the development of independent modular units that interface and interchange with its host platform. By simplifying the system design to a collection of interchangeable, self-contained, independent modules, the process prevents the organization from over-engineering or over-producing a single product.	"Reducing Complexity Through Modularity: Agile emphasizes simplicity by avoiding unnecessary work. MOSA promotes modular design, allowing systems to be built, upgraded, or replaced in parts rather than overhauling the entire system, reducing unnecessary effort. Avoiding Redundant Development: Agile encourages focusing only on what is necessary to deliver value. MOSA's modular approach avoids redundant work by enabling reuse of existing components instead of reinventing solutions. Easier Maintenance & Upgrades: Agile values doing less while achieving more by maintaining simplicity. MOSA's modular design makes it easier to swap, upgrade, or integrate new components without excessive redesign efforts. Optimizing Resource Utilization: Agile encourages minimizing work to maximize efficiency. MOSA optimizes system development by allowing teams to focus only on necessary modules, reducing wasted effort. Conclusion: Both principles emphasize efficiency, avoiding unnecessary work, and simplifying development, making MOSA's Employ Modular Design highly aligned with Agile's focus on simplicity.	Yes, there's a strong alignment between the MOSA principle "employ modular design" and the Agile Manifesto principle "Simplicity--the art of maximizing the amount of work not done--is essential." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on breaking down complex systems into smaller, independent, and interchangeable modules with well-defined interfaces. * **Agile: Simplicity:** * This principle emphasizes minimizing unnecessary complexity and focusing on what's essential to deliver value. **Alignment Points:** * **Reducing Complexity:** * Modular design inherently simplifies complex systems by breaking them into manageable units. This aligns directly with the "simplicity" principle. * By having well defined interfaces, interactions between modules are simplified. * **Promoting Reusability:** * Modular design encourages the reuse of existing modules, which avoids redundant work and minimizes the amount of new code that needs to be written. This "maximizes the amount of work not done." * Reusing code, reduces the amount of testing needed, and reduces the amount of code that needs to be maintained. * **Focusing on Essential Functionality:**	Yes, the MOSA principle "Employ modular design" aligns well with the Agile Manifesto principle of simplicity. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Simplicity—the art of maximizing the amount of work not done—is essential**: This principle highlights the importance of focusing on essential tasks and avoiding unnecessary work. By simplifying processes and reducing complexity, teams can improve efficiency and deliver value more quickly. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and efficiency. MOSA's focus on modular design supports the Agile principle of simplicity by enabling the creation of well-defined, manageable components that can be developed and integrated efficiently. This modular approach helps teams focus on essential tasks and avoid unnecessary work, aligning with the Agile goal of maximizing the amount of work not done. In summary, employing modular design according to MOSA principles supports Agile practices by facilitating simplicity, ultimately enhancing efficiency and the delivery of value.	1	1	1	1	1.00
M2	A4	**Employ Modular Design:**	**The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.** The Agile Manifesto authors valued verbal conversation to explain, instruct, or converse among team members. The benefits of verbal communication include facial expressions, non-verbal cues, real-time feedback, and reduced misinterpretation. The AM principle also aligns with the value statement of individuals and interactions over processes and tools.	The MOSA principle addresses the development and delivery of the modular units, which do not align well with the AM principle of face-to-face communication. The integrated product team (IPT) inherently communicates in exchange information on the development of the modular units. However, in many large-scale programs, documentation is utilized to convey the customer's needs and design. Verbal communication is discouraged as a reliable source of truth. For instance, the development and design of the modular units are stated within a request for proposal (RFP) or statement of work (SOW). The unit's requirements are documented within the performance specifications, which are derived from the subsystem specifications. The design team translates these requirements into design documents, drawings, or 3D models. The manufacturing team produces the unit-under-test according to the design documentation, and the test team performs testing based on the test requirements and procedures. One benefit of the MOSA principle is that it allows for the development of modules that are not limited to one vendor, contractor or supplier. Effective communication is expected between the customer and various vendors or suppliers. However, geographical distances may make face-to-face communication impractical, to which case, telecommunication may be a more efficient alternative.	"Communication Approach: Agile prioritizes face-to-face conversation as the best way to share information quickly and effectively. MOSA focuses on technical modularity and interoperability, which relies more on standardized documentation, defined interfaces, and specifications rather than real-time, direct conversations. Collaboration Structure: Agile encourages informal, real-time communication within small, co-located teams. MOSA is often applied to large, complex systems where multiple organizations (government, contractors, industry partners) must collaborate, making asynchronous communication (e.g., well-documented interfaces) more critical than face-to-face interactions. Dependency on Clear Standards: Agile assumes high-bandwidth, direct conversations to resolve issues quickly. MOSA ensures teams can work independently by using clearly defined module specifications, reducing the need for constant direct communication. Partial Alignment: While MOSA encourages collaboration between stakeholders, it does not emphasize face-to-face communication as the primary method. Instead, it prioritizes well-documented, standardized module designs that allow distributed teams to work independently. However, in an Agile-MOSA hybrid environment, face-to-face communication within individual teams developing modular components	While "employ modular design" doesn't directly mandate face-to-face communication, it creates an environment that can indirectly support and enhance it, aligning somewhat with the Agile Manifesto principle "The most efficient and effective method of conveying information to and within a development team is face-to-face conversation." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Face-to-face conversation:** * This emphasizes the value of direct, real-time communication for effective collaboration. **Alignment Points (Indirect):** * **Clarifying Interfaces, Reducing Ambiguity:** * A well-designed modular system with clear interfaces reduces ambiguity and the need for extensive documentation. This can free up time for more valuable face-to-face conversations. * When interfaces are well understood, less time is spent on written communication to define those interfaces. * **Facilitating Focused Discussions:** * Modular design allows teams to focus discussions on specific modules and their interactions. This can lead to more efficient and productive face-to-face conversations. * Discussions are more focused, and therefore more efficient. **Supporting Team Collaboration:**	The MOSA principle "Employ modular design" and the Agile Manifesto principle emphasizing face-to-face conversation address different aspects of the development process, but they can be complementary. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Face-to-face conversation**: This principle highlights the importance of direct, personal communication within a development team. Face-to-face conversations facilitate quick and clear communication, reduce misunderstandings, and foster stronger collaboration and teamwork. **Complementary Aspects**: While modular design focuses on the structure and organization of the system, face-to-face communication focuses on the efficiency and clarity of information exchange within the team. Both principles aim to enhance the development process, though they address different elements. Modular design can benefit from face-to-face communication as it ensures that team members are on the same page regarding the design and integration of modules, leading to more effective collaboration. In summary, while the MOSA principle of employing modular design and the Agile principle of face-to-face conversation address different aspects of the development process, they can work together to enhance overall system collaboration and efficiency by combining modular design with	0	0	0.5	0.5	0.25
M2	A5	**Employ Modular Design:**	**At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.** Continuous learning and process improvement are important in maintaining the agility of the lifecycle. Team members are encouraged to review their work process successes, failures and inefficiencies and provide feedback and make necessary changes. The process flow is flexible and adaptable, allowing for easy incorporation of such changes.	The AM principle partially aligns with and supports the MOSA principle. The MOSA principle does not directly address the team's continuous learning and process improvement by employing modules; however, with each iterative development of the modules, the team inherently improves its process, design, and execution in delivering the modules.	"Continuous Improvement & Iteration: Agile encourages teams to regularly evaluate and refine their processes. MOSA's modular design enables continuous assessment and iterative improvements to individual system components, ensuring adaptability over time. Adaptability & Evolution: Agile teams adjust their approaches based on feedback and lessons learned. MOSA supports an evolving system architecture, allowing organizations to integrate improvements without overhauling entire systems. Scalability & Optimization: Agile promotes small, incremental changes that improve efficiency. MOSA's modular approach allows teams to analyze, refine, and optimize specific modules, ensuring better performance and maintainability. Reducing Inefficiencies: Agile retrospectives help teams identify bottlenecks and inefficiencies. MOSA enables system-wide refinements, reducing technical debt and improving system effectiveness over time. Conclusion: Both principles emphasize continuous improvement, reflection, and adaptability, making MOSA's Employ Modular Design strongly aligned with Agile's focus on iterative team and process enhancement."	Yes, there's a good alignment between the MOSA principle "employ modular design" and the Agile Manifesto principle "At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Regular reflection and adjustment:** * This principle emphasizes continuous improvement through regular retrospectives, where teams analyze their processes and make adjustments to enhance their effectiveness. **Alignment Points:** * **Facilitating Incremental Improvement:** * Modular design allows for incremental improvements to the system. Teams can focus on improving individual modules without affecting the entire system. This aligns with the Agile principle of making small, iterative adjustments. * Individual modules can be tested, and verified, after changes are made, with less risk to the entire system. * **Supporting Experimentation:** * Modular design makes it easier to experiment with different approaches and technologies. Teams can try out new ideas in individual modules without risking the stability of the entire system. This supports the Agile principle of continuous learning and adaptation.	Yes, the MOSA principle "Employ modular design" aligns well with the Agile Manifesto principle of regular team reflection and adjustment. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Regular reflection and adjustment**: This principle highlights the importance of continuous improvement within a development team. At regular intervals, the team reflects on its processes and practices to identify areas for improvement and make adjustments to enhance effectiveness. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and continuous improvement. MOSA's focus on modular design supports the Agile principle of regular reflection and adjustment by enabling teams to independently assess and improve individual components. This modular approach facilitates the identification of areas for improvement and the implementation of adjustments, aligning with the Agile goal of continuous improvement. In summary, employing modular design according to MOSA principles supports Agile practices by fostering a culture of continuous reflection and adjustment, ultimately enhancing team effectiveness and adaptability	0.5	1	1	1	0.88
M2	A6	**Employ Modular Design:**	**Business people and developers must work together daily throughout the project.** The importance of business people and developers working together to prevent unnecessary requirements, maintain costs and schedules, and remove any development obstacles.	The AM principle strongly aligns with and supports the MOSA principle. Although the MOSA principle does not specify how the work is coordinated, the planning and selection of which modules to design, develop, test, and deliver are communicated to business people, program managers, and developers to maximize the availability and capabilities of the modules. Business people are involved in the program management of the project from the initial development and negotiation of the customer contract to tracking earned value and cost, and finally, the closeout of the specific module project. MOSA does not specify the communication frequency, but the nature of the program requires continuous collaboration with business people.	"Collaboration Between Stakeholders: Agile emphasizes continuous interaction between business stakeholders and developers to ensure alignment with evolving needs. MOSA promotes collaboration between government agencies, industry partners, and developers to define modular architectures and standards. Shared Understanding & Requirements Alignment: Agile ensures business and development teams work together to refine requirements in real time. MOSA encourages early and continuous stakeholder engagement to ensure that modular components align with operational needs. Adaptability to Changing Requirements: Agile promotes frequent communication to accommodate evolving priorities. MOSA's modular approach enables incremental upgrades and integrations, ensuring systems can adapt to changing mission or business needs. Key Difference: Agile emphasizes daily collaboration, often in co-located teams, while MOSA operates across multiple organizations, often requiring structured coordination rather than daily direct interaction. MOSA relies more on predefined standards, modularity, and interoperability, reducing the need for constant, real-time communication between business and development teams. Conclusion: MOSA's Employ Modular Design supports collaboration between stakeholders, but it does not inherently require daily interaction between business leaders and developers as Agile suggests. Thus, it is partially	Yes, "employ modular design" aligns well with the Agile Manifesto principle "Business people and developers must work together daily throughout the project," though the connection is more about enabling effective collaboration than directly dictating it. Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Daily collaboration:** * This principle emphasizes the importance of close, ongoing communication between business stakeholders and development teams to ensure alignment and responsiveness. **Alignment Points:** * **Clarifying Requirements and Interfaces:** * Modular design necessitates clear definitions of module interfaces and functionalities. This requires close collaboration between business people and developers to ensure that the modules meet the business needs. * By having well defined interfaces, business people, and developers have a clear, and common understanding of the system. * **Facilitating Iterative Development:** * Modular design supports iterative development, which relies on frequent feedback and collaboration between business people and developers. Daily communication is essential to ensure that the modules are being developed in a way that meets the evolving business requirements.	The MOSA principle "Employ modular design" and the Agile Manifesto principle that "business people and developers must work together daily throughout the project" address different aspects of the development process but can be complementary. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Business people and developers working together daily**: This principle highlights the importance of continuous and close collaboration between business stakeholders and development teams. Regular interaction ensures that the project stays aligned with business goals and that feedback is incorporated swiftly. **Complementary Aspects**: While modular design focuses on the structure and organization of the system, close collaboration between business people and developers focuses on aligning the project with business goals and ensuring effective communication. Both principles aim to enhance the development process, though they address different elements. Modular design can benefit from close collaboration as it ensures that business goals and technical requirements are aligned, leading to more effective and efficient project outcomes. In summary, while the MOSA principle of employing modular design and the Agile principle of daily collaboration between business people and developers address different aspects of the development process, they can	1	0.5	1	0.5	0.75

M2	A7	**Empley Modular Design:**	**Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.** The customer-centric principle encourages acceptance of latent requirements or updated requirements to improve the final product.	The AM principle strongly aligns with and supports the MOSA principle in that the host system accepts various modules with updated or different functionality without impacting the host system's other functions. The modules are designed with cohesive, encapsulated, self-contained, and highly-binned attributes, ensuring they do not interfere with the interchange with another modular unit. The development team incorporates latent requirements, such as different functionalities and logic programs, into the design of the next module unit.	"Flexibility to Adapt to Changing Requirements: Agile embraces late-stage changes to maximize customer value. MOSA's modular architecture allows for system modifications and upgrades without requiring a complete redesign, making it adaptable to evolving needs. Incremental Development & Integration: Agile enables iterative improvements that integrate changes continuously. MOSA facilitates incremental updates by allowing teams to develop and integrate new modules independently, minimizing disruption to existing systems. Competitive Advantage Through Rapid Innovation: Agile ensures that businesses can quickly adapt to market changes. MOSA supports rapid technology insertion, allowing organizations to integrate the latest advancements and maintain a competitive edge. Reducing Risk & Cost of Changes: Agile minimizes the impact of late-stage changes through small, iterative releases. MOSA reduces the cost and risk of modifications by ensuring that changes can be made to individual components rather than the entire system. Conclusion: Both MOSA's Empley Modular Design and Agile's embrace of change enable flexibility, adaptability, and continuous improvement, making them highly aligned in their approach to managing evolving requirements."	Yes, "empley modular design" aligns very strongly with the Agile Manifesto principle "Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Welcome changing requirements:** * This principle emphasizes the ability to adapt to changing customer needs throughout the development process, even late in the project. **Alignment Points:** * **Facilitating Change Implementation:** * Modular design makes it easier to implement changes, even late in development. Because modules are independent, they can be replaced, updated, or modified without affecting the rest of the system. * Changes can be isolated to a single module, or small set of modules. * **Enabling Rapid Response to Change:** * Modular design allows for rapid response to changing requirements. Changes can be implemented and tested quickly, which is essential for maintaining agility. * The testing of changes can be done quickly, and independently of the whole system. * **Supporting Incremental Development and Integration:** * Modular design supports incremental development and integration.	Yes, the MOSA principle "Empley modular design" aligns well with the Agile Manifesto principle of welcoming changing requirements, even late in development. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Welcome changing requirements**: This principle highlights the importance of being open to changes in requirements, even if they come late in the development process. Agile processes are designed to harness change for the customer's competitive advantage, ensuring that the final product meets evolving needs and provides maximum value. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and responsiveness to change. MOSA's focus on modular design supports the Agile principle of welcoming changing requirements by enabling the development of independent, functional components that can be easily modified and integrated as requirements evolve. This modular approach allows teams to adapt to changes more effectively and deliver value to the customer, aligning with the Agile goal of harnessing change for the customer's competitive advantage. In summary, employing modular design according to MOSA principles supports Agile practices by facilitating adaptability and responsiveness to changing requirements, ultimately enhancing the customer's competitive advantage.	1	1	1	1	1.00
M2	A8	**Empley Modular Design:**	**The best architectures, requirements, and designs emerge from self-organizing teams.** Self-organizing teams are those given the authority and trust to assign roles, manage tasks, and make decisions. The team leader and developers are closest to the product design and, therefore, have the insight to develop the best requirements and designs.	The AM principle partially aligns with and supports the MOSA principle. The MOSA principle does not address team dynamics or the organization of self-organizing teams. Defense MOSA programs are contracted to vendors for development and production. The contracting vendors have their own structured organizational framework and processes, which prevent the independence of a self-organizing team. The organization's human resources or management has already designated role assignments. However, the AM principle supports the MOSA program, since the modules are independent, cohesive, encapsulated, self-contained, and highly-binned, allowing the customer to assign different modular units' needs to various contracting vendors. The contracting vendors are self-organizing and free to develop the best architecture requirements and designs for their specific module.	"Decentralized Development Approach: Agile promotes self-organizing teams that determine the best architecture, designs, and requirements. MOSA encourages a modular approach, where different teams can independently develop and improve modules, fostering decentralized innovation. Flexibility in System Design: Agile teams evolve architecture organically based on continuous feedback. MOSA's modular structure allows different teams to work on independent components, refining their designs over time. Encouraging Innovation & Collaboration: Agile self-organizing teams drive creativity and efficiency. MOSA enables teams from various organizations (government, industry, developers) to collaborate, contributing expertise to modular components. Key Differences: Agile emphasizes self-organizing teams making decisions organically, while MOSA relies on predefined modular standards and interoperability agreements, which may impose constraints on complete self-organization. MOSA operates in large, often multi-organization environments, where governance structures and contractual agreements may limit the autonomy of individual teams. Conclusion: MOSA's modular approach supports decentralized innovation, but it does not fully embrace the Agile concept of self-organizing teams making all architectural decisions. Therefore, it is only partially aligned with this Agile principle."	Yes, "empley modular design" aligns well with the Agile Manifesto principle "The best architectures, requirements, and designs emerge from self-organizing teams." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Self-organizing teams:** * This principle emphasizes the value of empowering teams to make their own decisions and take ownership of their work. **Alignment Points:** * **Enabling Decentralized Decision-Making:** * Modular design allows self-organizing teams to make decisions about the design and implementation of their specific modules without needing constant oversight from a central authority. * Teams are empowered to make localized decisions. * **Facilitating Emergent Architecture:** * Modular design supports emergent architecture by allowing teams to experiment with different approaches and technologies within their modules. This can lead to innovative solutions that might not have been possible with a more rigid, centralized design. * The interfaces of the modules create the architecture, and the teams create the modules. * **Promoting Team Ownership:** * When teams are responsible for the design and implementation of their	Yes, the MOSA principle "Empley modular design" aligns well with the Agile Manifesto principle that the best architectures, requirements, and designs emerge from self-organizing teams. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Self-organizing teams**: This principle highlights the importance of empowering teams to organize themselves, make decisions, and take ownership of their work. Self-organizing teams are believed to produce the best architectures, requirements, and designs because they are closest to the work and can respond to changes more effectively. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and high-quality outcomes. MOSA's focus on modular design supports the Agile principle of self-organizing teams by enabling teams to develop independent, functional components. This modular approach empowers teams to take ownership of their work and make decisions that leads to better architectures, requirements, and designs. In summary, employing modular design according to MOSA principles supports Agile practices by fostering a culture of self-organization and ownership, ultimately enhancing the quality of architectures, requirements, and designs.	0.5	0.5	1	1	0.75
M2	A9	**Empley Modular Design:**	**Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.** This principle emphasizes the importance of the team's members. Without the team members, the tools and processes will not deliver a product. Team members are encouraged and trusted to make decisions.	The AM principle partially aligns with and supports the MOSA principle. MOSA does not explicitly address individual or team dynamics. However, from the customer's perspective, the customer supports the contractors or suppliers with the necessary requirements, documents, tools, and possibly government facilities or resources. The customer provides the required program documents, such as performance requirements, statement of work, and interface documents, the supplier or contractor should provide an appropriate modular product.	"Empowering Teams Through Modular Design Agile promotes trusting teams to deliver solutions without micromanagement. MOSA enables teams to work independently on modular components, giving them autonomy to design and develop within defined interfaces. Providing an Enabling Environment: Agile fosters a supportive environment where teams can thrive. MOSA creates a structured framework where teams have clear standards and guidelines, allowing them to focus on innovation within their modules. Encouraging Specialized Expertise & Collaboration: Agile values motivated individuals working towards a common goal. MOSA allows different teams or organizations to specialize in developing specific modules, leveraging their expertise effectively. Key Differences: Agile emphasizes trust and self-management, while MOSA operates within a structured framework with predefined standards and interoperability rules, which may limit full autonomy. MOSA often involves multiple organizations (government, contractors, industry partners), requiring more structured coordination rather than completely autonomous, self-directed teams. Conclusion: MOSA's modular design supports team autonomy within defined boundaries, but it does not fully align with Agile's emphasis on self-organizing, trust-based teams. Therefore, it is partially aligned with this Agile principle."	Yes, "empley modular design" strongly aligns with the Agile Manifesto principle "Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Motivated individuals:** * This principle emphasizes the importance of trusting and empowering individuals to do their best work. **Alignment Points:** * **Providing a Clear Environment:** * Modular design provides a clear and well-defined environment for motivated individuals to work in. Well-defined interfaces and independent modules allow teams to focus on their specific tasks without being hindered by dependencies or ambiguities. * The boundaries, and responsibilities of each team are clearly defined. * **Supporting Autonomy and Ownership:** * Modular design empowers individuals and teams by giving them autonomy over their specific modules. This fosters a sense of ownership and responsibility, which can significantly boost motivation. * Teams are given ownership of their modules. * **Enabling Independent Work:** * Modular design allows individuals and teams to work independently,	Yes, the MOSA principle "Empley modular design" aligns well with the Agile Manifesto principle of building projects around motivated individuals, providing them with the environment and support they need, and trusting them to get the job done. **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Motivated individuals**: This principle highlights the importance of empowering motivated individuals by providing them with the necessary environment and support and trusting them to get the job done. It emphasizes the value of trust and autonomy in achieving successful project outcomes. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and empowerment of individuals. MOSA's focus on modular design supports the Agile principle of building projects around motivated individuals by enabling teams to develop independent, functional components. This modular approach allows teams to take ownership of their work and make decisions that lead to more effective and efficient project outcomes. In summary, employing modular design according to MOSA principles supports Agile practices by fostering a culture of trust, autonomy, and collaboration, aligning with the Agile principle of building projects around motivated individuals and providing them with the environment and	0.5	0.5	1	1	0.75
M2	A10	**Empley Modular Design:**	**Working software is the primary measure of progress.** This principle emphasizes the importance of incremental and iterative software code development by incorporating feedback frequently and correcting mistakes before the final product release. The term "working software" implies that the software is functional but not ready for customer deployment. The goal is to deliver small, functional increments of software code for iterative review and as a form of measuring progress over the delivery of documentation.	The AM principle partially aligns with and supports the MOSA principle. Both principles measure progress. The AM principle specifies "working software" which implies prototype or work in progress, thereby not ready for customer deployment. The modular unit may contain either or combination of software, firmware and hardware subcomponents which are dependent upon each other for functionality. Since hardware prototypes are more time consuming to develop and test, working software is only one area to measure the project's progress. For instance, modular development may rely on a set of measures such as MOEs and MOPs, to track progress.	"Focus on Functional Deliverables: Agile measures progress based on working software rather than documentation or plans. MOSA's modular design ensures that each module or component is developed to be functional and interoperable, aligning with the goal of delivering working solutions. Incremental Development & Integration: Agile delivers software in small, functional increments to validate progress. MOSA enables incremental system improvements by integrating new modules, ensuring that each addition is functional before progressing further. System Readiness & Effectiveness: Agile values real, usable functionality over theoretical progress. MOSA ensures that each module meets defined performance and interoperability standards before it is integrated into the larger system. Key Differences: Agile prioritizes rapid, continuous delivery of working software, while MOSA focuses on modularity and interoperability, which may involve longer development cycles and more emphasis on architectural compliance. MOSA applies beyond software to hardware and complex systems, meaning progress is sometimes measured by modular integration milestones rather than just "working software." Conclusion: MOSA's modular design approach supports the delivery of functional	Yes, "empley modular design" aligns very strongly with the Agile Manifesto principle "Working software is the primary measure of progress." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Working software:** * This principle emphasizes that the most important metric for progress is the delivery of functional, usable software. **Alignment Points:** * **Enabling Incremental Delivery:** * Modular design allows for the independent development and testing of individual modules. This makes it possible to deliver working software in smaller, more frequent increments. * Individual modules can be completed, and verified, and then integrated into the working software. * **Facilitating Rapid Prototyping and Testing:** * Modular design simplifies the process of prototyping and testing. Teams can focus on developing and testing individual modules, which speeds up the overall development process. * Testing of individual modules is much faster than testing a monolithic system. * **Supporting Continuous Integration:** * Well-defined interfaces between modules make it easier to integrate	Yes, the MOSA principle "Empley modular design" aligns well with the Agile Manifesto principle that "working software is the primary measure of progress." **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Working software is the primary measure of progress**: This principle focuses on the importance of delivering functional software as the main indicator of progress. It emphasizes tangible results and the delivery of value to the customer over other metrics or documentation. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and the delivery of value to customers. MOSA's focus on modular design supports the Agile principle of using working software as the primary measure of progress by enabling the development of independent, functional components. This modular approach allows teams to deliver functional software incrementally and more frequently, aligning with the Agile goal of using working software as the key measure of progress. In summary, employing modular design according to MOSA principles supports Agile practices by facilitating the delivery of functional software, ultimately aligning with the principle that working software is the primary measure of progress.	0.5	0.5	1	1	0.75
M2	A11	**Empley Modular Design:**	**Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.** Many projects' workflow suffers from the expression of hills and valleys, where the development work tempo increases due to several reasons, such as milestone deadlines or decreases when waiting for customer feedback. The development process performs best when the team's workflow remains constant. The people maintaining a constant pace will prevent burnout or mistakes in the product.	The AM principle partially aligns with and supports the MOSA principle, by designing and developing multiple modules, the workforce is kept at an even pace as smaller modules with different variations and improvements are developed rather than one all-encompassing unit. However, the MOSA principle does not address individuals such as sponsors, developers and users, rather the MOSA principle applies to the system-level of sustainable development.	"Sustainable System Evolution: Agile emphasizes maintaining a steady, manageable pace to avoid burnout and ensure long-term productivity. MOSA's modular approach enables incremental updates and lifecycle sustainment, reducing the need for disruptive system overhauls and supporting long-term sustainability. Reducing Technical Debt & Workload Peaks: Agile aims to prevent unsustainable workloads through iterative development. MOSA allows teams to upgrade or replace individual modules without extensive rework, helping maintain steady development over time. Long-Term Flexibility & Maintainability: Agile supports continuous improvement without requiring excessive effort at any one time. MOSA ensures that systems remain adaptable and maintainable, enabling long-term sustainment with less resource strain. Key Differences: Agile focuses on maintaining a sustainable development pace for individuals and teams, while MOSA focuses on system-level sustainability over long lifecycles (which may not always directly impact daily development workflows). MOSA's implementation often involves large-scale projects with government or industry partners, which can introduce bureaucratic and contractual constraints that may not always align with Agile's preference for steady, flexible workflows. Conclusion:	Yes, "empley modular design" aligns well with the Agile Manifesto principle "Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely." Here's how: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle focuses on creating a system architecture composed of independent, interchangeable modules with well-defined interfaces. * **Agile: Sustainable development:** * This principle emphasizes the importance of maintaining a consistent and manageable pace of development. **Alignment Points:** * **Promoting Maintainability:** * Modular design makes systems easier to maintain and update. When changes are needed, they can often be isolated to specific modules, reducing the risk of unintended consequences and simplifying the maintenance process. This reduces the workload, and allows for a sustainable pace. * **Enabling Predictable Development:** * Modular design can lead to more predictable development cycles. When modules are well-defined, teams can estimate the effort required for development and maintenance more accurately, contributing to a consistent pace. * **Reducing Complexity:** * By breaking down complex systems into smaller, more manageable	Yes, the MOSA principle "Empley modular design" aligns well with the Agile Manifesto principle that "Agile processes promote sustainable development." **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Sustainable development**: This principle highlights the importance of maintaining a constant, sustainable pace for sponsors, developers, and users. It focuses on creating a work environment where teams can sustain productivity and deliver value continuously without burnout. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and sustainable development. MOSA's focus on modular design supports the Agile principle of sustainable development by enabling teams to develop independent, functional components that can be maintained and evolved over time. This modular approach facilitates a steady pace of development, as teams can work on specific components without being overwhelmed by the entire system, aligning with the Agile goal of maintaining a constant pace indefinitely. In summary, employing modular design according to MOSA principles supports Agile practices by fostering a culture of sustainable development, aligning with the Agile principle of promoting a constant and maintainable pace for all stakeholders involved.	0.5	0.5	1	1	0.75
M2	A12	**Empley Modular Design:**	**Continuous attention to technical excellence and good design enhances agility.** The principle addresses the importance of quality design in product development. A high-quality, agile product adapts to future changes and updates, while also minimizing the chances of rework or technical debt. The continuous attention to detail at every stage of the design and development process is the key to reducing rework and ensuring a superior product.	The AM principle strongly aligns with and supports the MOSA principle. By employing modular designs require attention to detail and quality assurance to ensure the modules will interface and communicate with the host. The consequence of a module incorrectly interfacing with the host, either mechanically or electrically, requires recall to the supplier for design modifications and delays final delivery.	"Emphasis on High-Quality Design: Agile promotes technical excellence and good design to enhance flexibility and maintainability. MOSA encourages modular, well-defined architectures that ensure components are designed for interoperability, scalability, and long-term use. Facilitating Agility Through Modularity: Agile values good design because it enables teams to quickly adapt and evolve systems. MOSA's modular approach allows organizations to replace, upgrade, or improve individual components without disrupting the entire system, enhancing overall agility. Long-Term Maintainability & Reduced Technical Debt: Agile encourages continuous refinement of code and architecture to prevent technical debt. MOSA ensures that each module adheres to open standards and best practices, reducing the risk of obsolescence and costly rework. Support for Incremental Improvements: Agile promotes continuous delivery and iterative improvements. MOSA allows for incremental enhancements of individual modules, ensuring that technical advancements can be integrated efficiently. Conclusion: Both MOSA's Empley Modular Design and Agile's focus on technical excellence emphasize high-quality design, maintainability, and adaptability, making them strongly aligned in their approach to sustainable and flexible	Yes, there's a very strong and direct alignment between the MOSA principle "employ modular design" and the Agile Manifesto principle "Continuous attention to technical excellence and good design enhances agility." Here's how they connect: **Understanding the Principles:** * **MOSA: Employ modular design:** * This principle emphasizes breaking down systems into independent, interchangeable modules with well-defined interfaces. This promotes flexibility, maintainability, and reusability. * **Agile: Continuous attention to technical excellence and good design:** * This principle highlights the importance of maintaining high technical standards and good design practices to enable agility and responsiveness to change. **Alignment Points:** * **Enhancing Adaptability:** * Modular design inherently increases adaptability. Because modules are independent, they can be replaced, updated, or modified without affecting the rest of the system. This directly enhances agility by allowing for rapid responses to changing requirements. * **Facilitating Change:** * Modular design makes it easier to implement changes. When changes are isolated to specific modules, the risk of unintended consequences is reduced, and the development process becomes more efficient. * **Supporting Iterative Development:**	Yes, the MOSA principle "Employ modular design" aligns well with the Agile Manifesto principle of "continuous attention to technical excellence and good design enhances agility." **MOSA: Employ modular design**: This principle emphasizes the use of modular components in system architecture, promoting flexibility, scalability, and ease of integration. Modular design allows for independent development, testing, and maintenance of components, facilitating adaptability and innovation. **Agile Manifesto: Technical excellence and good design**: This principle highlights the importance of maintaining high standards of technical quality and thoughtful design throughout the development process. By focusing on technical excellence and good design, teams can enhance their agility, making it easier to adapt to changes and deliver high-quality software. **Alignment**: Both principles promote practices that enhance flexibility, adaptability, and high-quality outcomes. MOSA's focus on modular design complements Agile's emphasis on technical excellence and good design. Modular design supports the creation of well-architected systems that can be easily modified and extended, aligning with the Agile principle of enhancing agility through continuous attention to technical quality and thoughtful design. In summary, employing modular design according to MOSA principles supports Agile practices by fostering a culture of technical excellence and good design, ultimately enhancing agility.	1	1	1	1	1.00