Investigating Public Acceptance on Public Oriented Human Space Commercialization

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ABSTRACT

Based on people's enthusiasm and economical reasons, space commercialization will get more momentum in the future, and eventually reach a full commercialization status, a public-oriented human space commercialization (POHSC) where the public freely participate and purchase space products and services. In this study, the authors conduct a survey-based research model to investigate public perception on POHSC in the human space exploration (HSE) context. The authors want to identify what factors influence public acceptance and adoption of POHSC, and to evaluate public willingness to pay for future services provided by POHSC. For these objectives, the authors develop the concept of 'eMerge', a conceptualized mobile device-based application tool with which the public access and pay for their services. The authors also propose the Technology Acceptance Model with 'eMerge' specific (TAMe). The results show that public perceptions are strongly affected by perceived availability, perceived usefulness, and perceived enjoyment to use 'eMerge'. The Perceived availability and perceived enjoyment have significant effect on public motivation to use 'eMerge' by forming a positive attitude toward intention to use it. It also shows that the public have very high expectations and enthusiasm on POHSC in terms of their estimated spending on 'eMerge'. These results can be used as base knowledge in POHSC for future R&D and commercialized technology development.

Keywords: *Human Space Exploration (HSE), Public-Oriented Human Space Commercialization (POHSC), Research & Development (R&D), Technology Acceptance Model, Technology Acceptance Model with 'Emerge' Specific (TAMe)*

INTRODUCTION

The aerospace industry has been striving to enhance human space exploration (HSE) technologies over the last half century as part of a nationwide research & development (R&D) project managed by government agencies like National Aeronautics and Space Administration (NASA). In parallel to this traditional movement, although it is in an early stage, the aerospace industry has been in the midst of a transition to space commercialization

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since 1990 (Peeters, 2003). For example, as described in Bush (2002), the development of the International Space Station (ISS) has raised a public expectation and enthusiasm about full commercialization. Recently, NASA plans to support the commercial orbital spaceflight and associated commercial use of space stations (NASA Watch, 2011). In addition to the U.S., Europe, Russia and Japan have also participated in this commercialization with fast-growing programs. For example, Arianespace in France has played a key role in the commercial launching service in 1990s (Suzuki, 2000), and it has captured more than 50% of the commercial launching market (Lionnet and Alexandrova, 2011). In fact, the ISS is the output through the international collaboration with Russia, Europe, Canada and Japan. NASA and other partners in the ISS have been seeking international collaboration to commercially utilize the ISS to reduce its operational cost and to enhance science and technology development (Rocketplane Kistler, 2011). According to Peeters (2003), the reduced government funding was one of the drivers for this commercialization path, and the most visible effect of this space commercialization was the globalization of the aerospace industry through strategic alliances. Based on this globalization, although the U.S. is still the leading nation, its market share in many space-related industry segments declines as global competition increases (Giacalone, 2008).

In this paper, we discuss the public-oriented human space commercialization (POHSC), and investigate public acceptance on POHSC in the HSE context. The POHSC is an extension of the traditional concept of human space commercialization (HSC). Space commercialization means that a commercialized market is established where customers buy and sell space-related products and services supplied by providers. The traditional concept of HSC has a very narrow meaning, which specifically includes the use of commercial space vehicles and use of any equipment in space to obtain commercial value of services and products from that equipment. In the traditional HSC, institutional customers (governments and government agencies) and commercial customers (corporations) play both roles of service or product providers and consumers. However, POHSC assumes that a fully commercialized HSE market where HSE-related products and services are traded is formed in the future. In the POHSC, in addition to institutional and commercial customers, individual consumers also directly purchase more diversified HSE-related products and services offered from diverse providers including governments, government agencies, and corporations (broader market scope) in the market. The products and services may have a wide range from a simple observation of different levels of spaceflight launching data and a remote control of lunar development robots to competition with other consumers (wider technology breadth). If appropriately implemented, the POHSC will have much faster commercialization speed than that of the traditional HSC because of its broader market scope and wider products and services. According to Chen (2009), market scope, technology breadth, and commercialization speed are core dimensions of the technology commercialization competence (TCC) which refers to the competence to use technologies in products and services across markets. That is, we believe that the POHSC has much higher level of TCC than that of the traditional HSC. Giacalone (2008) classified the space industries into satellite communications, global positioning systems (GPSs), space transportation, and remote-sensing categories, and each of these categories includes several sub-industries. He noted that the satellite communication and GPS categories were two largest categories in terms of the 2002 total space industry revenues. HSE is very closely related with the space transportation. Although HSE has the longest history compared to other categories, its long-term future seems to have many challenges in terms of government budget priority in the U.S. (Tkatchova, 2011). Under this circumstance, we believe that the POHSC concept may provide an answer for future and potential HSE projects. Based on its aforementioned broader market scope and wider technology breadth, HSE's