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Comprehensive Analysis and Study of Applications of Condensed Matter Physics

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ABSTRACT

Consumer behavior has always been an interesting subject for marketers. With the constant increase of market, banking sector is one of the fastest growing sectors in India. This study examines the satisfaction level of consumer on major National banks, Private Banks and Foreign bank in India and services provided by them. It also provides a functional comparison of the two different approaches in terms of SERVQUAL model. The study also analyzes the relationship between deliverance of services and actual customer expectation with the help of factor analysis and regression analysis in SEM. This study will provide important insights to banks in redefining their corporate image to one that is customer-focused and driven by service quality. The findings of the study also suggest after evaluation of intrinsic and extrinsic cues of consumers from cross sections differ in evaluating a bank's performance and expectation of the end users. The results of Structural Equation Modeling (SEM) highlighted the precedence areas of service instrument. The gap scores show that there is ample extent for improvement in all the aspects related to service quality. SEM and estimation has proposed by AMOS.

Keywords: Banking Sector, Consumer Behavior, SERVQUAL, Structural Equation Modeling (SEM).

I. INTRODUCTION

Condensed-matter and materials physics is the branch of physics that studies the properties of the large collections of atoms that compose both natural and synthetic materials. The roots of condensed-matter and materials physics lie in the discoveries of quantum mechanics in the early part of the twentieth century. Because it deals with properties of matter at ordinary chemical and thermal energy scales, condensed-matter and materials physics is the subfield of physics that has the largest number of direct practical applications. It is also an intellectually vital field that is currently producing many advances in fundamental physics.

Fifty years ago the transistor emerged from this area of physics. High-temperature superconductivity was discovered by condensed-matter physicists, as were the fascinating low-temperature states of superfluid helium. Scientists in this field have long-standing interests in electronic and optical properties of solids and all aspects of magnetism and magnetic materials. They investigate the properties of glasses, polymeric materials, and granular materials as well as composites, in which diverse constituents are combined to produce entirely new substances with novel properties.

Condensed-matter and materials physics has played a key role in the technological advances that have changed our lives so dramatically in the last 50 years. Driven by discoveries in condensed-matter and materials physics, these advances have brought us the integrated circuit, magnetic resonance imaging (MRI), low-loss optical fibers, solid-state lasers, light-emitting diodes, magnetic recording disks, and high-performance composite materials. These in turn have led to the spectacular growth of modern computer and telecommunications industries and, consequently, to the information revolution.

For many years after the invention of the transistor, the major intellectual challenge facing researchers in condensed-matter and materials physics was to understand the physical properties of nearly perfect single crystals of elements, simple compounds, and alloys. Most of these materials occur in some form in nature. On a basis of increased knowledge and powerful new synthesis techniques, today's condensed-matter and materials physics is directed toward creating entirely new classes of materials—so-called "artificially structured" materials—that do not exist in nature and whose sizes reach all the way down to the atomic domain. At the same time, a growing number of researchers are using new theoretical and experimental tools to extend our understanding to much more complex forms of matter—high-temperature superconductors, multicomponent magnetic materials, semicrystalline polymers, and glasses. These tools are, in turn, giving greater insight into more complex phenomena like the fracture of solids and the continuous transition from liquid to glass in the process of cooling. Ever in view in current condensed-matter and materials physics are research opportunities presented by dramatic progress in the biological sciences. Condensed-matter and materials physicists are working with biological scientists to develop a new field of "physical biology" in which physics-based techniques and approaches are applied to the study of biological materials and processes.

Indeed, condensed-matter and materials physics is distinguished by its extraordinary interdependence with other science and engineering fields. It is a multifaceted and diverse interdisciplinary field, strongly linked to other science and engineering disciplines that both benefit from and contribute to its successes. Important examples of this collaboration include fullerenes (physics and chemistry), macromolecules (physics, chemistry, and biology), structural alloys (physics and materials engineering), and silicon technology (physics and electrical engineering). Condensed-matter and materials physics also has strong interrelationships to other branches of physics. Prominent examples include Bose-Einstein condensation (with atomic physics) and the fractional quantum Hall effect (elementary-particle physics). Its practitioners include those who discover and develop new materials, those who seek to understand such materials at a fundamental level through experiments and theoretical analysis, and those who apply the materials and understanding to create new devices and technologies. This work is done in universities, in industry, and in government laboratories. Advances in basic research inspire new ideas for applications, and applications-driven technological advances provide tools that enable new fundamental investigations. Technological advances provide new tools such as synchrotrons, neutron sources, electron microscopes, computers, and scanning-probe microscopes. These new tools are leading to new advances in the fundamental understanding of materials and to a wide-ranging impact on other fields—biology, chemistry, environmental sciences, and engineering.

II. CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

Over the past 50 years, condensed matter has become the largest field in physics – while complex systems research is perhaps the fastest growing today. These disciplines are linked, and many methods for studying complex systems were originally developed for condensed matter. Both fields connect tightly with other disciplines and with industry.

Physics techniques and complex systems knowledge are extremely useful in interdisciplinary projects. We're involved in research with scientists and engineers from many fields, including biology, chemistry, ecology, economics and other social sciences.

The burgeoning field of big data analytics opens tremendous prospects for experienced graduates across diverse industries. Condensed matter also feeds graduates into multiple domains. With our central focus on complex, soft matter, the medical industry is particularly welcoming.

Shaun Hendy is interested in the complex systems that occur in condensed matter as well as in economics and society. He uses computer simulation, statistical physics, and mathematics to study problems in fields as diverse as nanoscience, materials science, social systems, and the economic geography of innovation. Dion O'Neale is involved in the network analysis of complex systems, with a particular focus on the economics of science and innovation.

Nicola Gaston employs quantum mechanical techniques to interrogate the relationship between electronic structure and the chemical and physical environment. She is particularly focused on the relationship between size and the properties of atom-clusters, molecules, and nano-particles. Malcolm Grimson's interests encompass statistical mechanics, phase transitions, thin films, multiferroics, and skyrmions.

Cather Simpson leads the Photon Factory. She specialises in ultrafast spectroscopy, laser micromachining and microfabrication, photonics and microfluidics, including device development and other high-value manufacturing innovations. Geoff Willmott works with soft condensed matter. He's particularly interested in nanofluidics and dynamic microfluidics. These are fields with rich applications in medicine, biotechnology, and industry.

We also have a strong grouping around the biological interface. Frédérique Vanholsbeeck's expertise includes optical imaging and sensing, with a focus on biomedical and primary industry applications. She works with clinicians, biologists and engineers. Peter Wills is a theoretical biologist who explores the origin of life, genetic coding, prion proteins, self-organising autocatalysis, and quasispecies (closely related molecules resulting from errors in nucleic acid self-replication).

III. METHODOLOGY

The Condensed-matter and materials physics is entering an era of great excitement and anticipation as powerful new experimental and computational capabilities are brought to bear on some of the most fundamental scientific and technical challenges of our time. Underlying these challenges is the knowledge that drives the information revolution, modern materials technology, and biotechnology enabled by understanding of the molecular basis of life. We have seen astounding developments over the past decade such as buckyballs and carbon nanotubes, high-temperature superconductivity, giant and colossal magnetoresistance, and large-scale quantum phenomena. The next decade, enriched by powerful new research tools, promises to be even more extraordinary.

New capabilities for condensed-matter and materials physics research include spectacular advances in the atomic-scale characterization and manipulation of materials, computer simulations of large interacting systems, and the ability to relate properties and phenomena from molecular- to macroscopic-length scales. These new capabilities are uniting the worlds of atomic-scale behavior and macroscopic phenomena in ways that provide avenues for understanding and designing materials and processes from the atoms up. In turn, this new understanding holds the promise of breakthroughs at a time when the limits of incremental progress are being tested in materials-based technologies ranging from integrated circuits and magnetic storage devices to the synthesis of advanced polymers to the performance of materials under extreme conditions. Perhaps the greatest impact will be felt at the interface between biology and physics, where the convergence of condensed-matter and materials physics and molecular biology is expected to drive important advances in the fundamental understanding of biological processes.

RESEARCH TOOLS AND APPLICATIONS FOR CONDENSED-MATTER PHYSICS

The arsenal of research tools for condensed-matter and materials physics includes a wide variety of experimental equipment. This equipment enables the creation of extreme environments in which to explore the behavior of matter and the synthesis of materials with extraordinary properties. It also provides new "eyes" to observe and new "hands" to manipulate at the atomic scale. Examples of such equipment range from benchtop-scale atomic-force microscopes used by individual investigators, to storage rings the size of a small town that generate the x-rays used by collaborative research groups with many members.

These experimental tools enable new insights into systems of recognized importance and the exploration of completely new regimes. One example of scientific progress that depended on modem instruments of research involved unraveling the properties of the high-Tc superconductors. Developing today's understanding of these materials depended on the use of experimental tools:

• Neutron diffraction was used to determine atomic coordinates.

• Synchrotron radiation was used to determine the electronic structure.

• Electron microscopy made it possible to determine the microstructure.

• Neutron scattering was used to determine magnetic order.

• High magnetic fields and high pressures were used to gain understanding of charge transport.

Many of these studies were performed at large- or medium-scale facilities.

Although large facilities are critical to condensed-matter and materials physics, another theme that pervades this report is the importance of atomic-scale observation and manipulation. Two of the most important tools for this purpose are the scanning-tunneling microscope and the transmission electron microscope. The equipment is on the small-to-medium scale.

Scanning-tunneling microscopes work by placing a probe that is sharp, on an atomic scale, so close to the sample that the quantum wave function of the electron allows it to jump the gap. By scanning this probe over the sample, using sophisticated positioning technology, the surface can be mapped atom by atom. The resolution is far better than anything that can be achieved with light waves, because the wavelength of light is thousands of times too large to visualize atoms. Various kinds of scanning-probe microscopes are now commonly available, including instruments that can examine chemical reactivity, magnetism, optical absorption, mechanical response, and other properties. A particularly promising development is the imaging of molecules, including rather large ones that play a role in biological processes.

Scanning-tunneling microscopes can go beyond measuring structures to actually creating them by positioning individual atoms. In principle, it is possible to create any structure to test our understanding of the physics of devices at this scale. One of the challenges in this area is to learn to control the stability of atomic-scale structures. In general, individual atoms placed on a surface will not stay put unless the temperature is extremely low. Another challenge is that, if this technique is ever to lead to practical devices, it would have to be much faster than it is now.

CONCLUSION

Condensed-matter and materials physics faces critical challenges in realizing this future. Investments in facilities and research infrastructure are essential to provide a world-class research environment and to enable breakthrough opportunities. Partnerships across disciplines and among universities, government laboratories, and industry are essential to leverage resources and strengthen interdisciplinary research and connections to technology. Finally, special attention must be given to condensed-matter and materials physics education to ensure the availability of intellectual capital to sustain the vitality of the field and its contributions to society.

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