STRATEGY FOR HONEYWELL IN THE AUTOMATION SOLUTIONS INDUSTRY FOR PULP AND PAPER

by

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ABSTRACT

Honeywell is a global supplier of automation solutions for the paper industry. Honeywell has a large installed base but in recent years has lost market share to its competitors. Despite industry maturity and product commoditization, the automation solutions industry is attractive for Honeywell as systems are critical for papermaking. Honeywell is well positioned to compete in this challenging industry given strengths in industry key success factors such as customer relationships, technology leadership, and global reach but must address weaknesses in cost leadership, service capability, and industry investment to be successful.

For Honeywell to become service-led and to increase market share, a combined strategy of operations consolidation, service differentiation, new technology differentiation, and focus on Honeywell’s process knowledge system is recommended. Notwithstanding alignment with industry forces, strict application of cost, differentiation, or focus strategy is not practical. Honeywell has the management support, resources, and organizational capability to support this combined strategy.
DEDICATION

If not for the love and support of my wife Myra, completion of the EMBA program would not have been possible. I am grateful for everything she has done for me throughout this program and would like to take this opportunity to dedicate this work to her. I would also like to dedicate this work to my lovely new daughter Esperanza who has been an inspiration in completing this project. Thank-you.
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# DEFINITIONS AND ACRONYMS

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<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>PKS</td>
<td>Process Knowledge System.</td>
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<tr>
<td>P3</td>
<td>Pulp, Paper and Printing business vertical.</td>
</tr>
<tr>
<td>CWS</td>
<td>Continuous Web Systems.</td>
</tr>
<tr>
<td>QCS</td>
<td>Quality control systems.</td>
</tr>
<tr>
<td>DCS</td>
<td>Distributed control systems.</td>
</tr>
<tr>
<td>KSF</td>
<td>Key success factor.</td>
</tr>
<tr>
<td>AE</td>
<td>Application Engineer</td>
</tr>
<tr>
<td>HDIP</td>
<td>Honeywell Development and Intellectual Property – new product development process</td>
</tr>
<tr>
<td>Marcom</td>
<td>Marcom is a Honeywell internal name for the Marketing Communications group.</td>
</tr>
<tr>
<td>Cross-direction (CD)</td>
<td>Refers to width dimension of paper and paper machine. In terms of control, variation in the CD direction is considered spatial variation.</td>
</tr>
<tr>
<td>Machine-direction (MD)</td>
<td>Refers to length dimension of paper and paper machine. In terms of control, variation in the MD direction is considered time-based variation.</td>
</tr>
<tr>
<td>Nip</td>
<td>Small gap formed between two adjacent rolls. Typically found in the press section for mechanically removing water from the paper web, or in the calendaring section for mechanically controlling sheet thickness.</td>
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1 INTRODUCTION

This section outlines the project purpose and methodology. An overview of Honeywell International Incorporated (Honeywell) and its presence in the pulp, paper and printing and continuous web solutions industries is also provided. Finally, Honeywell’s company structure, history, and product portfolio are presented. Pulp and paper process descriptions are provided to complement the discussion on products offered.

1.1 Project Purpose

Honeywell has a history of innovation and market leadership in measurement and control solutions for the pulp and paper industry however its position in the industry has declined over the last decade. The industry is mature and measurement and control products have become commoditized as the competition has caught up to Honeywell in technology. The machine builders, Metso and Voith, have become more dominant players in the industry by packaging control solutions into their machine designs. This has allowed them to effectively capture the entire new machine market while progressing in the upgrade market traditionally dominated by Honeywell and Asea Brown Boveri (ABB). In light of these challenging conditions, paper measurement and control products remain important to Honeywell due to the profitability of this business vertical within Process Solutions (HPS). Automation solutions are also essential components of the papermaking process and are valuable to customers. Finally, measurement and control are important elements of Honeywell’s Experion PKS® Process Knowledge System (PKS). Experion PKS is a business management platform used to control a customer’s entire papermaking operation and combines measurement and control systems with production management tools and business management tools.
Honeywell’s goals for HPS are to become a service-led business and to increase its share of its customers’ business through implementation of the Experion PKS enterprise system. While Honeywell is well established at serving the pulp and paper industry and has a large market share to build upon, it is critical for Honeywell to review its strategic direction and ensure it is appropriate for the changing market conditions. The purpose of this project is development of a strategy to support Honeywell’s goals and increase market share by leveraging Honeywell’s presence in the pulp and paper industry and its comprehensive product portfolio.

1.2 Project Methodology

This strategy analysis will use the Diamond-E framework as outlined by Crossan, Fry and Killing.\(^1\) Chapter One is an overview of Honeywell and its presence in the pulp, paper and printing (P3) and continuous web solutions (CWS) industries. The organization structure, history and product portfolio will be presented. As Honeywell’s strategy encompasses automation solutions for the entire pulp and paper process, an overview of this process is provided for perspective on the challenges, opportunities, and benefits of automation. Chapter Two is an external analysis and evaluation of industry attractiveness using Porter’s Five Forces including identification of industry key success factors.\(^2\) A competitive analysis is provided to compare Honeywell and its major competitors against the industry key success factors. Threats and opportunities for Honeywell are also presented. Chapter Three is an internal analysis of Honeywell and focuses on management preferences, resources, and organizational capabilities. An assessment of strengths and weaknesses is made and a gap analysis is performed to identify mechanisms for strengthening the company’s position in each area for a particular strategic orientation. Chapter Four is an evaluation and selection of strategic alternatives for consideration.

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based on the outcome of the preceding external, competitive, and internal analyses. In Chapter Five, a recommendation of strategic alternatives with regard to implementation and strategic fit with the organization is provided.

1.3 Honeywell Overview

Honeywell is a multinational corporation based in the United States (US). Honeywell has approximately 118,000 employees and operates in over 100 countries worldwide. Honeywell was incorporated in Delaware in 1985, however its history dates back to 1906 when the company was founded by Mark C. Honeywell, a pioneer in automation technology. It was originally named the Honeywell Heating Specialty Company with a specialization in hot water heaters. In 1927 the company merged with the Minneapolis Heat Regulator Company, originator of the now famous round thermostat, and continued to expand its presence in the instrumentation and control industry. Although it had been selling its products around the world for many years, the company began to expand its own operations internationally in the 1930’s. The company officially became known as Honeywell in 1963 and was operating in 95 countries around the world by 1998. The current company is the outcome of a merger between AlliedSignal and Honeywell in 1999. The company chose to keep the name Honeywell due to its significant global brand recognition, but moved its headquarters from Minneapolis, Minnesota, to Morristown, New Jersey. Today, Honeywell is a Fortune 50 company with a market capitalization of $40.8 billion US. Its chief executive officer is David M. Cote.

Honeywell focuses on technology and manufacturing for many industries and has over 250 manufacturing operations globally. It has four strategic business units: Aerospace,
Automation and Control Solutions, Specialty Materials, and Transportation Systems. In general, Honeywell provides sensing and control products, systems, and services for each of these four major business units.

In Aerospace Honeywell provides power systems, landing systems, avionics systems, sensing and control systems for the commercial, regional, business, military, and space aircraft industries. Management and technical services are also provided. Major products include auxiliary power units, air management and cabin pressure control systems, engine start systems, flight safety systems, and spacecraft guidance and control subsystems. Major customers include the US government, NASA, Boeing, Airbus, and Lockheed Martin.

In the Specialty Materials business Honeywell provides resins and chemicals, advanced fibres and composites, specialty films and additives, semiconductor materials, catalysts, and process equipment for a wide variety of industries including refrigeration, steel processing, oil refining, food and pharmaceutical packaging, semiconductors, and microelectronics. Major products include nylon polymer, refrigerant insulation and foam blowing agents, fluoropolymer film, PVC lubricant systems, interconnect-dielectrics, semiconductor packaging materials, molecular sieves, and adsorbents.

In Transportation Systems Honeywell provides turbocharger systems, thermal systems, friction materials, and aftermarket automotive and car-care products for vehicle original equipment manufacturers (OEMs), engine manufacturers, brake manufacturers, railway and aircraft OEMs, and auto supply retailers, distributors and dealers. Major products include gas and diesel turbochargers, exhaust gas coolers, filters, antifreeze, disc brake pads and shoes, and brake linings for aircraft and railway braking systems.

In the Automation and Control Solutions business Honeywell provides environmental combustion sensing and controls systems, security and life safety systems, process automation
products and solutions, and building solutions and services for industrial, commercial and residential customers. Major products include heating, ventilating and air conditioning controls, air cleaners, heat and energy recovery ventilators, thermostats, home security and monitoring systems, gas detection products and systems, and advanced measurement and control systems. Major customers include food and beverage processors, health care organizations, security monitoring and service providers, refining and petrochemical companies, mining and mineral companies, pulp and paper manufacturers, and other continuous web producers.\(^7\)

Within Automation and Control Solutions there are several business units including HPS, Environmental and Combustion Controls, Building Solutions, Global Finance, Life Safety, Security, and Sensing and Control. HPS focuses on vertical markets including P3, CWS, Oil and Gas, Hydrocarbon Processing, Petrochemicals, Life Sciences, Power Generation, and Metals, Materials and Mining.

\section*{1.4 Honeywell in Pulp, Paper and Printing and Continuous Web Solutions Industry}

\subsection*{1.4.1 Overall Focus}

For the P3 and CWS industries Honeywell focuses on measurement, control, and management solutions for production processes and overall business operations. Automation solutions including business management applications, distributed control systems, quality control systems, and services are provided for the pulp and paper manufacturing processes. Similar solutions are provided for the printing process, as well as the rubber, plastic, and metal manufacturing processes. Within HPS, Honeywell manages the P3 and CWS business (P3/CWS) together.

1.4.2 Organization Structure

The global P3/CWS business utilizes a hybrid of regional and functional structures. There is a global Business Director with responsibility for the overall P3/CWS business. There are also three regional Business Leaders responsible for the Americas, EMEA (Europe, Middle East, and Africa), and APAC (Asia-Pacific), respectively. Reporting directly to the Business Director are leaders in Strategy and Alliances, Marcom and Messaging, Business Analysis, and Business Development. In addition, business service leaders in Pulping, Paper, CWS, Business Solutions, and OptiVision report directly to the P3/CWS global Business Director. The regional Business Leaders report directly to HPS regional Vice Presidents and General Managers, and have a dotted-line relationship with the P3/CWS global Business Director. Finally, there are functional leaders in Solutions Marketing, Technology, Operational Excellence, and the Finland Centre of Excellence that report directly to Vice Presidents in their respective function but maintain a dotted-line relationship with the P3/CWS Business Director. An organization chart for the P3/CWS business vertical is provided below for reference.
Figure 1-1 P3/CWS business vertical organization structure.

Source: Honeywell, figure by Author.

1.4.3 History in Pulp, Paper and Printing

Prior to 1997, Honeywell’s presence in the pulp and paper industry centred on the TDC 2000®, Honeywell’s distributed control system offering. In 1997, Honeywell acquired Measurex Corporation (Measurex) to expand its product portfolio and presence in the industry. Measurex, founded in 1968, was focused on quality control systems for continuous sheet industries including paper, plastic, rubber and metal. Quality control system products include scanners, sensors, profile actuators, and advanced process controls. Optimization and maintenance services are also an important part of quality control systems. Measurex’s quality control system products were complementary to Honeywell’s distributed control system offering and were viewed as a natural fit. Since the merger, Honeywell has continued to focus on development of quality control and distributed control system products for P3 and has worked to ensure these systems can be integrated into the enterprise level Experion PKS®. Experion PKS is
Honeywell’s “system for process, business and asset management.” This total solution offering allows Honeywell to control an entire operation from the decisions made in the office through to the monitoring and adjustment of production processes.

1.4.4 Automation Solutions Product Offering

To provide perspective on the industry and the depth of Honeywell’s investment and presence, it is important to discuss the pulp and paper processes and to provide an overview of products offered as automation solutions. Honeywell has a significant product portfolio for P3 spanning the entire papermaking operation from business applications to process measurement and control applications. All Honeywell systems can be integrated thereby providing customers with an enterprise solution to meet their plant control and business needs with a single supplier. This section will introduce the products related to the P3 industry. General applications are described first, followed by information on the pulping, stock preparation, and papermaking processes and associated control solutions. Finally, information on printing, CWS and service products is provided.

1.4.4.1 Business Applications

All of Honeywell’s business applications are part of Experion PKS. Experion PKS links a customer’s assets, process, people, and business into a single enterprise solution for controlling their business. Applications help customers align their production capabilities with the objectives of their business and can be set up for use at a single mill or across multiple mills. These systems can also be linked to corporate management systems to facilitate company-wide decision making.

There are several business applications. Asset Manager is used to enhance preventive maintenance through continuous monitoring of the performance and condition of control loops,

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field devices, and other process related assets. OptiVISION® is business logic software designed specifically for the pulp, paper, and CWS industries. It is used to manage the customer’s business process including order management, planning, scheduling, production management, quality management, inventory management, and enterprise resource planning integration. OptiVISION helps customers manage pricing decisions and control cost through optimization of manpower, allocation of assets, management of working capital, and prioritization of capital spending. Quality OptiMISERTM is a software tool for storage and analysis of process data and is available in OptiVISION as well as the Da Vinci™ and MXProLine™ quality control systems. This system allows customers to use statistical analysis for comparing real-time process data with lab data and product specifications. Management can use this as a decision making tool based on ongoing audits of product quality and process performance. Quality OptiMISER also acts as a data warehouse for paper quality and can be used to store customer specific information like complaints on product quality and associated resolutions.  

1.4.4.2 Distributed Control Systems

Distributed control systems are used to manage and control industrial processes through measurement inputs, field device outputs, and integrated control algorithms. These systems are also used to monitor performance and quality trends. Honeywell has several distributed control systems, but is primarily focused on implementation of Experion PKS.

Experion PKS is an open, scalable, real-time system used to link people with business requirements, industrial processes, and management of assets. It has been built for storing and sharing knowledge to enhance the effectiveness and decision making capability of people working with the system. Experion PKS includes facility wide process control capabilities. It provides an interface with business software to help manage the entire production process.

enhance business agility, and facilitate management decision making. Experion PKS spans multiple industries and has been designed for integration of legacy Honeywell distributed control and quality control systems.

Experion PKS includes a specific controller option focused on processes, machinery and drives for P3. This controller provides operators with the ability to control the entire process with a single system and utilizes multivariable and statistical process control techniques for process optimization.

TotalPlant® Solution is Honeywell’s earlier version of Experion PKS and is used to collect, store, monitor, and report on facility wide process performance data. TotalPlant can be easily migrated into Experion PKS. This provides existing customers with an upgrade path.

The TDC 2000® and the TDC 3000® are Honeywell’s traditional distributed control systems. Honeywell also offers the Alcont distributed control system which incorporates a higher degree of advanced controls algorithms than a traditional distributed control system. Finally, Honeywell offers PlantScape® for control of both discrete and continuous processes. All systems can be readily upgraded and integrated into Experion PKS.\(^\text{10}\)

To facilitate upgrades and migrations into Experion PKS, Honeywell provides assessment services for legacy distributed control systems. Assessment includes an audit of the process as well as recommendations for migrating interface systems and other hardware, training, and integration. Services can be provided to customer’s using Honeywell systems or competitive systems.

1.4.4.3 Pulping

Papermaking involves the conversion of a raw fibrous material, typically wood, into a flat sheet that can be used as a medium for printing, writing, painting, wrapping, storage, and other applications. The first step in this process is pulping where raw material is converted into fibre.

Pulping Process

The following figure outlines the pulping process.

Figure 1-2: Overview of the chemical pulping process.

Source: Honeywell, figure by Author.
The process starts with raw material supply, primarily wood. The raw material is converted to chips. Chips are broken down into fibre in the downstream pulping process by chemical, mechanical, or combined processes.

In a chemical process, wood chips are added to a mixture of water and chemicals called white liquor and are cooked under pressure and temperature in a digester. This process removes fibre bonding material called lignin and leaves cellulose fibre behind. Typically this is an alkaline kraft process resulting in brown pulp that can be used as is for box grades or bleached for use in white paper grades. However pulp can also be produced by an acidic sulfite process. Chemical pulping produces longer fibres but has a low yield of 40% – 50% of the original wood substance.\(^1\) It is used for softwood species such as fir, hemlock, cedar, spruce and pine or hardwood species such as aspen, birch, beech and oak. Chemical pulping processes must contend with chemical recovery and environmental safety.

In a mechanical process, fibres are separated by mechanical means such as the ground-wood process which introduces blocks of wood to a grinding stone to remove fibres. An alternate mechanical process uses refiners which are a series of rotating discs that separate fibres from chips using shear forces in between adjacent discs. Thermo-mechanical pulping uses steam to heat and soften the chips prior to refining thereby increasing the efficiency of the refining process. Thermo-mechanical pulping also allows production of longer fibres than standard mechanical processes. In general, mechanical pulping produces shorter fibres but has a high yield at approximately 95% of the original wood substance.\(^\text{12}\) It is primarily used for softwood species, and is much more energy intensive than chemical pulping.

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In chemical pulping, pulp exiting the digester is screened to remove large fibre clusters, knots and oversized particles. Next it is washed to remove residual liquor for chemical recovery, thickened, and sent to the bleaching plant or to storage. For many grades of paper, bleaching is required to increase the brightness and whiteness of the pulp stock. The bleaching process consists of several stages of reaction with acidic and alkaline mediums. The stock is washed between each stage to remove residual chemicals. There are many safety hazards associated with bleaching including exposure to poisonous gases, handling of acids and other toxic materials, and potential for explosion. Process control is extremely important for pulp quality and process safety.

A major component of the chemical pulping process is chemical recovery. Recovery helps improve the economics of operation and minimize environmental impact. The alkaline recovery process aims to reduce chemical usage by processing digester effluent called black liquor. Black liquor occurs when lignin, removed from the wood chips during fibre separation, is mixed with the white liquor used in the cooking process. The black liquor concentration is first strengthened through evaporation, and then incinerated. The by-product or smelt from the incineration process is dissolved to form green liquor. Green liquor is then causticized using lime to form white liquor which is then recycled back into the cooking process by reintroducing it to the digester. Lime is recovered from the causticizing process by burning the residual lime mud. Similar processes exist for recovering chemicals in sulfite pulping but will not be presented here. Process controls facilitate optimization of the chemical recovery process.

**Control Solutions for Pulping**

Honeywell offers advanced measurement and control solutions for chemical, mechanical, and recycled fibre pulping processes. These solutions help customers optimize performance
while meeting economic and environmental objectives. All pulping solutions can be integrated into Experion PKS.

The Advanced Batch Digester Solution is used for optimization of the pulp preparation process by controlling wood chip and liquor inputs as well as cooking temperature. Controls are designed to increase pulp yield and throughput, to minimize quality variation and chemical usage, and to help stabilize downstream processes through stable upstream production. The Advanced Bleaching Solution is used along with the Precision Bleaching Sensor to measure and monitor the incoming pulp brightness and control the bleaching process to desired exiting pulp brightness. The system allows management to make effective decisions on what grades to produce based on product quality and cost of production. Chemical recovery is enhanced using the Causticizing Process Knowledge Solution™ to reduce white liquor variation and increase overall mill production through increased causticizing efficiency. This is further enhanced by the Advanced Evaporator Plant Control Solution which is used to control the production of liquor in the pulping process based on target dry solids content in the final liquor. Optimization of these processes can improve energy consumption and reduce cost of production. The Advanced Lime Kiln Solution is used to promote the consistent production of lime for varying production rates to enhance the causticizing operation and white liquor quality.

The Thermo-mechanical Pulp Solution is used for control and optimization of the mechanical pulping and bleaching operations. It helps to reduce pulp variability and to increase the consistency of pulp quality. The Advanced Recycle De-inking Solution is used to control the process for producing pulp from recycled paper products. This system utilizes sensors and controls to optimize production and quality while minimizing use of chemicals. Ink removal is monitored and used as an input to the downstream bleaching process.
The recovery boiler is an important part of the pulping process and is the most expensive component in terms of capital cost. The boiler is typically very large and is used to provide heat for many parts of the process including steam generation, evaporation, and burning of organic material during chemical recovery. Recovery boilers can be dangerous if not maintained and controlled properly, and are therefore a major area of focus and concern for mill personnel. The Advanced Recovery Boiler Solution is used to control the boiler combustion process in an effort to optimize chemical recovery and steam consumption while minimizing pollutant emissions. Boiler operation is stabilized through monitoring and control and increases safety of operation through process visibility.

Loop Scout™, a tool for analyzing control loop performance and recommending corrective actions to improve performance and business impact, is implemented in many of the aforementioned control solutions.13

1.4.4.4 Stock Preparation

In between pulping and papermaking is a stage of the process called stock preparation. Here, pulp is made into a slurry using water and is further refined or beaten to condition the fibres depending on the specific paper grade requirements. Chemical and mineral additives are used to facilitate downstream processes including dewatering, sheet formation, and development of sheet properties such as strength, fluid penetration resistance, optical brightness, and colour14. Control of stock preparation is critical for product uniformity.

After preparation, stock is transported to the headbox, the first element of the paper machine, via the approach system. The primary component in the approach system is the fan

pump. Fan pump control is critical and both flow and pressure must be kept stable to minimize process variation. A stock flow valve is used to control the flow and subsequently the weight for the paper grade being produced on the paper machine at any point in time. Control of the fan pump and stock flow valve are typically handled by the mill’s distributed control system.

1.4.4.5 Papermaking

The first continuous paper machine patent was issued to Nicholas-Louis Robert in 1798 followed by patents for improved continuous paper machine design in 1803 and 1807 to Henry and Sealy Fourdrinier\(^\text{15}\). Although the industry has evolved significantly in two centuries, the manufacturing process remains essentially the same.

**Papermaking Process**

The following figure outlines the papermaking process.

Figure 1-3: Overview of the papermaking process.

![Papermaking Process Diagram](image)

*Source: Honeywell, figure by Author.*

Papermaking is essentially a process of dewatering and drying stock to form a sheet. Stock is spread evenly onto a moving wire at the headbox and is passed through a forming section, a press section, and a drying section en route to the reel of the paper machine where it is wound onto a drum to form a roll of paper. Water and moisture are removed throughout this

process converting the stock with 97% - 98% water and 2% - 3% fibre to paper with 7% - 10% moisture and 90% - 93% fibre.

The headbox is at the beginning, or wet end of the paper machine. The headbox is designed for uniform distribution of stock onto the wire across the entire width of the paper machine. The wire is a finely woven, porous metal or polymer fabric that carries stock from the headbox to the press section. Stock exits the headbox and flows onto the moving wire through a gap formed by the slice lip and the apron. Cross-direction basis weight variation is controlled through relative deformation of the slice lip across the width of the machine, or alternately through localized control of stock consistency as it exits the headbox.

The forming section is between the headbox and the press section and is used to form the paper web through fibre orientation and dewatering. On traditional fourdrinier machines, the forming section is open and the wire transports the stock over a series of dewatering mechanisms with one side of the sheet exposed to air. On more modern machines, twin formers are used where the stock is supported by a wire on both surfaces. In twin forming machines, sheet formation occurs right away as the stock is immobilized between the wires. Water that is removed from the stock during formation is called white water and is recycled for fibre recovery to improve the economics of operation. At the end of the forming section, the web passes over a vacuum roll called the couch roll and is separated from the wire as it enters the press section.

The press section is between the forming section and drying section and is used to remove free water from the paper web through mechanical means. This process has an impact on moisture profile uniformity, surface smoothness, bulk (volume) and web strength. At the beginning of the press section, the paper is transferred from the forming section wire to the pickup felt. The pickup felt is a woven, porous polymer fabric that is used to transport the web in the early portion of the press section. As the web travels through the press section, it is passed
through a series of nips where the felt and sheet are squeezed between two adjacent rolls. As the web passes through the nip, water is transferred from the web to the felt thereby removing moisture from the web. The web is transferred to a new felt for each subsequent press nip. Moisture removal is facilitated through the use of vacuum, and also through application of steam which helps lower water viscosity allowing it to be removed more easily. At the end of the press section, the paper web contains 50% – 60% moisture and does not require support as it enters the dryer section.

The dryer section is located between the forming section and the reel and consists of a series of steam heated drying cylinders. It is used to dry the sheet from 50% - 60% moisture to 7% - 10% moisture through evaporation. At this stage in the process, moisture can no longer be squeezed out of the sheet as it is more tightly bonded to the fibres. This process requires the sheet to be pressed against the dryer can using a dryer felt. Dryer felts are constructed of woven, porous synthetic fabric. As the sheet travels around the dryer can it is heated to the flash point of water. As the paper leaves the dryer can, moisture is flashed off as steam in the pocket between dryer cans and the sheet temperature drops. The sheet is then placed in contact with the next dryer can and the process is repeated. The dryer section is the most expensive component of the paper machine in terms of capital investment and operational costs.

The calender is located between the dryer section and the reel and consists of a series of contacting rolls that the sheet passes through to improve surface finish and thickness uniformity. Calenders typically consist of several rolls stacked in the upright position, but two-roll stacks are also common. Calender rolls can be hard or soft, depending on the process and paper grade. As the sheet passes through the nips or gaps formed between adjacent rolls in the calender stack, it is plastically deformed to improve the caliper (thickness) profile. Calendering is controlled by overall stack loading and incremental loading in specific regions of the sheet. Cross-direction
control is accomplished through the use of zone controlled rolls, induction profiling systems, or hot and cold air shower systems.

After paper passes through the calender stack it is wound onto a large roll called the reel. The finished paper reel is then removed from the machine and transferred to the winder where it is converted into more manageable roll sizes for downstream processing and storage.

Surface coatings are often applied to the paper during manufacturing. A starch solution called sizing is used to increase penetration resistance and is applied to the passing sheet by a size press. A size press is commonly located between two dryer sections. Coating can also be applied to enhance paper properties such as gloss, slickness, colour, printability, and brilliance. Coating is typically a pigment rich formulation containing clay, adhesives, plasticizers, preservatives, and dyes. As coating is applied, voids in the paper surface are filled. Coating is more common on higher quality grades of paper or board and can be applied during the papermaking process, or in an off-machine operation.

**Control Solutions for Papermaking**

Honeywell produces control systems for the production process of all grades of paper including board or container, fine, newsprint, and tissue. Quality control systems are primarily used for measurement and control of paper properties, but are integrated with distributed control systems and business applications to provide control and knowledge management for the entire papermaking process.

Quality control systems include scanners, sensors, control software, and profiling actuators. Scanners can be located at various points along the paper machine but are commonly positioned at the dry end of the paper machine and before coating stations. A scanner is typically populated with a set of sensors to measure sheet properties such as basis weight, moisture, coat
weight, and caliper (thickness). This information is sent to the control system where it is used to determine the cross-direction (CD) and machine-direction (MD) variation in the sheet based on a specific target value for that particular sheet property and paper grade. This information is used to calculate an adjustment that must be made on the paper machine to resolve the variation in the sheet parameter. Adjustments are made using profiling actuators which either physically manipulate the paper machine or the sheet itself to control the process. For example, water can be added to the sheet to correct variation in the moisture profile, while force can be used to deflect a slice lip to help control the basis weight profile.

Honeywell’s quality control system for the pulp and paper industry is Da Vinci. The Da Vinci system consists of an application server where CD and MD control algorithms are located and where sensor measurements are processed into control actions for actuator systems and other field devices. The Da Vinci system also provides trending and reporting capabilities as well as statistical analysis tools for operators and management.

Paper measurement systems consist of sensors and scanners. Scanners have a sensor head that travels back and forth across the sheet, collecting CD and MD sheet property information. Sensor technology involves the use of X-rays, nuclear sources, infrared light, and cameras for measuring sheet properties and is the foundation of the quality control systems business. Sensor technology is historically the key area of differentiation in quality control system products and is attractive to customers due to the potential improvement in paper quality through measurement and control.

Remote distributed sensing involves spreading measurement throughout the paper machine to determine local variation as well as time based variation. SpectraFoil MD is used for measurement of the sheet dewatering or drainage performance at the wet end of the paper machine. Measurements can be used as part of vacuum and other drainage controls, or used as
inputs for controlling chemical addition or refining operations. The ExPress Moisture scanner is
used specifically to measure the moisture profile in locations that are not accessible to traditional
scanner systems such as the press section. ExPress Moisture is also available as a single point
sensor that can be used for spot measurement of the MD moisture profile and drying performance
of the paper machine. GelView® is used for measuring coating consolidation and facilitates
optimization of the coating drying process as well as enhanced paper print quality.

Performance CD and Performance CD Multivariable are advanced control algorithms
available with Da Vinci for traditional or multivariable cross-direction control of paper sheet
properties. Performance CDOpen™ is a stand-alone system that allows Honeywell CD controls
to be used with competitive scanning systems or with existing Honeywell systems where a Da
Vinci upgrade is not possible. Performance MD and Performance MD Multivariable are software
packages available with Da Vinci for traditional or multivariable machine-direction control of
paper sheet properties.

IntelliMap® is used for establishing the relationship between actuator movement and
process change for the relevant sheet property. It facilitates optimization of control system and
profile actuator performance. IntelliMap can be used with both traditional and multivariable
control schemes.

Profile actuator systems are typically comprised of an array of actuators mounted into a
housing, or beam, that spans the width of the paper machine. The output of individual actuators
can be altered to increase or decrease the particular paper property in an isolated region of the
sheet, thereby providing cross-direction profile correction.

Web Monitoring Systems are used for detecting the cause of sheet or paper web breaks.
This information is used to minimize downtime and increase machine productivity. Web
Inspection Systems are used for detection and identification of paper defects such as holes or
foreign matter. Papermakers use this information to remove defects and minimize downstream processing concerns, thereby improving paper quality for their customers.

Other quality measurement and monitoring systems include JumboMaster® which is used for optimizing the amount of paper on a paper roll for downstream processing and waste minimization. Machine Sentinel is a software package used for monitoring, tracking, and managing the paper production process in terms of paper quality. It is used to establish relationships between quality variations and process disturbances such as vibrations in the press section, pulsations in the stock supply system, or the condition of rotating equipment. Machine Sentinel facilitates informed decision making related to maintenance and quality. Quality Companion™ is a system for collecting data from all mill quality control systems and storing it in a relational database for reporting and analysis. Quality data can be analyzed for several systems at the same time using a single system.\(^\text{16}\)

1.4.4.6 Printing

Printa is Honeywell’s system for automation of the printing process and focuses on monitoring and reporting on the condition of the printing press during operation, start-up and shutdown. Closed-loop colour control is available for ensuring consistent ink application, clarity, and density. Hilcont® is used for monitoring the paper web throughout the printing process to identify causes of web breaks, similar to the Web Monitoring System available for papermaking.\(^\text{17}\)


1.4.4.7 Continuous Web Solutions

MXProLine™ is the quality control system for Continuous Web Solutions (CWS) and can be integrated into Experion PKS. Similar to quality control systems for paper, MXProLine includes scanners, sensors, and control applications for rubber, plastic, and metal sheet manufacturing processes. It can be used with both Honeywell and third-party systems and field measurement devices. For the rubber calendering process, the system is used for measurement and control of weight, thickness, sheet width, and other rubber sheet quality parameters. For plastic film, this system is used for measurement and control of weight, thickness, composition, colour, moisture, opacity, and other plastic sheet quality parameters. Finally, MXProLine is also used for aluminum manufacturing including cold rolling, foil rolling, continuous casting, hot rolling, and reversing processes.18

1.4.4.8 Services Offered

Honeywell has a wide range of services available to customers to help ensure their automation systems are working in an optimal manner. Technical Assistance Centres are set up to offer telephone support for customers and Honeywell site personnel on a twenty-four hour basis. Solution Support Online is a website where technical bulletins, product manuals, and other useful product documentation can be found to facilitate troubleshooting and problem resolution.

CWS Support Program offers unlimited access to technical support for CWS customers. Additional services are available to support on-site efforts that cannot be handled through regularly scheduled visits or remote support. System migration programs are also in place to ensure timely upgrades to both hardware and software including checkout and commissioning.

PM ProActive Service is a program involving preparation of a customized service and maintenance plan that can be carried out by the customer or Honeywell representatives. Honeywell service personnel can be located at customer sites for full-time system support or can be scheduled to make regular site visits. Tools are configured specifically for use with the customer’s equipment and are available to both Honeywell and customer personnel responsible for system maintenance.

Honeywell offers QCS Remote Monitoring Service for customers with Da Vinci or legacy MXOpen products. This service allows customer control engineers to work with Honeywell personnel to monitor and optimize operation of their quality control system including control tuning and profile actuator operation. Tools can be configured to notify Honeywell personnel when specific performance variables have surpassed operating limits to facilitate prompt corrective action. A secure Virtual Private Network is used for this service.

Results ROI Services involve comprehensive analysis of paper machine operation to benchmark performance. Experts are assigned to the site to optimize control and performance while ensuring preventive maintenance is also carried out. Experts have access to Honeywell’s knowledge base to facilitate quick response times for troubleshooting and problem resolution.¹⁹

1.5 Summary of Introduction

As shown, Honeywell has built up its presence in the pulp, paper and printing and continuous web solutions industries through acquisitions and product development. It is well established in these industries and has a comprehensive portfolio of automation solutions spanning the entire manufacturing process. An industry and competitive analysis is provided next to support development of a strategy for Honeywell in this business vertical.

2 INDUSTRY ANALYSIS

This section provides an analysis of the automation solutions industry for pulp and paper. A definition of the industry is provided, followed by an extensive five forces analysis. Industry attractiveness is discussed based on the outcome of this analysis, and industry key success factors are identified. Finally, a competitive analysis is made for major competitors in the industry including identification of opportunities and threats for Honeywell.

2.1 Industry Definition for Automation Solutions

For the pulp and paper industry, Honeywell’s automation solutions include distributed control systems and quality control systems. Distributed control systems are employed throughout the pulp and paper manufacturing process and are used primarily for controlling flow, pressure and temperature. Inputs taken from field instrumentation are analyzed in software control algorithms to determine required control action, and adjustments are made to process control hardware such as valves and pumps to minimize process variation. Quality control systems are typically used for the papermaking process “to control paper quality parameters of basis weight, moisture and caliper. Paper machines cannot meet customer quality requirements without them.”20 Quality control and distributed control systems are often used together, and both systems are capable of integration with Experion PKS. Inclusion of these systems in Experion PKS is critical as it allows Honeywell to offer a comprehensive, mill-wide control solution with tools to manage the entire operation and facilitate business level decision making. This helps protect a customer’s existing investment in automation by providing and upgrade or migration path towards Experion PKS.

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For distributed control and quality control systems, Honeywell is part of an oligopoly consisting of Honeywell, ABB, Metso Automation, Emerson, and Yokogawa. Other large automation companies such as Invensys, Rockwell and Siemens will not be considered further due to their lack of presence in the pulp and paper industry or inability to provide both distributed control and quality control systems. Voith Paper Automation is a significant player in quality control systems but not for distributed control systems and will not be considered in detail. Finally, smaller companies that compete in niche areas of this market will not be considered further.

The following external analysis will focus on the automation solutions industry for pulp and paper. For purpose of analysis, automation solutions will be considered to consist of distributed control systems and quality control systems.

2.2 Five Forces Analysis of the Automation Solutions Industry

An analysis of the automation solutions industry is required to identify strategic alternatives for Honeywell. Using Porter’s five forces, the analysis determines the attractiveness of the industry for both incumbent firms and new entrants, and assesses the level of competition. The outcome of the analysis is identification of the industry key success factors. These factors are subsequently used as part of the competitive analysis to compare Honeywell against its major competitors and to identify opportunities and threats which are taken into consideration in development of strategic alternatives.

2.2.1 Threat of Entry or Barriers to Entry

Economies of scale are an important barrier to entry for the automation solutions industry. Scale increases the company’s ability to control cost through volume purchasing of distributed control system hardware including input/output modules, servers, processors, and workstations. With the exception of advanced, industry specific control algorithms, distributed
control systems can be used in multiple industries. In this situation, scale enhances a company's ability to leverage technical development in other industries thereby minimizing exposure to industry specific cycles. Quality control system manufacturing involves significant amounts of precision machining and customized fabrication. Increasing manufacturing volume helps control cost by distributing factory overhead and setup time over a larger number of parts. Companies with scale can also leverage their purchasing power via integration of supply chain and use of purchasing agreements across divisions. As paper is manufactured all over the world, scale enhances service capability through possession of large support networks. This makes it possible to address customer concerns in a timely manner thereby reducing machine downtime and lost production.

Product differentiation is a barrier to entry. Distributed control systems are fairly homogeneous. All companies offer open, scalable architecture that allows integration of competitive systems and provides a migration or upgrade path for existing installed bases. Integration of distributed control systems with enterprise level, business management systems provides some degree of differentiation, but all major competitors offer solutions in this area. Quality control systems are also fairly homogeneous and products have become commoditized. At a lower level, product differentiation exists based on technical merit and quality. However, it will be difficult for new entrants to convince customers to purchase their product in the absence of significant benefit in cost or performance over proven products. Innovations which have a significant impact on productivity or quality have slowed making it even more difficult to differentiate on technology for quality control systems. With commoditized products, differentiation in other areas such as service must be explored.

Capital requirements are generally high in the automation solutions industry and represent a significant barrier to entry. A large amount of research and development (R&D) is required for advanced software applications and hardware for distributed and quality control
systems. With commodity-like products, return on R&D investment is not high. In addition, quality control systems require companies to have in-house manufacturing capability with skilled labour or be willing to pay a premium for outsourcing. The abusive papermaking environment commands the use of expensive, corrosion resistant raw materials thereby increasing the cost of inventory. Payment cycles are long and new entrants must be able to remain afloat while waiting for payment. This can be particularly challenging for distributed control systems where the timeframe for physical installation, configuration and commissioning can easily span several months. Negotiation of favourable contract terms can help mitigate concerns in this area.

Cost disadvantages for new entrants in relation to experience and the learning curve are not overly significant for quality control systems as new entrants commonly arise from within the papermaking or quality control systems industries. However, successful implementation of distributed control systems and higher level, business management systems requires a lot of experience as well as knowledge of the entire pulp and paper process. This experience is difficult to acquire and can only be gained through years of involvement in the industry. Alternately, resources can be solicited and acquired from incumbent firms. Experience is also critical for retrofits and upgrades where knowledge of legacy and third party systems is essential. A cost disadvantage can arise from government funding to incumbent firms for R&D, but new firms are able to apply for similar funding. Due to the global nature of the industry, new entrants may have an advantage in selection of cost effective locations for operations over incumbent firms that are strongly rooted in existing locations. However, large multinationals typically have the capital and knowledge to set up or relocate facilities to these same regions.

Access to distribution channels is a significant barrier to entry. Although shipping may not be an issue, other aspects of distribution including sales, installation and aftermarket services can be challenging to develop. Relationships are important in the paper industry. Local talent with an understanding of the culture may be required to establish and build customer relations.
This can be especially helpful when selling technology to mill management or when working with mill production personnel on system installation, commissioning and operation. Global reach is also important as not all market regions are strong at the same time.

Government acts as a barrier to entry via imposition of tariffs and other policies that impact a foreign company’s ability to operate in various host countries. Environmental regulations vary and impact control system design. To account for this, suppliers may develop different strategies for different regions. Furthermore, there are numerous certifications such as Conformité Européenne (CE), Canadian Standards Association (CSA), and Underwriter’s Laboratory (UL) which must be satisfied to ensure compliance with health, safety and environmental regulations before products can be used in certain countries. Patent rules and enforcement also vary by country and competitive advantage can be limited if not enforced. Greenfield projects in developing countries will be approached with caution if there is concern for policy stability.

Industry maturity and the market share possessed by incumbent firms act as a barrier to entry. Global firms dominate the market in this industry and have the established relationships and financial resources to make entry challenging for new firms. Overall, the market is mature; most mills have automation systems, and paper companies opening new mills tend to work with suppliers used at other locations for consistency in operations and enhanced global support.

Overall, threat of new entrants is low as barriers to entry are high for the automation solutions industry.

2.2.2 Bargaining Power of Suppliers

Most distributed control system providers have moved towards the use of standard, commercially available hardware. Although this limits supplier power in general, it also allows suppliers to maintain control over design and maintenance requirements. This forces distributed control system companies to upgrade and patch systems as required by suppliers. Supplier power is higher for quality control systems as hardware utilizes quality raw materials such as stainless steel sheet and plate. Many purchased components such as nozzles, printed circuit boards, and optical equipment are also critical to the quality and performance of quality control system technology. Although many suppliers of such items are available, switching costs can be high. This, along with low purchasing volumes, strengthens supplier power. Further complicating matters are programs that strive to increase buyer working capital by making payment terms more favourable for the buyer, straining supplier relations.

As mentioned, supplier switching costs can be high. For distributed control system hardware, issues could arise in terms of compatibility and support for the installed base. For quality control system products, designs are standardized and changes require significant effort to document and to ensure backwards compatibility. With low sales volumes, searching for alternates or changing existing designs can be cost prohibitive unless performance is an issue. On the other hand, profitability is a concern with commoditized products and cost reduction can be critical to success. The cost benefit of changing suppliers needs to be evaluated in each case.

Substitute switching is not highly prevalent in the automation solutions industry. Firstly, quality control and distributed control systems represent a significant investment for papermakers. Secondly, the papermaking environment is demanding and reliability is very important. Once a product or material has been proven for an application, change is difficult to justify.
Global purchasing agreements can mitigate supplier strength. This can be an advantage for larger companies if their supply chain is integrated across divisions, increasing volumes and providing greater access to supply channels.

Attracting and retaining skilled labour is a challenge. Although the automation solutions industry is very technology oriented, it is focused on the paper industry which is mature and not considered “sexy” when compared to high tech industries. Firms must compete for talent inside and outside the industry, and incur cost in recruiting and training when experienced employees move on. If a company wants to pursue a differentiation strategy, talented employees are required for R&D, engineering and manufacturing. In hot employment markets, compensation will be higher for research scientists and engineers. As quality control system products require skill and precision to make, compensation is often higher for manufacturing personnel as well. Setting up operations in low cost centres is an option, but talent is not always available. This issue is magnified in a growing economy like China where there are many employment opportunities and high turnover rates. However, this will become less of an issue over time as there is significant growth of graduates of engineering and other technical degree programs in developing nations. “In 2004, China graduated about 500,000 engineers, while India graduated 200,000 and the United States graduated 70,000. In less than five years, China has more than doubled the number of their students who have graduated from college each year with degrees in engineering.”22 This may lead to an increasing trend in movement of both operations and technical development to less costly regions over time, where talent is more readily available for mature industries and growing industries alike.

Overall, supplier power is quite high.

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2.2.3 Bargaining Power of Buyers

Pulp and paper manufacturers buy automation solutions for their operations. Paper machine builders also purchase quality control systems as part of turnkey solutions. Buyers are not highly concentrated. The market is mature in developed nations, and most existing paper machines already have quality control and distributed control systems installed. Developing nations represent a growth opportunity for new and existing machines. Asian countries, China and India in particular, are investing heavily in large projects such as paper mills. They are increasing their focus on export manufacturing operations.

The figure below illustrates global distributed control system (DCS) revenues forecast for the period 2001 through 2011 (actual figures through 2004).

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As shown, the distributed control systems market is forecast to grow at an average of 1.2% between 2007 and 2011. Growth is primarily in Asia while North America and Europe remain relatively flat. In a mature market, a growth region provides buyer power as competition increases to capture market share. Furthermore, the open nature of distributed control systems has decreased customer loyalty and made it easier to shop around. A large portion of cost associated with distributed control systems is installation and wiring. If switching suppliers entails significant hardware installation, buyer power is diminished. Buyer and supplier power alike can be diminished by purchasing agreements.

The figure below illustrates industry revenues from quality control systems (QCS) between 1990 and 2005, excluding revenues from service.

**Figure 2-2: Global QCS systems revenue.** Revenue from service not included.

![QCS Systems Revenue](image)

*Source: Fadum Enterprises Inc., figure by Author.*

Generally, the quality control systems market has been declining since 1995. Sales are difficult and buyer decisions have a significant impact on a supplier’s ability to meet targets for a given year. Products are commodity-like thereby diminishing buyer loyalty. However, the impact of quality control systems on paper quality and production throughput makes them important to buyers even in Greenfield projects where they represent a small percentage of overall cost. Buyers do represent a small threat of backward integration, especially for profile actuator systems.

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One area of growth in quality control systems is service. In 2005, this represented $252 Million USD in revenues.\textsuperscript{38} There is a trend away from pure maintenance services towards process optimization as paper manufacturers focus on controlling cost and lose expertise in the automation area through labour force reductions. The opportunity for service spans the entire market. In upgrade markets like Europe and North America, services can be provided to help buyers upgrade or migrate from competitive systems. In addition, system optimization and maintenance services can be offered. In growth regions like Asia where there are more new machine projects but little distributed control and quality control systems expertise, optimization services are beneficial.

Switching costs are high for buyers. Distributed control systems involve a significant investment in wiring and hardware for handling inputs and outputs. Quality control systems represent a significant economic investment and are customized to suit the paper machine. Replacement of either system can be costly in terms of installation expenses, lost production, and training.

Buyers can be segmented into three categories. Early adopters will pay for new technology to gain competitive advantage and are powerful; both relationship and technical excellence are important to these buyers. These buyers are typically manufacturers of premium coated grades or tissue grades. Price sensitive customers want the best deal and drive suppliers to focus on cost; cost is more important than relationship to these buyers. These buyers are typically manufacturers of commodity grades like newsprint. Balanced buyers want technology but are not willing to pay a premium for it, and in this sense may be the most powerful as they drive both cost and differentiation; relationship is extremely important for these buyers. Delivery is important for all three segments as production shutdowns are required for installation of

automation systems. Buyers are in a low margin business and are cost conscious; however the savings realized from small improvements in production are significant and provide incentive for continued innovation by suppliers.

Buyers have power because their purchases are very important to the distributed control and quality control systems supplier. However, this power is diminished by the fact that buyers require both distributed control and quality control systems to be able to compete in their own market.

2.2.4 Threat of Substitutes

Substitutes for distributed control systems are available in the form of supervisory control and data acquisition (SCADA) systems. SCADA systems link programmable logic controller systems, remote operator stations, and a central processor via a communications network. The primary advantage of a SCADA system over a distributed control system is cost. SCADA systems can be fifty percent or less of the cost of an equivalent distributed control system.\(^\text{39}\) These systems tend to be smaller, which may represent a disadvantage in growing regions where the focus is on building larger plants. The Chinese government recently announced plans to close smaller plants where efficiencies from economies of scale cannot be realized.\(^\text{30}\) Distributed control system vendors must emphasize the capability for integration with higher level enterprise systems, as well as the use of common systems across their buyer’s global operations to diminish the impact of this potential substitute.

There are no real substitutes for quality control systems. However, there are substitutes for paper which can indirectly impact the quality control systems industry. Fortunately, demand

for printing, writing, tissue, and box grades is growing in developing nations.\textsuperscript{31} “The demand for paper in India is growing at a rate of 7 – 8\% per annum, compared to 2 – 2.5\% in developed countries.”\textsuperscript{32} Capacity expansion is also on the rise in these regions. For example, China’s Dongguan Nine Dragons Paper Co., Ltd., one of the largest packaging producers in the world, recently purchased four new paper machines from Voith Paper.\textsuperscript{33}

Overall, threat of substitution is low even though options are available for distributed control systems.

\textbf{2.2.5 Competitive Rivalry}

The automation solutions industry for distributed control and quality control systems is mature but is experiencing some growth in developing nations. The industry can be split into new machine projects and migration or upgrade projects. For customers with existing distributed control systems, older systems are upgraded to newer technology or migrated towards use in a higher level enterprise system. It is difficult for machine vendors to force use of their distributed control system as it extends outside the machine to the entire pulp and paper operation. Therefore, opportunities are more balanced across the distributed control systems market for all competitors. For quality control systems, new machine business is dominated by Metso and Voith as they embed measurement and control products into their machines. They also tie performance guarantees to the use of their equipment. In these new machine projects, it is very difficult for papermakers to force the use of competitive quality control systems unless specific technology is not available from the machine builder. Strong customer relationships and corporate level agreements can help in this regard. The migration and upgrade business is open.

to all players but Honeywell and ABB have an inherent advantage due to their market share and vast installed base.

Firms compete in many areas. Due to the homogeneous nature of most quality control system products, rivalry is high on price. This leads suppliers to focus on cost reduction, but some flexibility exists for new technology. Price is also important for distributed control systems as they represent a significant investment for the customer, and are easily integrated with competitive systems due to their open architectural design. Rivalry is high on brand for distributed control systems as firms exploit their reputation and installed base. Rivalry is medium on brand for quality control systems as all major players have a decent reputation in the industry. However, rivalry intensifies at the product level as firms exploit poor customer experiences with competitive systems while marketing the benefits of their own quality control products. Rivalry is low for distribution as all major companies are multinational. Rivalry is medium-high for service and expertise as all companies have lengthy industry experience and capability for on-site or remote servicing. Some companies are placing more emphasis in this area as a means of differentiation. competition is further intensifying as companies offer services to help transition customers from competitive systems to their own. Relationships are important and are always being exploited to protect or steal market share. Installed base, track record of success and support are all important factors in maintaining relationships. Experience is important for competition, especially as papermakers downsize their workforce and become more reliant on suppliers for their expertise and application knowledge. This is even more critical for new developments with unproven benefits. Finally, rivalry is medium on technology. Although all companies strive to develop the best distributed and quality control systems, customers often do not make their decisions based on technology alone thereby diminishing its impact on rivalry. Unique technologies represent an exception and can provide sufficient differentiation to influence customer decisions.
Overall, competitive rivalry is high. The market is mature, has well defined segments, and is susceptible to cycles. Products are commoditized, but new technology remains attractive to customers thereby providing incentive for suppliers to innovate.

### 2.3 Automation Solutions Industry Attractiveness

Based on the five forces analysis, industry attractiveness is medium-high for incumbent firms and low for new entrants. Growth opportunities exist in Asia, barriers to entry are high, supplier power is high, buyer power is medium-high, threat of substitutes is low, and competitive rivalry is high. This is further supported by repeating the analysis using the industry structure questionnaire developed by Professor Ray Sutaari of Wilfred Laurier University. This questionnaire is used to rate the automation solutions industry as favourable, moderate, or not favourable for each of the five forces. Results indicate that the industry overall is mildly favourable with favourable barriers to entry and threats of substitution, moderate bargaining power for buyers and suppliers, and unfavourable intensity of rivalry amongst competitors. Refer to Appendix A for the further detail on the questionnaire.

### 2.4 Key Success Factors for Automation Solutions Industry

The five forces analysis highlights several key success factors (KSFs) for the automation solutions industry which will be presented in this section in detail. KSFs are subsequently weighted in terms of importance to the industry and are used in the competitive analysis to assess Honeywell against its major competitors. The following is a list of the major key success factors identified by the preceding industry analysis:

1. Relationship
2. Cost control
3. Integrated supply chain
4. Service capability
5. Technology leadership
6. Global reach
7. Industry presence
8. Financial capacity and investment in industry
9. Employee attraction and retention
10. Operations capability

Relationship is the most important KSF for this industry. Established relationships act as a barrier to entry. Strong supplier relations can offset any strain created over negotiation of terms that favour one party over another, and can help maintain supply in light of changes in demand or timing of orders. This latter point is becoming more critical as firms adopt just-in-time strategies and cope with implementation. Customer relations are critical even though loyalty has diminished over time. Papermakers have long memories and are risk averse; they are inclined to work with suppliers that they have a solid relationship with. A strong, healthy relationship can also increase customer lifetime value and ensure the two companies continue to work together to implement new technology, optimize system performance, and upgrade installed systems. Finally, relationships help protect a company’s installed base and are therefore an important factor in remaining competitive.

Cost control is extremely important in this mature industry, even in areas of growth like Asia. Products are commoditized and customer loyalty has diminished with the trend toward more open solutions. Pulp and paper manufacturers are in a low profit business and maintain a focus on cost reduction. Suppliers to the industry must keep prices down to compete for orders and prevent substitute switching. This means a focus on cost to improve margins. Large multinationals with integrated supply chain have an advantage if they can leverage their scale and improve cost with global purchasing agreements that span industry segments.

A strong integrated supply chain (ISC) is critical for success. Companies that can leverage supply across industries to increase volume and reduce cost will benefit. Supplier power
is also diminished if ISC has the ability to facilitate research of and transition to lower cost alternatives for existing components, raw materials, and other product inputs. ISC promotes cost control which, in turn, allows pricing flexibility and increases a company’s ability to compete in a highly rivalrous industry.

Service capability is important as customers focus less on technology and more on optimization and control of their operations. Service provides an element of differentiation in a mature industry with commoditized products. This makes entry difficult for new firms with less experience and fewer resources. Service is also important as customers look to automation suppliers to offset the loss of talent within their own organizations due to cost control measures and workforce reductions. Service capability is also critical for competition. Due to the open nature of distributed control systems, the potential for integration of competitive systems, and the size of the upgrade and migration market, service offerings have expanded to include system transition along with more traditional maintenance and optimization services. Companies with expertise in all areas as well as global support for these offerings will have an advantage.

Although technology has become less important as products become more commoditized, it remains a KSF due to the potential impact on cost of customer operations. Technology must be open, scalable, and capable of integration with competitive systems. In addition, it must be possible to integrate into enterprise level systems. Companies that can offer the entire solution will have an advantage as customers look to build or consolidate their existing systems with a single supplier to take advantage of optimization and maintenance services. Although the industry is mature, innovation is still warranted as a means of sustaining reputation and stealing market share. Innovation of unique technologies can also provide sufficient differentiation to influence customer purchasing decisions.
Global reach is essential in today’s market. Customers are global and the industry is cyclical. To minimize the impact of downturns in specific regions, companies must be able to access all markets and must have resources in all regions. Furthermore, distributed control and quality control systems have a relatively long life so it is important for companies not to limit themselves in terms of their customer base. Use of a global ISC promotes cost control through volume purchasing and low cost sources. As customers branch globally, companies can maintain relations and grow their business with these customers through global operations. This is especially critical for servicing as downtime is very costly in this industry. Quick action is required and, hence, a comprehensive global support network must be maintained.

Industry presence in terms of market share, installed base and reputation is important. In most of the world, the market is not growing. In these areas, the installed base represents the greatest opportunity in terms of upgrade or migration to newer, more comprehensive automation systems. Market share can act as a barrier to entry by limiting the market available to new firms. With risk averse customers, companies can also leverage their reputation in maintaining their installed base, making it difficult for new firms and incumbent firms alike to steal market share.

Financial capacity and investment in the industry is an important factor due to the amount of capital required for development of distributed control and quality control systems. Furthermore, companies must also be able to continue operations while waiting for payment due to lengthy contracts and installation times for distributed control and quality control systems. A significant investment in the industry not only strengthens a company’s overall product and service offering, it enhances a company’s reputation through the implied long-term commitment to its customers.

The ability to attract and retain talent for a mature industry is critical for success. This is especially challenging in hot markets where there are many opportunities or where there are other
more attractive employment options. Maintaining experienced personnel in existing markets is also essential if companies want to capitalize on migration and upgrade opportunities. Significant experience is required for working with older, legacy systems.

Operational excellence in terms of manufacturing and distribution is also a KSF. Although low cost is important, quality and reliability cannot be sacrificed. Furthermore, companies must be able to design systems, acquire materials, manufacture, ship, deliver and install on schedule. Installation of quality control systems typically requires a shutdown of papermaking operations which often coincide with major maintenance activities. As downtime represents lost profit in a low margin business, missing or extending shutdowns is a serious concern for customers. A supplier’s competitiveness is seriously impacted by its ability to meet commitments.

2.5 Analysis of Competition in Automation Solutions Industry

This section provides a brief profile for each of Honeywell’s major competitors in the automation solutions industry. A breakdown of market share in distributed control and quality control systems is provided, followed by a comparison of Honeywell and its competitors against industry key success factors. Finally, an assessment of the results including identification of opportunities and threats for Honeywell is provided.

2.5.1 Supplier Profiles for Major Competitors

2.5.1.1 ABB

ABB is the market leader for distributed control systems based on 2004 revenue data, and is second to Honeywell for quality control systems based on average market share from 2003 to 2005 in terms of installations. ABB’s enterprise level product is Industrial IT System 800xA, which combines distributed control systems and plant automation with asset optimization and
business processes in a single package. System 800xA can also be used to link systems that are in different geographic locations. This benefits customers by allowing them to coordinate operation, maintenance, installation, and commissioning amongst various plants or machines. ABB offerings for pulp and paper span the entire operation and can be integrated with other ABB products and competitive systems. One advantage for ABB over Honeywell is its ability to supply drives to complement its process control automation package. ABB focuses on increasing customer productivity through reduced downtime and strives to preserve and capitalize on its installed base moving forward.34

2.5.1.2 Metso Automation

Metso Automation is part of a duopoly for paper machine manufacturing with Voith Paper. As quality control and distributed control systems represent a small portion of total machine cost, Metso has a pricing advantage in the new machine market. Metso also designs and embeds quality control systems into the machine making them difficult to replace with competitive systems. This helps secure future replacement and upgrade business. Metso owns pilot machines, such as PM2 at the Rautpohja Paper Technology Centre in Jyväskyla, Finland, that it uses for its own research as well as for customer research.35 This provides Metso with a unique service offering and a significant advantage in testing new innovations in a papermaking environment. Metso’s primary focus is papermaking and they have a strong reputation in the industry. However, this focus also exposes Metso more than its competition to the cyclical nature of the paper industry. Metso has caught up to other quality control system suppliers in terms of technology and is in an excellent position for growth in market share.

2.5.1.3 Emerson

Emerson is a player in the distributed control systems market but does not offer quality control systems for the pulp and paper industry. However, Emerson is strong in field devices and control valves and capitalizes on its reputation across industries in this area. DeltaV is Emerson’s distributed control system offering which, along with its AMS Suite for asset management and optimization, can be integrated into PlantWeb for a total enterprise level solution. Emerson is continuing to grow as an automation solutions supplier and is increasing its strength as a competitor in the pulp and paper industry.

2.5.1.4 Yokogawa

Yokogawa has an ambition to be the number one process automation supplier by 2010. In 2005, Yokogawa embarked on a global marketing campaign to increase customer awareness of its products, its corporate philosophy and its brand. Yokagawa’s distributed control system offering is called Centum. Centum is a building block of VigilantPlant, an enterprise level solution linking together production management, asset management, measurement and control, design and engineering, installation and commissioning, and safety for a plant-wide control solution. Through its marketing efforts and ambition for industry leadership, Yokogawa is increasing its presence in the paper industry outside of its traditional market in Japan.

2.5.2 Market Share for Honeywell and Major Competitors

ABB is the market leader for distributed control systems followed closely by both Metso and Honeywell. These three companies have just over 70% of the total distributed control

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systems market share for pulp and paper, based on revenues. Honeywell is the leader in quality control systems with ABB close behind. Between them, Honeywell, ABB and Metso have 94% of the quality control systems market share for pulp and paper.

The figures below illustrate the market share held by major competitors for distributed control systems and quality control systems, respectively. For distributed control systems, the “Others” category includes Emerson, Yokogawa, Siemens and Invensys. For quality control systems, Emerson is not shown.

Figure 2-3: Worldwide DCS system market share by revenue, 2004.40

Worldwide DCS Market Share, by Revenues, 2004

Honeywell, 21.2%
Metso, 23.5%
ABB, 25.4%
Others, 29.9%

Source: Frost and Sullivan, figure by Author.

2.5.3 Comparison of Major Industry Competitors to Industry Key Success Factors

The following table ranks each competitor against industry key success factors. A scale of one to ten has been used where one represents weak and ten represents strong in the area represented by each KSF. The KSFs have been weighted as to their relative importance.
Table 2-1: Comparison of major industry competitors against key success factors.

<table>
<thead>
<tr>
<th>Industry Key Success Factors</th>
<th>Weight</th>
<th>Honeywell</th>
<th>ABB</th>
<th>Metso</th>
<th>Emerson</th>
<th>Yokogawa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship</td>
<td>15%</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Cost Control</td>
<td>13%</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Integrated Supply Chain Strength</td>
<td>9%</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Service Capability</td>
<td>13%</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Technology Leadership</td>
<td>10%</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Global Reach</td>
<td>6%</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Industry Presence</td>
<td>10%</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Financial Capacity and Investment in Industry</td>
<td>7%</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Employee Attraction and Retention</td>
<td>9%</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Operations Capability</td>
<td>8%</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>7</td>
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<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td>74</td>
<td>72</td>
<td>74</td>
<td>62</td>
<td>66</td>
</tr>
<tr>
<td><strong>Weighted Total</strong></td>
<td>7.05</td>
<td>7.15</td>
<td>7.45</td>
<td>6.08</td>
<td>6.56</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author.

2.5.4 Assessment of Competitive Analysis

The competitive analysis has identified several strengths for Honeywell including relationship, technology and global reach. Honeywell is well established in the pulp and paper industry having introduced distributed control systems in the 1970’s. This position was reinforced through the acquisition of Measurex, along with its history of providing innovative quality control products to the paper industry, in the 1990’s. As a result, Honeywell has a large installed base and strong customer relationships. This represents an opportunity for future business including retrofits, upgrades, and long-term service agreements with existing customers.

Although the industry is mature, Honeywell has continued to innovate and find new ways for papermakers to improve product quality and increase productivity. It has one of the most complete solutions on the market in Experion PKS with a full complement of integrated distributed control and quality control systems for total control of the pulp and paper process.

Technical leadership represents an opportunity for Honeywell to utilize differentiation and customer focus in marketing its products against the competition. Honeywell also has a worldwide network of sales, service, projects and operations focused on pulp and paper. This represents an opportunity in adapting to a shifting marketplace.

The assessment has also identified several weaknesses for Honeywell including cost leadership, service capability, industry presence, financial capacity and industry investment. In a
mature market with commoditized products, product cost becomes an area of focus. However, Honeywell has been slow to shift focus from technical leadership and differentiation to cost. This represents a threat for Honeywell as buyers continue to operate in a low profit industry and increase their attention on cost as a means to increase profitability. Service is a major growth opportunity in the automation solutions industry; however Honeywell is focusing more on technology development than service. This represents a threat for Honeywell if it cannot capitalize on its vast industry knowledge to develop a more comprehensive service offering.

Another significant threat is the growth in market share and industry presence by Metso. Metso has a corner on the new machine market and, by embedding solutions into these machines, has secured future replacement and upgrade business. Metso's continued development in both distributed control and quality control systems allows them to compete for existing retrofit and upgrade business as well. With pilot machines for testing and continued investment in development, Metso has an advantage for innovation and provision of unique service offerings.

Contrarily, as a large corporate conglomerate Honeywell must distribute development funding across many business units. With the presence of other growth industries, capital funding and investment in development for the mature pulp and paper sector can be limited, making it more difficult to compete. Other threats include the ability of smaller players to partner with the machine builders to diminish specific areas of technical advantage.

2.6 Summary of Industry Analysis

The external analysis has identified that the automation solutions industry for pulp and paper is mildly attractive for incumbent firms such as Honeywell. In terms of industry key success factors, Honeywell is strong in the areas of customer relationships, technology leadership and global reach. However, Honeywell is not as strong in the areas of cost leadership, service capability, industry presence, and investment in the industry. Although Honeywell has a large installed base, it is losing market share to competition like Metso. Metso has a growing presence
in the industry and a unique competitive advantage in its ability to specify and build its own automation solutions into new paper machines. This, along with Metso’s high degree of focus on the paper industry, represents a challenge for Honeywell and other competitors. Honeywell’s strengths and weaknesses identified in this analysis will be taken into account in formulating a strategy for automation solutions in the pulp and paper industry.
3 INTERNAL ANALYSIS OF HONEYWELL IN THE AUTOMATION SOLUTIONS INDUSTRY

The external analysis indicates that there are certain elements of both cost and differentiation strategies that are appropriate for Honeywell. A cost leadership strategy is relevant given Honeywell’s high relative market share. This is further supported by the maturity of the automation solutions industry for distributed control and quality control systems. However, a differentiation strategy also makes sense as papermakers increasingly look towards automation and control suppliers to help improve their process and solve their papermaking problems. This section provides an internal analysis of Honeywell and evaluates management preferences, resources and organizational capabilities in relation to each strategy. Gap analysis is used to identify ways Honeywell can address misalignments in preferences or weaknesses in capability in support of a particular strategy. A summary of strengths, weaknesses, opportunities and threats is provided at the end. Strategic alternatives will be presented and discussed in detail in Chapter Four.

3.1 Assessment of Management Preferences

It is important to evaluate management preferences to determine the level of support that can be expected for strategic alternatives developed as a result of the industry analysis. Although management preferences do not define the strategy, they have a direct impact on implementation. This section explores management preferences in key functional areas of the pulp, paper and printing business vertical in Honeywell Process Solutions. Due to the influence of management at the HPS level on the strategic direction for P3, preferences of HPS leadership are evaluated as
well. A gap analysis identifies ways to align management preferences with the particular strategic orientation.

3.1.1 Pulp, Paper and Printing Leadership

Although P3 is a business vertical, it is served by several functional groups that focus on P3 but do not report directly to the P3 business leader. This section explores the preferences of P3 management including the global business leader and key functional leaders in Technology, Marketing, Operations, Finance, Projects and Services. It is important to understand each party’s preferences in order to determine how well aligned they are with a particular strategy and what needs to be done to improve alignment moving forward.

The P3 business leader does not have a strong preference for cost or differentiation for automation solutions as a whole. Cost is considered important for quality control products. This has resulted in an increase in investment for cost reduction projects that also focus on increasing serviceability and reliability. Differentiation in high level distributed control systems is also supported. This has led to an increase in focus on improving the pulping portfolio as a means to enhance the Experion PKS offering. Differentiation through technology leadership is promoted in areas where Honeywell currently has an advantage, such as advanced control algorithms. Innovation is also supported for new technology that does not exist in the market today. Service is recognized as an opportunity for differentiation and is being heavily promoted internally; however, there has been little development or enhancement of service programs to date. To complement improvements in cost and differentiation, strategic partnerships are being sought in growing markets like Asia Pacific to compete for systems on new machines. In mature markets like Europe and North America, system upgrade programs are being pursued.

The P3 Technology leader came to Honeywell through Measurex, which was known for quality control system innovation and market leadership. A differentiation strategy is preferred
and there is a firm belief that business longevity depends on quality, reliability and innovative solutions to papermaking problems. However, there is also recognition of the changing market and need to sustain technology at lower cost to remain competitive with commodity products. There is support for increased use of resources in low cost centres. There is also a focus on customers and becoming their solutions partner. This is relevant for either strategy, but must be managed carefully to ensure the overall strategic direction is maintained.

The P3 Solutions Marketing leader also comes from Measurex and prefers differentiation. The importance of cost leadership in remaining competitive and protecting market share is recognized and there is support for innovation programs aimed at keeping product costs low as a top priority. There is particular support for a strategy that focuses on the installed base and utilizes innovation as incentive to upgrade legacy systems. Development of high value-added, high margin products such as new sensors is preferred over higher risk, commodity-like products such as actuator systems.

There are several manufacturing locations for quality control systems in Vancouver, Canada; Tianjin, China; Waterford, Ireland; and Phoenix, USA. As is typical in manufacturing, leaders have a preference for cost based strategy. Increasing production volume is viewed as a mechanism for increasing productivity and reducing cost. However, operations are currently spread out in several locations. Consolidation of regional operations is being considered as a means to increase scale. Further consolidation may be required but must be weighed against the impact on distribution.

Management in Finance is primarily concerned with ensuring margin targets are met. This can be accomplished by decreasing cost to increase profitability, or by differentiating and charging a higher price. There does not appear to be a strong preference, just a bias towards cost control.
Management in Projects prefers a cost based strategy as performance is measured in relation to project margins. Although new products are recognized for promoting future business, they also represent risk and difficulty meeting bottom line projections. With more support from other functions on projects that involve new products, differentiation would be supported further.

Management in Services prefers a differentiation strategy as service is viewed as a major enabler of differentiation in the current automation solutions industry. However, cost seems to drive management decision making. This is evident by the lack of training for service personnel based on budget concerns.

3.1.2 Honeywell Process Solutions Leadership

The HPS President has a strong preference towards differentiation at the enterprise level. His vision involves the use of Experion PKS to control customer operations within a particular site as well as linkage of several sites together for total business visibility and process control. Inclusion of distributed control and quality control systems in Experion PKS is important as it bolsters the value of Experion PKS as a total solution. He also wants HPS to become a service-led business, capitalizing on an opportunity for growth and differentiation. The profitability of P3 within HPS is recognized, and it receives approximately 10% of the HPS R&D budget for development programs. However, there is a preference towards growth industries such as oil and gas where the profit potential is significantly higher. Merger and acquisition opportunities are also being sought to complement the existing portfolio and further differentiate from the competition.

Although differentiation is preferred, cost leadership on commodity products is promoted as a means to increase profitability and improve competitiveness in mature markets.
3.2 Closing the Gap on Management Preferences

Important preferences for a differentiation strategy include innovation, customer relationships, and solutions rather than products. Groups with more customer contact and greater involvement with technical development tend to support this strategy.

Important preferences for a cost strategy include meeting margin targets and implementing effective manufacturing processes. This promotes control of manufacturing quality, cycle time, and inventory. Obtaining scale to promote higher productivity and efficiency is also important. This strategy is supported primarily by functions whose performance is measured using financial metrics.

A significant concern in convincing management to support a differentiation strategy for P3 is the cost involved. For example, differentiation with service requires a significant amount of training to capitalize on the current, site-based service model. Differentiation via product innovation is also costly and risky for a mature, low growth market like P3. Further complicating implementation of a differentiation strategy is the functional structure of P3. Functional managers only have control and accountability for their own group. This promotes a cost focus but could be resolved by aligning goals across functions to promote participation in innovation.

Implementation of a cost strategy would require a more focused approach for leaders in key functional areas like Technology and Marketing. Senior management recognizes the advantage of cost leadership for remaining competitive in the distributed control and quality control systems market. However, the history of innovation and differentiation is well rooted. New performance incentives, quotas for submission of ideas to the R&D docket with a cost focus, and greater scrutiny on performance against financial targets are a few ways to refocus management on removing cost. The company structure supports these mechanisms and ensures
that goals for all employees are aligned with those of HPS leadership. As a pay-for-performance company, this provides incentive to follow the company strategy.

3.3 Assessment of Organizational Resources

This section provides an assessment of the resources available to Honeywell for implementation of a cost or differentiation strategy. Staff, facilities, and business functions are evaluated for gaps in relation to each strategy, and a summary of the level of strength or weakness in each resource area is provided. Finally, mechanisms for strengthening resources are presented.

3.3.1 Development Centres

Development centres are located around the world and employ technical personnel that work on development of both hardware and software for distributed control and quality control systems. Production engineering for customer contracts also occurs in development centres. Facilities are located in Vancouver, Canada; Kuopio, Finland; Bangalore, India; and Sydney, Australia. There are also several facilities in the US including Phoenix, Arizona; Freemont, California; Duluth, Georgia; and Cincinnati, Ohio. Technical personnel include Doctors of Philosophy in physics and controls, mechanical, electrical, and chemical engineers, technologists, former papermakers, and other technical staff. All employees are trained in Design for Six Sigma and Honeywell Development and Intellectual Property (HDIP). These are internal processes for product design and management of development projects. The HDIP process includes stages that require approval from a committee of representatives from various business functions. Facilities vary but typically include laboratories for prototyping and experimentation.

Hardware development is generally stronger for products used in papermaking than for products used in pulping. Software development for advanced controls is strong in both quality control and distributed control systems alike. However, there is less focus and structure for distributed control system development in the pulping area. Due to the importance of pulping to
enhancement of Experion PKS, there has been a recent emphasis on strengthening the pulping portfolio through increased investment. Experion PKS spans industries and therefore capitalizes on product improvements generated by development efforts in other industries.

A key factor for development centres is relationship with local mills. For Honeywell, this is more prevalent in Finland than in other locations and represents a weakness in comparison to the competition.

A low cost centre is located in Bangalore, India with resources for software and hardware development. Staff in Bangalore currently focus on continuous improvement projects for existing products but will be increasingly involved with new development projects in the future. Benefits anticipated are innovation at low cost, but results to date have been mixed as staff in Bangalore work to increase product familiarity. There is an expectation to spend a certain percentage of the Engineering budget on resources in Bangalore, and it is speculated that this will increase over time.

3.3.2 Manufacturing, Integration and Training

Manufacturing operations exist in Vancouver, Waterford, Phoenix, and Kuopio. Tianjin will also be used for manufacturing in the future, but is only used for assembly and integration at this time. The current business structure facilitates regional distribution of products and represents significant manufacturing capacity. However, overall sales volumes are not high and factory capacity is not being utilized in several locations. This has resulted in layoffs and loss of skilled personnel as part of cost control measures. Employees are skilled and experienced in machining, fabrication and assembly, and there are opportunities to both increase scale and retain talented employees through consolidation of operations. Inventory management is emphasized to improve working capital but has not been engrained in operational culture within P3 due to the custom nature of products.
There are integration centres in Waterford, Phoenix, and Tianjin. These facilities are used for assembly and testing of distributed control and quality control systems before shipping to customer sites. Integration centres also serve to identify many cost reduction opportunities. Employees in Waterford and Phoenix have significant industry experience and are customer focused. Many are former Measurex employees and are a great resource for generating ideas for upgrading older systems. Tianjin is a relatively new facility and employees there have limited industry experience and high turnover. They are still learning about assembly and testing of quality control systems and are a weaker source of ideas for differentiation at this time. However, this is offset by their potential as a low cost operation located in a fast growing market for automation solutions. Other integration centres and Technology resources are working with Tianjin to increase knowledge and productivity. Expatriate assignment was used during setup and start-up of operations to ensure stability and quality. With time, the expectation is that the Tianjin integration centre will grow in importance for P3.

Automation College is a training centre for automation solutions in Duluth, Georgia. It does not have a strong tie with the various development centres at this time, but has potential to be a strong resource if linkage with development centres can be improved. At present, this represents a weakness in a business that wants to be service-led.

### 3.3.3 Marketing

The marketing group is divided into three areas: product management, strategic marketing, and Marcom. Product managers ensure that customer needs are met through product development and promote new products to the marketplace. Strategic marketing focuses on ways to capitalize on market opportunities and regionalization. Marcom focuses on preparation and distribution of marketing collateral and communication to the marketplace.
Product managers and strategic marketing personnel are generally well experienced in the industry and have strong technical backgrounds. Traditional marketing activities such as market studies are outsourced. This allows marketing personnel to focus on ensuring alignment of development with overall strategic direction, and capitalizing on market opportunities. Personnel are actively involved in the HDIP process as members of stage review committees. They are well connected with customers and support sales efforts in all global regions. They represent strength for a differentiation strategy due to their drive for market leadership and technical excellence. However, their preference for differentiation is an inherent weakness for implementing a cost strategy.

Marcom is not well connected with the development centres. This can be perceived as a weakness for a differentiation strategy. More linkage is required to satisfy the demands of customers, sales and service personnel for information that is accurate, timely, professional and consistent. The centralized approach does have some potential advantages in terms of reducing cost of operations.

3.3.4 Human Resources

Honeywell has a pay-for-performance policy and utilizes its Performance Development system to link performance and behaviour to compensation. The education policy offers full reimbursement to promote development of employees and future leaders. This further serves to facilitate employee retention. Benefits include medical, dental, a savings and pension plan with company contribution, a stock purchase plan, and a management incentive plan to enhance performance and retention.

As a multinational corporation where innovation is critical in many areas, it is difficult to utilize different policies for different industries based on market conditions. Therefore, Honeywell must offer the same, attractive benefits to all employees. This facilitates employee
retention which is important for both differentiation and cost strategies. Furthermore, use of one policy makes it easier to manage thereby reducing cost.

### 3.3.5 Sales

The Sales group includes corporate account managers, regional account managers, application engineers (AEs), and regional sales support specialists. AEs and regional specialists focus on determination of economic benefits, process improvements and performance guarantees. This information is used to support the efforts of account managers. Most sales personnel have many years of industry experience. AEs are typically more junior, but tend to migrate into sales positions as they gain experience. The AE program is most prominent in North America but has diminished over recent years with the slowdown in the North American paper industry. Given the AEs’ involvement with applications for papermaking and their associated experience, promotion of this program in other regions would be beneficial for a differentiation strategy through enhanced customer service.

### 3.3.6 Projects and Services

Project teams are regionally based and focus on installation and commissioning of automation systems. Teams are comprised of hardware and software specialists and provide commissioning services for new systems. Installation of new systems is typically sub-contracted. Project teams interface directly with customers and are committed to the success of both Honeywell and the customer. They understand that future business depends on the quality of installation and impression on the customer. The Projects group is cost focused and is driven to achieve margins. Innovation is a double-edged sword for them as it helps attract new business, but represents higher installation and commissioning expenses to sort out bugs and other issues.

Service is provided through technical assistance centres, full and part-time resident services, remote services, travelling specialists, and more. While resident services traditionally
focused on maintenance, customers are demanding more value which has resulted in a shift towards increased optimization services. Honeywell has been slow to formally deploy a comprehensive optimization service offering and is more reactive than proactive in this area.

### 3.4 Closing the Gap on Organizational Resources

The following table summarizes relevant resources and ranks them in terms of strength or weakness for cost and differentiation strategies.

![Table 3-1: Summary of resource strengths and weaknesses in relation to strategy.](source)

<table>
<thead>
<tr>
<th>Resource</th>
<th>Differentiation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Centres</td>
<td>Strong</td>
<td>Medium-high</td>
</tr>
<tr>
<td>Integration Centres</td>
<td>Medium-high</td>
<td>Medium-high</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Medium-high</td>
<td>Medium</td>
</tr>
<tr>
<td>Training</td>
<td>Medium</td>
<td>Weak</td>
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<td>Marketing</td>
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<tr>
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</tr>
<tr>
<td>Projects</td>
<td>Medium</td>
<td>Medium-high</td>
</tr>
<tr>
<td>Services</td>
<td>Medium</td>
<td>Weak</td>
</tr>
</tbody>
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*Source: Author.*

For a differentiation strategy, training can be strengthened through increased integration with development centres. Projects can be strengthened by relieving cost pressure on installations involving new developments. This can be accomplished through financial support from development centres and use of factory specialists to assist with commissioning and
troubleshooting. Services can be strengthened through training that supports a shift in focus towards process optimization.

For a cost strategy, development and integration can be strengthened through goal setting and financial incentives to overcome the differentiation preference. Manufacturing can be strengthened through consolidation and increased scale. Marketing can be enhanced by framing the strategy as differentiation through price, but changing the culture of differentiation through innovation will be difficult. There is not much that can be done to strengthen human resources as common policies are adopted across industry segments. Sales will be difficult to strengthen due to the customer focus and problem-solving nature of the P3 business however a cost strategy will make it easier to sell against stiff competition by through increased price flexibility. Services can only be strengthened by increasing the value provided to the customer, thereby justifying cost.

3.5 Assessment of Organizational Capabilities

This section provides an assessment of Honeywell against required organizational capabilities for implementation of a cost or differentiation strategy. Honeywell’s structure, culture and processes are reviewed. A gap analysis is used to identify ways for to align organizational capabilities with each strategy.

3.5.1 Required Capabilities

For a differentiation strategy in the automation solutions industry, an organization must be able to innovate for a mature market. Due to the level of rivalry, development must be quick to secure patents and first-mover advantage. Furthermore, the organization must be adept at understanding customer needs to ensure focused development. It must also be able to transfer knowledge quickly to service personnel, and must have pulp and papermaking application expertise. Development must be a team effort across functions.
The organization must be externally focused and management behaviour must be customer-centric. The organization must strive to build and maintain strong customer relationships. Development processes must ensure that customer needs and other external factors are taken into consideration.

Organization culture must value the customer, product quality, and performance excellence. It must want to be the market leader and the customer’s partner of choice for papermaking solutions. It must value idea generation and protection of intellectual property.

For a cost strategy, an organization must focus on productivity, efficiency and increasing scale. Functional synergy is required to improve processes and streamline the delivery cycle. Engineers must work directly with Manufacturing to standardize products and ensure customer expectations are met. Engineering objectives must be more tightly aligned with those of other functions, such as Supply Chain, to ensure that support is provided for cost reduction programs initiated and driven outside of the Technology group.

The organization culture must be one of continual improvement in cost and process efficiency. Management behaviour must convey a relentless focus on cost reduction, process optimization, and opportunities to increase scale. The organization must focus internally and monitor quality and cost.

3.5.2 Current Organization Structure, Culture, and Processes

As presented earlier, the organizational structure is a hybrid of regional and functional structures. Some functions, including Technology and Operations, are co-located in development centres. As a complete operation, each development centre is treated as a cost centre. This imparts a culture of cost control on all functions working at each location even though innovation is a big part of current business operations. Variation in reporting structure and goal
misalignment reduces the synergy between the various groups. For example, a cost reduction exercise that is considered a top priority for Supply Chain is not always perceived as a top priority for Technology and may actually present an obstacle to accomplishing other goals.

The P3 organization has a customer-centric culture which has carried over from the Measurex era. This is reinforced by human resource systems that reward individuals based on performance and alignment with critical behaviours.

There are many processes in place to support differentiation through innovation such as Design for Six Sigma, HDIP, Velocity Product Development (VPD), and software development processes. The spirit of these programs is excellent, but the implementation has made them highly bureaucratic – many program managers would say that the processes actually stifle innovation. In Operations, programs aimed at reducing waste and minimizing inventory have been implemented in the interest of streamlining workflow and minimizing working capital, but the highly customized nature of quality control systems creates challenges for these programs.

3.6 Closing the Gap on Organizational Capabilities

For a differentiation strategy, innovation could be enhanced through greater exposure of employees working on innovation to customer needs and the papermaking process. This could be realized through increased integration with Marketing, and improved communication in areas such as overall strategic direction and decision making criterion for funding of development programs. The use of HDIP leadership teams for reviewing and approving project development stages helps in this regard, but only once projects are underway. Honeywell has made strides in this area in recent years through enhanced employee communications using newsletters. In addition, sessions have been held with a cross section of personnel from Marketing, Technology, and other parts of the business to generate ideas on the overall direction of development programs. Development processes need to be improved to reduce bureaucracy and speed up
innovation, and programs like VPD are aimed at accomplishing this. On a higher level, the company structure could be modified to enhance teamwork across functions. Establishment of a leadership team or appointment of a general manager with decision making authority for P3 and autonomy within HPS could help in this regard. Although the current structure has a business leader, the structure is too fragmented to be effective. Improvement in this area would further serve to increase retention of key employees and reinforce a culture of excellence and commitment to P3. Reinvigoration of the Application Engineer program could help lay the foundation for the future through a renewed focus on application expertise. This would also facilitate development of process optimization and other customer services through increased teamwork and knowledge transfer across functions.

For a cost strategy, productivity could be improved through consolidation of operations. Although regional operations have some benefit in terms of market proximity, centralization would enhance scale, reduce cost, and promote synergy between functions. Such change would have to be managed carefully, but has been successful within P3 in the past. Operational efficiency could be further improved by aligning goals and promoting a higher level of team accountability; structural change would facilitate accomplishment of this objective. A significant challenge would be convincing employees that cost can replace innovation as a means of adding value for customers in the long-term. With a history of innovation and deeply rooted customer culture, it is conceivable that this can only be accomplished through significant change in management structure or incentives.

3.7 Summary of Honeywell Internal Analysis

The internal analysis has identified several strengths and weaknesses in supporting potential strategic alternatives. For a differentiation strategy, strengths include the support of management at the P3 business leadership level and in critical functional areas such as
Technology and Marketing. Development and integration centres are well structured for innovation in terms of facilities and employee talent. Organizational culture and customer focus are also well suited for innovation and solutions partnership. Weaknesses include the functional structure and implementation of bureaucratic development processes. Opportunities include use of centralized training facilities to support training programs and build service knowledge. Threats include the maturity of the paper industry and preferential funding to other vertical markets with higher growth potential.

For a cost strategy, strengths include management support of processes to improve operational efficiency and support of low cost centres for continuous product improvement. Honeywell’s primary weakness is lack of scale and fragmented operations. Consolidation represents a significant opportunity to increase scale and reduce cost of operations. Threats include the underlying Measurex culture of innovation and focus on customer solutions. Structural change or significant rework of incentives may be required to facilitate commitment to this strategy.

The preceding analysis has shown that Honeywell is capable of supporting strategies centred on cost or differentiation. These capabilities will be taken into consideration in development of strategic alternatives in the next section.
4 STRATEGY FOR HONEYWELL IN THE AUTOMATION SOLUTIONS INDUSTRY

In this section, strategic alternatives are presented and evaluated. First the three generic strategies of cost, differentiation, and focus are discussed in terms of their level of appropriateness given the external market conditions. It is shown that adoption of these strategies wholeheartedly is not practical for Honeywell and that a combined strategy is more effective. Next, specific strategic alternatives emphasizing elements of the generic strategic orientations are presented. Each alternative is scored against weighted decision making criteria to determine which options are the most attractive for implementation. Finally, the robustness of each strategic option is evaluated for macro trends in the industry.

4.1 Generic Strategic Orientations

There are three generic strategic orientations: low cost, differentiation, and focus. This section evaluates the viability of each strategy for Honeywell given the external market conditions. The advantages and disadvantages are presented along with an assessment of how appropriate it is for Honeywell to adopt the strategy exclusively.

4.1.1 Low Cost Provider

There are many advantages to a low cost strategy as a means to generate revenue through increased sales, increased profit margins, and increased market share. Most importantly, it is attractive to buyers in all segments of the pulp and paper industry. Industry profits are low, and customers are competing on cost themselves. The market is saturated; almost all pulp and paper operations have both distributed control and quality control systems already. Products are commodity-like, making the ability to compete on technical leadership and differentiation more
challenging. Growth in the quality control systems business has been in general decline since 1995. The distributed control systems business has seen some growth, but it has been modest and is forecast to continue at that pace through 2011. Although the Asian market is growing, it is an emerging economy and cost remains a major factor in decisions. Buyers have power, even though they must utilize both quality control and distributed control systems to remain competitive in their own market. Furthermore, the trend towards more open technology makes it easier for customers to shop around. Suppliers to automation companies have power as purchasing volumes are low. This is strengthened by high switching costs due to the level of standardization and strict quality certification for materials and other purchased components. Lower cost substitutes are gaining strength through technical advancement and comparable performance. This makes it critical for distributed control system suppliers to control costs to remain competitive. All of these factors make a low cost strategy attractive for Honeywell.

However, there are also many disadvantages to a low cost strategy. The cost of improvements to the control system can be greatly outweighed by the potential benefits from improved quality, increased productivity. The cost of improvements is also overshadowed by the potential costs associated with system malfunctions and downtime. This diminishes the importance of cost in buying decisions and emphasizes the importance of reliability, reputation, and service. Customers expect suppliers to be their solutions partner in optimizing their pulp and paper operations. This implies working on new and improved ways of optimizing their process through measurement and control. Relationship is an industry key success factor; lack of development and innovation has the potential to negatively impact a company’s reputation and strain relations with existing customers that expect support in resolving papermaking concerns. A cost focus will also create a perception that product quality and durability, two important factors for pulp and papermaking productivity, will be compromised. This could manifest itself in customers deciding to work with competitors, thereby resulting in loss of market share.
Customers are very fickle and will not hesitate to switch suppliers if they have any concern that support will be an issue moving forward. Even though switching costs are high, systems last upwards of twenty years making this a reasonable concern in consideration of the financial investment and ongoing decline in customer expertise on automation systems.

Despite Honeywell’s market share, the overall maturity of the pulp and paper market, and the level of commoditization in quality control and distributed control systems, full scale adoption of a low cost strategy is not practical for the P3 business vertical of HPS. Honeywell has a history of innovation, and technology is important to its customers. Small improvements in productivity can result in significant increases in profit for customers, an important consideration in the low profit papermaking business. Lack of innovation could be misconstrued as lack of commitment to P3. This could result in a loss of market share as customers look to Honeywell’s competitors for their automation solutions. Implementation of a low cost strategy would also be challenging given Honeywell’s culture of innovation and management preferences towards differentiation. Although multiple vertical markets with unique requirements exist within HPS, it is challenging to adopt radically different strategies in each area. In addition, Experion PKS spans HPS. Innovative developments in each business vertical enhance the overall Experion PKS offering. Finally, a low cost strategy would have little impact on Honeywell’s ability to capture some of the new machine business as quality control and distributed control systems make up a small component of the overall cost of a new machine. This is an advantage to both Metso and Voith as they can essentially give away these systems to fend off competition while making up the lost margin in other areas of the contract.

4.1.2 Differentiation

A differentiation strategy has many advantages. It can be used to increase sales, to increase profit margins, and to increase customer lifetime value by making Honeywell the
customer’s supplier of choice. It is attractive to buyers as new developments offer them competitive advantage through technology leadership and associated improvements in productivity and product quality. For Honeywell, it serves to strengthen customer relations through continued improvement of the papermaking process and assistance with operational concerns. Differentiation can expand the market to include new machines if the machine manufacturers do not possess similar technology. This strategy also facilitates attraction and retention of top talent. Differentiation helps maintain barriers to entry as customers are more likely to work with incumbent firms on implementation of new technology than to risk working with new firms. This preserves the installed base and associated opportunities for system upgrades or migration to newer technology. Differentiation also helps Honeywell maintain the strength of its market position for Experion PKS. This system provides a total automation solution and is only growing in terms of quality and capability with further integration of quality control and distributed control systems. Continued development and differentiation on this platform is attractive for Honeywell and its customers. It conveys commitment to the success of Experion PKS and customers that use it. It also helps Honeywell become a bigger partner in its customer’s business and solidifies the working relationship between the two parties. For customers, it provides them with an opportunity to work with a single supplier to optimize their performance and capitalize on Honeywell’s experience and knowledge with automation solutions in the paper industry.

There are also several concerns in adopting a differentiation strategy. Capital investment in research and development for a mature industry with declining sales revenues and flat projections is a concern for senior management. This concern is magnified when there are other growth industries in HPS that warrant investment. There is also no guarantee that papermakers will invest in new technology offered by suppliers. With customers focusing on cost reduction, differentiation on product technology, quality, reliability or robustness may not be sufficient.
Alternate forms of differentiation, such as service or further development and integration with enterprise level systems, have to be considered. Given Honeywell’s current focus on differentiation through product technology, increased effort on integration of quality control and distributed control systems with Experion PKS is not a major concern. However, enhancement of service as a form of differentiation could be very costly.

Despite the many attractions associated with a differentiation strategy, it would not be practical for Honeywell to adopt this strategy wholeheartedly given the maturity of the market and the level of commoditization in quality control and distributed control systems. Product innovation is costly, and customer “must have” solutions are not common. The benefit of continuing to invest in enhancement of existing products can be questioned with the exception of high level solutions like Experion PKS where Honeywell has a strong market position, and where the product scope is so broad that it is difficult to replicate in the market.

4.1.3 Focus

The goal of a focus strategy is to satisfy the requirements of a specific market segment such as customers in a particular market region, producers of a particular paper grade, or buyers that are early adopters of technology. A focus strategy can also be used to change the overall direction of the business, for example changing Honeywell from an automation solutions provider to a service provider. A focus strategy can have elements of differentiation and cost leadership, but it is usually much narrower in scope than what is required to pursue customers across the entire industry.

It is not practical for Honeywell to adopt a focus strategy given its market share and the breadth of application in the installed base. Honeywell’s P3 installed base is worth approximately $5.5 Billion and spans all paper grades in all regions of the world. One of Honeywell’s greatest opportunities is working with its customers to upgrade existing systems or
to migrate to newer technology. In a mature market with limited growth, the benefit of narrowing focus to specific segments of the market can be questioned. In addition, Honeywell’s products have been designed for use in all applications. It may make sense to include an area of focus as part of the overall strategy, but adoption of focus as the sole strategy does not make sense at this time.

4.2 Strategic Alternatives

For Honeywell, a combined strategy is more practical and realistic than wholesale adoption of one of the three generic strategic orientations. This section provides strategic alternatives in each of the strategic orientations and evaluates the advantages and disadvantages of each in relation to the external market.

4.2.1 Low Cost - Consolidation of Operations

Honeywell could improve its position in terms of cost leadership through consolidation of operations. There are currently too many locations for development, manufacturing and integration. Although this has some advantage in terms of regional distribution, the benefit of operational efficiency through scale is not being realized. Consolidation would also help align the goals of critical functions like Manufacturing, Technology and Supply Chain. This would serve to promote a common accountability for overall performance. Reductions in cost through consolidation would improve Honeywell’s competitive position, especially for commodity products like quality control systems, and would help generate revenues through increased profit margins and increased system sales.

The challenge with this strategy would be in determining the best location. Setting up in Asia where market growth is the largest seems to be attractive on the surface, but the resources with the most experience and knowledge are located in North America and Europe. Although it is reasonable to expect that some of these people could be persuaded to relocate to Asia, it is not
likely that a sufficient number could be convinced to move. North America seems to be the most likely alternative for a number of reasons: the potential for consolidation is high given the number of operations currently in North America, it is home to Honeywell’s corporate head office and the HPS head office, people are attracted to living in North America, there is a high degree of talent employed in North America, and it is somewhat central to the overall P3 market. In comparison to Western Europe, North America has some advantages in proximity to the growing market in Asia in terms of lower shipping costs and transportation times.

At the very least, Honeywell should focus on regional consolidation in the short-term to improve scale and operational efficiency. Apart from the potential for short term increases in cost due to transition activities, consolidation will improve the cost competitiveness of Honeywell’s automation products.

4.2.2 Low Cost - Existing Quality Control System Technology

Honeywell could improve its ability to generate revenues through increased sales and improved profit margins by committing to a cost leadership strategy for existing quality control system technology. Honeywell’s current quality control system portfolio is comprehensive and includes many complex products that require intimate knowledge of design and functionality to optimize performance. Investment in simplification and robustness can serve to reduce cost and maintenance requirements. This will benefit the customer in terms of initial price and service costs over time. This can also result in more attractive warranty terms which could be used as a form of differentiation in a cost leadership strategy. For example, design improvements in the new Devonizer XP10 steam actuator resulted in the ability to offer a fifteen year warranty, far superior to competitive offerings. Programs like this can require one to two years to complete and range in cost from $50K to $100K for a simple actuator system, or require more time and much larger investments for complex, highly integrated products. This type of program entails
simplification of the design including part count reduction, improved robustness through material selection and testing, and incorporation of diagnostics to enhance serviceability. The end result is a superior product that can be marketed based on increased value to the customer at a lower cost. Honeywell is currently pursuing similar opportunities in several product lines. To promote this strategy, management will have to encourage evaluation of opportunities and submission of cost reduction proposals. Cost reduction targets will have to be set and performance will have to be evaluated against reaching those targets.

The benefit of this strategy for Honeywell is an enhanced ability to compete with commodity products in a mature market. Although investment is required, the end result will be products that are superior to the competition in cost and robustness. This will be attractive to customers in terms of reduced cost and service requirements. The challenge for this strategy is convincing management to invest in cost reduction programs instead of new technology development.

4.2.3 Differentiation on Service

For Honeywell, the greatest opportunity in the automation solutions industry is in the area of service. The market is growing in Asia, but there is a shortage of skill in working with automation systems for the pulp and paper industry. Customers are looking to suppliers for assistance optimizing system performance. Customers are also in the process of determining who their automation system supplier will be over the long-term.42 This situation is not unique to Asia; customers are downsizing globally and need the support of automation suppliers to be successful. With a significant global presence, a large installed base, and strong customer relationships, Honeywell is well positioned to benefit from an enhanced service offering. This strategy will generate revenues through increased sales of service contracts. It will further serve

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to reinforce customer relationships and to increase customer lifetime value through optimization of system performance.

Honeywell’s current service offering includes technical assistance centres, web sites for on-line support, resident maintenance services, and remote system monitoring and optimization. Programs are also available to assist customers with development and execution of comprehensive maintenance plans, and to provide on-site assessment and optimization for both existing automation systems and overall paper machine performance. Although this is a fairly comprehensive offering, it is too fragmented and unorganized in its current form. Services are provided by many different functional groups and are not standardized in terms of cost or scope. There is also an underlying focus on maintenance services. To benefit from this market opportunity, Honeywell will have to shift its service focus from maintenance to optimization and will have to integrate these services more closely. Honeywell must also be more active in its promotion of business and technical consulting services for system optimization. These services would involve the use of customer service representatives to look for ways to improve the performance of the customer’s automation system which would, in turn, benefit the overall performance of the customer’s process. Revenues would be generated by billing on a per service basis or through a predetermined service contract. Enhanced system performance would increase the potential of increased system sales as customers realize the true benefit of Honeywell’s automation solutions. Honeywell will also have to expand its services portfolio to include system transition services and will have to increase its level of application expertise.

To create this revenue stream, customer service representatives must develop new skills. This would require a significant training effort. Automation College, Honeywell’s current training centre for automation solutions, would be instrumental for successful implementation of this strategy and would act as the central location for hands-on training on distributed control and quality control systems. As mentioned previously, Automation College is not closely linked with
development centres at present; a much tighter link would have to be established to increase the
effectiveness of training. Furthermore, senior management must be committed to this training
program to ensure that courses are not cancelled in the interest of cost savings. To facilitate this,
alternate forms of training such as remote classes or satellite classes should be considered. Web-
based training has some value, but much of the quality control and distributed control systems
training is experiential and requires face-to-face interaction between student and instructor.
Working with hardware and software applications is also critical in understanding the technology
and the benefits to the customer.

Talented personnel are also required for this strategy to be successful. Honeywell can
capitalize on the strength of its Application Engineer (AE) program in North America and Europe
in promoting a similar skill set in the service group. This may require transfer of AEs into the
service group, or expatriate assignments to work with and train personnel in Asia where the AE
program is not prevalent. Honeywell will also have to increase its recruiting activity and should
consider hiring from papermaking related programs in Asia.

Honeywell must be committed to this strategy. HPS has a goal to become a service-led
business but there has been very little action to make this transition. Serviceability is being built
into product design and systems such as Experion PKS lend themselves to becoming part of a
comprehensive service model for customers. However, more than design improvements is
required. Honeywell must capitalize on its vast industry experience and application expertise
through provision of optimization services. Currently these services are offered through several
functional groups, but the efforts are not coordinated. A more consistent, comprehensive
approach is required to take advantage of this market opportunity.

Honeywell has the industry experience and knowledge to be able to implement a service
based differentiation strategy. To be successful, Honeywell does not need to go through a
transformational change in the way it does business as was spearheaded by Louis V. Gerstner Jr. of International Business Machines Corporation (I.B.M.) Gerstner Jr. recognized a change in the market and a customer need for service from a global information technology provider. He changed the way I.B.M. did business and saved the company in the process.\footnote{Gerstner Jr., Louis V. (2002, November). \textit{Who Says Elephants Can't Dance? Inside IBM's Historic Turnaround}. Harper Business.} Honeywell has a similar opportunity and already has many of the pieces in place to offer more comprehensive services. However, it needs to increase its focus on service to accomplish its objective to become a service-led business. It will require a significant investment in training, as well as continued development to improve system serviceability and diagnostic capability. This type of comprehensive service offering from product design through on-site services is attractive to customers that are looking to automation suppliers to be their partners in enhancing overall system performance.

4.2.4 Differentiation on New Technology

Honeywell is a technology leader and has a strong reputation in the industry for innovation. With a large installed base, there are many opportunities for system upgrades to new technologies or migration to larger scale systems such as Experion PKS. Customers look to Honeywell and its competitors for solutions and partnership in optimizing their processes. Lack of innovation in new products or in improvements to existing products can be interpreted as lack of commitment to the industry. This can be devastating to business if it results in a switch to a competitive system given the lifetime of quality control and distributed control systems. Protection of installed base is essential for long-term success.

Differentiation on new technology will require implementation of a less bureaucratic development process. Although there have been improvements in the current process such as use of a solutions management team comprised of personnel from various functions within the pulp
and paper vertical, the process is still cumbersome and adds to the overall development lifecycle. At present, development teams find they spend more than half their time on administration instead of design. Apart from the obvious impact on time, this impacts morale and motivation which serves to further lengthen the development cycle. This also increases the risk of losing talent due to high levels of frustration. Honeywell must look at further improvements to the development process to complement a differentiation strategy for new technology.

A strategy of differentiation on new technology will generate revenues through increased sales of new systems. The potential for customers to gain some competitive advantage through the use of new technology is often a major consideration in their buying decisions. New technology also improves the potential for system upgrades and sale of complementary products. Sales personnel can leverage the inclusion of new technology in their offering to persuade customers to upgrade their existing systems or to expand the scope of the contract. New technology also offers the potential for increased service revenues in the form of installation, commissioning, optimization, maintenance, and training.

4.2.5 Focus on Experion PKS

A strategy that focuses on Experion PKS will increase revenue through increased system sales and increased migration of legacy systems to Experion PKS. Furthermore, customer lifetime value will be increased by allowing Honeywell to become more entrenched in the customer’s operation. This will serve to secure an ongoing revenue stream through process optimization and upgrade services. Honeywell’s vast installed base of quality control and distributed control systems represents a significant potential for upgrade or migration to Experion PKS.

The benefit and attraction of Experion PKS for customers is that it is a total solution. For Honeywell, Experion PKS represents a significant growth opportunity in distributed control
system technology as an enterprise level automation solution. To benefit from this opportunity, Honeywell must continue investing in development of Experion PKS. It must continue working on integration of existing quality control and distributed control systems to differentiate from competitive systems. This will serve to protect Honeywell’s installed base and maintain the potential of the upgrade market.

Although Experion PKS is well accepted in the marketplace, there are challenges with this strategy. At present there is too much redundancy in existing applications due to their ability to operate in a stand-alone mode. As a result, the value of Experion PKS over existing systems is not always clear. Successful implementation will require Honeywell to improve customer awareness of the value in upgrading to Experion PKS versus continuing to operate a legacy system. Honeywell must also continue to develop component systems to enable seamless integration into Experion PKS with less redundancy.

Another major concern is that the investment required for Experion PKS is far greater than many customers are prepared for. Although upgrading to Experion PKS has the benefit of the total solution with tools for business and asset management, it can be costly and time consuming to implement. To address this concern, Honeywell must continue to work with customers on generating a sound migration path towards Experion PKS. Honeywell must also promote the benefit of Experion PKS in expanding system capability and allowing customer’s to capitalize on their existing investment in Honeywell automation solutions.

Despite these challenges, focus on Experion PKS is a valid strategic alternative. The potential benefit of Experion PKS as a total solution that enhances business decision making makes it attractive to customers. The ability for customers to build on investment in existing systems helps mitigate the cost involved in upgrading. To remain competitive, customers will also be inclined to follow the trend in the automation solutions industry towards implementation
of enterprise level systems. Furthermore, Honeywell is committed to the success of Experion PKS as an automation solution for several business verticals. These factors, in addition to the potential for increased customer lifetime value and increased long-term revenue generation, make this strategy attractive for Honeywell.

4.2.6 Focus on Growth Regions

Asia is a growing market with an increasing focus on manufacturing for export. Long-term growth is expected for countries like China and India. China itself may become the largest market for automation solutions in the world over the next 20 years. For a mature industry like automation solutions for P3, a growth region like Asia breeds competition and significantly increases rivalry as companies focus their efforts on securing business in the region. Honeywell has an excellent reputation in the industry, first class automation solutions, and a vast support network. It is in a good position to capitalize on a regionally focused strategy and could generate additional revenues through increased sales of systems and service contracts.

A regional focus has many challenges including increased exposure to industry cycles. For a large multinational like Honeywell with a worldwide installed base, a regional focus also limits opportunities in other parts of the world. An adaptation to this strategy may be to increase emphasis in Asia through the addition of resources while maintaining the same level of effort in other parts of the world. If the global trend continues to be closure of manufacturing facilities in the developed world and movement towards the emerging markets, a more focused regional strategy may have greater value in the long run. Honeywell will have to monitor this trend closely over time and adapt its strategy accordingly.

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4.2.7 Focus Development on Systems for High Quality Grades

With the growth of broadband and alternate forms of communication, demand for paper has diminished in the developed world. This is especially true of commodity grades like newsprint. However, demand for all paper grades is increasing in emerging markets like China and India. Today, the majority of machines in the largest papermaking nations are used to produce higher quality grades like tissue and coated box board. A strategy that focuses on development of systems for high quality grades has the potential to significantly increase application knowledge and expertise. This will facilitate revenue generation through increased sales of new, innovative systems and new service offerings specific to the unique requirements of these processes.

The nature of Honeywell’s products is that they can be used in all applications and for all paper grades. Although investment to date can be considered as sunk costs, continued use of existing products in all applications makes business sense as it does not require further development effort. However, an opportunity exists to focus new development programs on systems for high quality grades. To adopt this type of strategy, Honeywell would need to work closely with customers to determine their pulping and papermaking concerns and would need to direct development efforts accordingly. Participation in customer forums, such as those at the annual Honeywell User’s Group event, is one mechanism to accomplish this objective. These functions have proven useful in identifying strategic direction for development in the past and will continue to be beneficial to Honeywell moving forward.

Challenges with this strategy include the ability to develop new products in a timely and cost effective manner given the level of bureaucracy in the development process. Furthermore, it will be difficult to secure investment for new development in a mature industry given the financial risks and market uncertainty involved. This will only get worse as technology progresses and substitutes for paper become more prevalent.
4.3 Evaluation of Strategic Alternatives against Decision Making Criteria

This section evaluates each strategic alternative against decision making criteria.

Decision making criteria are based on industry key success factors and Honeywell’s current goals to enhance Experion PKS and become a service-led business.

The first criterion is to improve cost. This will increase Honeywell’s ability to compete in a mature market that has a high level of product commoditization. The second criterion is to increase market share. Although Honeywell maintains a significant market share in distributed and quality control systems, its position has diminished in recent years relative to the competition. The third criterion is to improve relations and to increase customer lifetime value. A strategy that enhances customer relationships and increases the level of commitment between Honeywell and the customer will promote a long term business partnership. The fourth criterion is to protect the installed base and is important due to the size and upgrade potential of Honeywell’s installed base. The fifth criterion is to enhance Experion PKS. The industry trend towards enterprise level automation solutions represents an opportunity for new business in growth regions like Asia, and system migrations in more mature markets like Europe and North America. Furthermore, Honeywell is committed to the success of Experion PKS across all business verticals and continues to invest heavily in development. The sixth criterion is to enhance service. Service has significant business potential and represented approximately half of the total quality control systems revenues in 2005. It is important for Honeywell to capitalize on the growing importance of service to customers. The seventh criterion is to enhance technology. Customers view technology as a means of competitive advantage and expect suppliers to innovate. The eighth criterion is to increase industry presence and satisfy customer expectations that suppliers are committed to the industry. This will also increase Honeywell’s ability to compete against companies like Metso that have a higher degree of emphasis on the pulp and paper industry. The
ninth criterion is to improve employee retention. A company is only as good as its people and Honeywell must look for ways to retain top talent in a mature industry. The tenth criterion is to enhance integration of supply chain. This will facilitate improvements in cost which will serve to increase Honeywell’s ability to compete through price flexibility. The final criterion is to increase operational capability. Product quality and reliability are essential as customers focus on reducing downtime. Manufacturing cycle time and distribution are also important to ensure system delivery per customer requirements. Operational improvements that streamline manufacturing and enhance distribution allow Honeywell to meet customer commitments and serve to strengthen customer relationships.

The following table is a decision making matrix and ranks each strategic alternative against the decision making criteria. A scale of one to ten has been used where five represents no impact, less than five represents a negative impact, and greater than five represents a positive impact. Decision criteria are weighted as to their relative importance.
Table 4-1: Strategic alternatives ranked against decision making criteria.

<table>
<thead>
<tr>
<th>Decision Making Criteria</th>
<th>Weight</th>
<th>Low Cost - Consolidation of Operations</th>
<th>Low Cost - QCS Technology</th>
<th>Differentiation - Service</th>
<th>Differentiation - New Technology</th>
<th>Focus - Experion PKS</th>
<th>Focus - Growth Region</th>
<th>Focus - High Quality Grades</th>
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<tr>
<td>Improve cost</td>
<td>8%</td>
<td>9</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Increase market share</td>
<td>10%</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Improve relations and increase customer lifetime value</td>
<td>10%</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Protect installed base</td>
<td>10%</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Enhance Experion PKS</td>
<td>10%</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Enhance service</td>
<td>10%</td>
<td>7</td>
<td>7</td>
<td>10</td>
<td>5</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Enhance technology</td>
<td>9%</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Increase industry presence</td>
<td>8%</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Improve employee retention</td>
<td>10%</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Enhance integration of supply chain</td>
<td>7%</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Increase operational capability</td>
<td>8%</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weighted Total</strong></td>
<td><strong>6.64</strong></td>
<td><strong>6.43</strong></td>
<td><strong>7.46</strong></td>
<td><strong>7.43</strong></td>
<td><strong>5.96</strong></td>
<td><strong>5.28</strong></td>
<td><strong>5.68</strong></td>
<td></td>
</tr>
</tbody>
</table>
4.4 Top Strategic Alternatives

The top four strategic alternatives based on the assessment against the decision making criteria are differentiation on service, differentiation on new technology, focus on Experion PKS, and low cost through consolidation of operations. Each of these strategic alternatives can be employed as part of a combined strategy for automation solutions in P3.

Differentiation on service has many benefits. It will increase market share by capturing a larger portion of the available service revenue in the automation solutions industry for P3. It will enhance customer relations through a common commitment to improving processes and increasing performance. It will protect the installed base by enhancing support for existing systems and providing services to ease transition to newer technologies. It will also enhance employee retention by growing the business and creating opportunities for existing personnel to grow professionally. Implementation will be costly and will require a significant commitment to training. With Automation College and a comprehensive Application Engineer program, Honeywell has the necessary resources to support this kind of training and development. For this to be effective, Honeywell must improve the integration of training with work in development centres so that training material is relevant and accurate. Management must back this strategy and be willing to invest in the future through training and development of new service programs. The current reactive approach to service will not work. Honeywell must be proactive with service and must treat it as a business.

Differentiation on technology has many advantages. New technology is attractive to customers if it offers them a competitive advantage and potential to increase profitability. It can be the difference in securing orders in the new machine market and in the upgrade market. It can also help steal market share from competitors if they do not have an equivalent product or have a poor track record of success with their competitive offering. Innovation conveys commitment to
the industry which increases customer confidence and willingness to build on current investments with Honeywell. This enhances customer relationships and protects the installed base, securing future business opportunities. Integration of new technology into Experion PKS helps build its customer value and improves its competitive position in the P3 marketplace. Finally, this strategy helps retain talented employees by providing an opportunity to work in an exciting, creative environment.

As a company with a history of innovation and strong preferences for differentiation, this strategy does not represent a significant shift in thinking and can be implemented relatively easily. Concerns with this strategy include the risk of investment in a mature market with limited growth potential. Furthermore, new technology introduces risk in meeting project margins. In terms of development, Honeywell must be more committed to completing the process before launching products into the marketplace. Honeywell must also invest in areas that are currently underdeveloped such as pulping. Pulping receives a lot of attention in high level discussions and has been identified by customers as an area of weakness in their operations. This represents an opportunity for Honeywell; however development in pulping does not seem to be as structured or successful as other areas of P3 automation. Honeywell needs to address this if it wants to increase its ability to offer a total solution and capitalize on a technology differentiation strategy.

Focus on Experion PKS is part of Honeywell’s current strategy and is well aligned with market requirements and industry success factors. Experion PKS allows Honeywell to become a bigger part of its customer’s success and increases lifetime value significantly. The ability to integrate legacy systems helps protect Honeywell’s installed base by offering a migration path towards the newer technology. Experion PKS also enhances service through improved process visibility and diagnostic capabilities. One of the challenges for Honeywell will be in conveying the benefit and importance of Experion PKS to technical personnel that do not work directly on the system. The scope and magnitude of Experion PKS are so great that it is difficult for
employees to see how customers would be able to adopt it in a low profit, mature market. Honeywell’s vision and strategy have to be communicated effectively to ensure development efforts are aligned with the overall strategy.

Finally, consolidation of operations has many benefits in terms of lowering cost and improving efficiency of operations. Honeywell currently has facilities in several regions around the world that are not operating at or near capacity. Consolidation within regions would address concerns with capacity and would provide Honeywell with economies of scale. Additional gains could be realized through further consolidation across regions, but the impact on distribution and ability to serve regional markets needs to be considered. Although functional goals should aligned regardless of location, there are many disconnects between fragmented operations that diminish overall business performance. Consolidation would facilitate alignment of goals by minimizing the number of unique operations and locating functions such as Technology, Supply Chain and Marketing in common facilities. Significant concerns with this strategy include ensuring the effective transfer of operations and mitigating risk of knowledge loss for unique operations. An event greater challenge is how to handle employee displacement. Honeywell will have to take this into consideration in assessing the costs and benefits of consolidation.

### 4.5 Macro Industry Trends with Potential to Impact Strategy

The strategic assessment presented above assumes that macro industry trends will continue in their current direction. Although space precludes a comprehensive analysis of these trends, those familiar with the industry would agree that they are relevant and should be taken into consideration by Honeywell in implementing strategy. This section briefly discusses trends in capital spending, environmental regulation and energy usage, and global demand for paper. A brief assessment of strategic alternatives against these macro trends is provided.
4.5.1 Capital Spending

Trends in capital spending have a significant impact on the paper industry. Globally, capital expenditures as a percentage of revenues have remained relatively stable since 1999. In North America, there has been a decline in spending since the late 1980's but it has stabilized since 2000. Asia represents the exception as developing countries like China and India invest heavily in industry and automation. This is further supported by increased investment in capacity to meet growing demand for paper in developing nations.

With lack of spending, equipment grows older and becomes less efficient relative to newer technology. Subsequently, producers become less competitive as operations become more costly. This represents an opportunity for automation suppliers if paper manufacturers decide to invest in aging assets or improve operational efficiency through increased automation. It also represents an opportunity for increased optimization services as paper companies focus on their core competencies and outsource other activities. At current investment levels, there have been many mill closures in North America due to the level of competition in the global paper industry. If trends in capital spending shift downward in North America, there would be increased pressure on existing mills to close thereby reducing legacy system upgrade opportunities for Honeywell. This would be partially offset by relocation of machines to Asia and the subsequent investment by Asian papermakers to increase automation and competitiveness in their own market. Growth in capital spending in Asia provides opportunities for automation suppliers including new system sales, service contracts, and system upgrades. If trends slow down or reverse in Asia, it could have a significant impact on automation suppliers. With increasing focus on the environment and

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the likelihood of changes in regulation, papermakers may shift capital spending to upgrading their plants in areas other than automation. Honeywell must consider this possibility in assessing the strategic alternatives.

4.5.2 Environmental Regulation and Energy Usage

Papermaking is one of the most energy intensive industries and has the potential to be impacted greatly by increased government regulation and enforcement of environmental policy. This may be beneficial for automation suppliers if government standards favour automation as a means to achieve a specific level of efficiency, and process control to minimize effluents and other emissions.\(^49\) It may also result in closure of older, smaller, less efficient machines in favour of larger, more economical modern machines. Opportunities for automation are greater on newer machines that require sophisticated controls for maximum efficiency.

Global energy prices are also on the rise and will have a direct impact on the cost of operations for energy intensive processes like papermaking. Process efficiency and system reliability will become even more critical as papermakers look for ways to reduce cost and remain competitive. Distributed control systems improve energy usage and waste recovery through advanced process controls and represent an opportunity for papermakers to optimize energy use. Enterprise level solutions have further advantages by providing management with real time information on process trends, product quality, and production costs thereby allowing them to make decisions on optimal production levels.

The cost of automation solutions will remain a concern for papermakers as they spend more on operations and invest less on capital improvement projects. With increasing substitutes for paper, papermakers will continue to feel pressure to keep prices low and will find it challenging to offset increases in production costs. If energy costs continue to rise, smaller

papermakers may not be able to survive and the industry could see further consolidation. This would benefit automation suppliers that have a relationship with the surviving company if there is an opportunity to upgrade or replace existing automation systems in the recently acquired mill. However, it could also serve to shrink the installed base and diminish market share for automation suppliers if operations are closed permanently.

4.5.3 Global Demand for Paper

Demand for paper is increasing in developing economies such as China and India. As population and income continue to grow, demand for everything increases due to the increased purchasing power of a larger number of citizens. At higher levels of personal wealth, demand increases for all types of paper as consumers acquire more material goods that require packaging and use more writing paper as part of personal development.  

Demand for most paper grades is flat or on the decline in the developed world. This is especially true for grades like newsprint where substitutes are readily available. The internet is the most obvious substitute for paper as a means of communication, but alternate forms of packaging material are having an impact on demand for container grades as well.

As paper substitutes become more prevalent, overall global demand for paper will decrease. Tissue grades may represent an exception, but printing, writing, newsprint, and container grades will all be affected. In the developing world where paper production is on the rise, a reduction in overall demand for paper would have an obvious impact on automation supply. Although this seems unlikely over the next decade, Honeywell must continue to monitor this trend and take the long-term impact into consideration in evaluating its strategic alternatives.


4.5.4 Assessment of Strategic Alternatives against Macro Industry Trends

A strategy involving differentiation on service and new technology, focus on Experion PKS, and cost leadership through consolidation of operations can be utilized in light of macro trends in the industry.

An enhanced service offering positions Honeywell well for changes in capital spending as customers focus on core competencies and look to automation suppliers for support in optimizing their systems. Optimization of process controls also helps reduce process waste and emissions, further supporting customer efforts to offset rising energy costs and increasing environmental regulation. Changes in global demand for paper will impact the demand for automation solutions and associated services. If demand decreases, rivalry will increase in the paper industry making service and the associated benefits on productivity more important for customers.

Development of new technology with a higher return on assets than competitive products makes it easier for customers to choose Honeywell when capital budgets are limited. Honeywell can also treat rising energy costs and increasing environmental regulation as design inputs to ensure that new technology accounts for these trends and minimizes the impact on customer operations. By monitoring global trends in paper demand, Honeywell can ensure that new developments are suitable for grades with the highest demand.

Continued focus on Experion PKS will position Honeywell well for changes in environmental regulation, especially if governments demand higher efficiency and reduced emissions from papermaking operations through automation. If industry trends result in customers spending less on automation, increased focus on Experion PKS and integration of lower level systems provides Honeywell with a more flexible offering for customers looking to make modest improvements in their process with limited investment.
Honeywell can benefit from consolidation of operations and the associated impact on the cost of automation systems. As all industry trends presented have the potential to impact a customer’s ability to invest in automation solutions, lowering costs provides Honeywell with more pricing flexibility to meet changing customer needs. This improves Honeywell’s ability to compete and helps protect its installed base and market share.

4.6 Summary of Strategic Alternatives for Honeywell

In this section, several strategic alternatives for Honeywell in the automation solutions industry were introduced and evaluated. An assessment of the generic strategic orientations of differentiation, cost leadership, and focus showed that it would not be appropriate for Honeywell to adopt one of these strategies wholeheartedly. It is more practical for Honeywell to adopt a combined strategy that emphasizes elements of each strategic orientation. Using decision making criteria based on industry key success factors, several strategic alternatives were evaluated for use as part of a combined strategy. To assess the robustness of the combined strategy, the top four strategic alternatives were evaluated against macro industry trends in capital spending, environmental regulation and energy usage, and global demand for paper. The outcome of this analysis is a recommendation for a combined strategy consisting of four strategic alternatives. The recommended strategy is presented in the next section and takes into consideration strategic fit with the organization and its internal capabilities.
5 STRATEGY RECOMMENDATION FOR HONEYWELL

The Author recommends that Honeywell adopt a combined strategy that involves consolidation of operations, differentiation on service, focus on Experion PKS, and differentiation on new technology.

Consolidation of operations will provide Honeywell with increased scale and will improve both cost and efficiency of operations. In turn, this will improve Honeywell’s ability to compete in the rivalrous automation solutions industry. Although regional consolidation may be the most practical approach in the short-term, Honeywell should consider further consolidation in the future as industry forces and macro trends will continue to put pressure on cost reduction.

Differentiation on service will allow Honeywell to capitalize on a significant market opportunity in the automation solutions industry. Profits are low in the paper industry and customers are continuously looking for ways to reduce cost of operations. A comprehensive service offering is attractive to customers that want to reduce cost through increased efficiency and minimization of waste. Automation solutions have the capability to address this need, but the full benefit can only be realized through optimization. By providing these services, Honeywell is helping its customers compete in their market. This kind of partnership will solidify Honeywell’s position in the industry. Honeywell is currently working on improvement in its service capability, but will have to increase its level of commitment to be successful in the long run.

Focus on Experion PKS will allow Honeywell to maintain its strong market position and customer value for enterprise level automation solutions. Experion PKS has very comprehensive functionality and does not suffer from the same degree of commoditization as traditional
distributed control and quality control systems. By focusing on increased system integration with Experion PKS, Honeywell will continue to expand the capabilities of Experion PKS and its value as a total solution for customers. It will also increasingly provide customers with a path for migration of legacy systems to Experion PKS, thereby protecting Honeywell’s vast installed base and its customers’ investment with Honeywell. Due to its growth potential as an automation solution for many industries, Honeywell will continue to invest heavily in Experion PKS. It only makes sense for Honeywell to capitalize on these efforts as part of a strategy for automation solutions in the paper industry.

Differentiation on new technology will reinforce Honeywell’s commitment to automation solutions for the paper industry and will improve its ability to compete. The solutions partnership nature of customer relationships must be considered as it prevents the larger companies from adopting a pure cost strategy. The majority of customers look to Honeywell for total solutions and there is an expectation that Honeywell will continue to innovate and discover new ways to improve the papermaking processes. If Honeywell does not continue to innovate and prove itself as a partner in the future success of its customers, it will lose market share to competition. Customers are price sensitive and have many choices. However, they are receptive to new technology and often treat it as a differentiator in making sales decisions. By pursuing technical leadership through differentiation on new technology and maintenance of existing products, Honeywell will capitalize on its ability to innovate without investing heavily in commodity products. This is a practical compromise for a mature industry that demands innovation from its suppliers.
APPENDICES

Appendix A

The following table represents a five forces analysis of the automation solutions industry based on a questionnaire developed by Professor Ray Sutaari, Wilfred Laurier University.
Table A-1: Five forces analysis summary for automation solutions in pulp and paper industry.

<table>
<thead>
<tr>
<th>Industry Force</th>
<th>Favourable</th>
<th>Between</th>
<th>Not Favourable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threat of New Entrants</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do large firms have a cost or performance advantage in your segment of the industry?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there any proprietary product differences in your industry?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there any established brands identities in your industry?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do your customers incur any significant costs in switching suppliers?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is a lot of capital needed to enter your industry?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is serviceable used equipment expensive?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the newcomer to your industry face difficulty in accessing distribution channels?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does experience help you to continuously lower costs?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the newcomer have any problems in obtaining the necessary skilled people, materials, or suppliers?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does your product or service have any proprietary features which give you lower costs?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there any licenses, insurance, or qualifications which are difficult to obtain?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can the new comer expect strong retaliation on entering the market</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Bargaining Power of Suppliers</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My inputs (materials, labor supplies, services, etc.) are standard rather than unique or differentiated.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can switch between suppliers quickly and cheaply.</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My suppliers would find it difficult to enter my business or my customers would find it difficult to perform my function in-house</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can substitute inputs readily.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have many potential suppliers.</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My business is important to my suppliers.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry Force</td>
<td>Favourable</td>
<td>Between</td>
<td>Not Favourable</td>
</tr>
<tr>
<td>----------------</td>
<td>------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>My cost of purchases has no significant influence on my overall costs.</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bargaining Power of Buyers</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a large number of buyers relative to the number of firms in the business?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have a large number of customers each with relatively small purchases?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the customer face any significant costs in switching suppliers?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the buyer need a lot of important information?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the buyer aware of the need for additional information?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there anything which prevents your customer from taking your function in-house?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your customers are not highly sensitive to price?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your product is unique to some degree or has accepted branding?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your customers' businesses are profitable?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You provide incentives to the decision makers?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Threat of Substitutes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substitutes have performance limitations which do not completely offset their lowest price or their performance advantage is not justified by their higher price.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The customer will incur costs in switching to a substitute.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your customer has no real substitute.</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your customer is not likely to substitute.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Competitive Rivalry</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The industry is growing rapidly.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The industry is not cyclical with intermittent over-capacity.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

97
<table>
<thead>
<tr>
<th>Industry Force</th>
<th>Favourable</th>
<th>Between</th>
<th>Not Favourable</th>
</tr>
</thead>
<tbody>
<tr>
<td>The fixed costs of the business are a relatively low portion of total costs</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>There are significant product differences and brand identities between competitors.</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>The competitors are diversified rather than specialized.</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>It would not be hard to get out of this business because there are no specialized skills and facilities or long-term contract commitments, etc.</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>My customers would incur significant costs in switching to a competitor.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My product is complex and requires a detailed understanding on the part of my customer.</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My competitors are all of approximately the same size as I am</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
<td><strong>1</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Industry Rating</th>
<th>Favourable</th>
<th>Moderate</th>
<th>Not Favourable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threat of new entrants</td>
<td>9</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Bargaining power of suppliers</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bargaining power of buyers</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Threat of substitutes</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Intensity of rivalry amongst competitors</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total for Industry</strong></td>
<td><strong>19</strong></td>
<td><strong>11</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

Source: Simon Fraser University EMBA Program, Business Strategy course notes, Spring 2007: table by Author.
REFERENCE LIST


