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User types and project involvement in role-based enterprise portal design

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Abstract

This research investigates the influence of user types (e.g., managers, analysts), project involvement, and gender on the design of role-based enterprise portals. A role-based prototype portal was deployed in a case company, and user experiences were assessed through surveys with different stakeholders. The results confirm that user types, project involvement, and gender have minimal impact on user experience within a well-designed role-based portal. the research identifies factors that favor the use of role-based content delivery in enterprise portals. This finding allows developers to focus on other design aspects, such as (1) Aligning portal content with the company's mission, vision, strategy, and objectives and (2) Optimizing the deployment of role-specific content. The research results suggest that considering these aspects is likely to increase user adoption of the portal. Additionally, the study highlights the importance of organizational charts in determining the structure (taxonomy) of a role-based portal design.

Keywords: Role-based Enterprise Portal, Project Involvement, Design Principles

Introduction

Companies that expand internationally (internationalization) face challenges in managing information due to the increased complexity of their operations. This includes dealing with diverse customer needs, regulations, and production factors across different countries. Research suggests that improved governance practices, especially those focused on information gathering and monitoring, can help address these challenges (Aguilera, et al. 2019; Poli, et. Al. 2021). To manage information overload, companies need robust systems capable of efficiently collecting, gathering, and analyzing large volumes of data from diverse sources and formats. Without such systems, companies risk losing the benefits of internationalization, such as leveraging localized knowledge for global advantage (Riviere, et al. 2018).

Information systems play a crucial role in effective global governance (Herath et al., 2023). They ensure information accessibility and foster a sense of community among international subsidiaries. Enterprise portals are essential tools for global companies, as they can effectively address various challenges. Role-based portals ensure that users receive information relevant to their job responsibilities (Davydov, 2001; Benbya, et al., 2004; Scheepers; 2006; Remus, 2007). However, designing these portals requires significant effort to identify and categorize content specific to different roles (Calegari, et al., 2019; Benbya, et al, 2004). One advantage of role-based portals is that they are less reliant on individual user characteristics, such as user type or gender since information delivery is based solely on roles.

This case study, conducted in collaboration with a growing multinational Fortune 500 company, focuses on the role-based content delivery feature of enterprise portals. It aims to understand how this functionality,

combined with good design practices, can serve as a valuable tool for corporate governance. Additionally, the study will explore the influence of user characteristics on the design of role-based enterprise portals.

Literature review

Despite its popularity and maturity, the term "portal" remains ambiguous. Davydov (2001) examines the evolution of the term "portal," noting that portals initially began as search engines like Yahoo!, Lycos, Excite, and AltaVista. These websites evolved into entry points with hyperlinks to the expanding World Wide Web, eventually becoming repositories of information and adding community collaboration features (Dias, 2001; Davydov, 2001; Benbya et al., 2004; Scheepers, 2006; Remus, 2007; Calegari, et al., 2019). At this stage, terms such as "portal," "Internet portal," and "Web portal" became interchangeable. Davydov (2001) defines portals as "a single, Web-based interface into the world of heterogeneous and incompatible information sources distributed across the network." The rise of corporate intranets significantly contributed to the acceptance of portals in the business world (Ahmed Fadelelmoula, 2020; Calegari, et al., 2019; Remus, 2007). Portals coexisted with intranets and supported features such as seamless access to information stored in text documents and corporate databases (e.g., sales, financial, inventory) from any browser-enabled desktop, highlighting the need for a "single point of navigation through the enterprise."

Portal technology has remained a dynamic market for the software industry. This dynamism, coupled with various usage scenarios arising from new technologies like ubiquitous computing and Internet access, makes it challenging to establish a stable classification scheme for different types of portals. As shown in Figure 1, portals can be broadly categorized into public portals, corporate/enterprise portals, and personal portals. Public portals, or Internet/Web portals, can be further subcategorized based on their scope and audience as horizontal or vertical (Dias, 2001; Davydov, 2001; Augustyniak et al., 2005). Horizontal portals are broad and general, typically aimed at consumer audiences. They attract numerous visitors by offering complementary services like news, weather forecasts, and access to search engines, email, instant messaging, and personal home page hosting. Examples include Google, AOL, MSN, and Yahoo! Vertical portals, or "vortals," are subject- or industry-specific, providing specialized information and services to particular audiences (Augustyniak et al., 2005). Examples include WebMD, TripAdvisor, CNET, and Spotify.

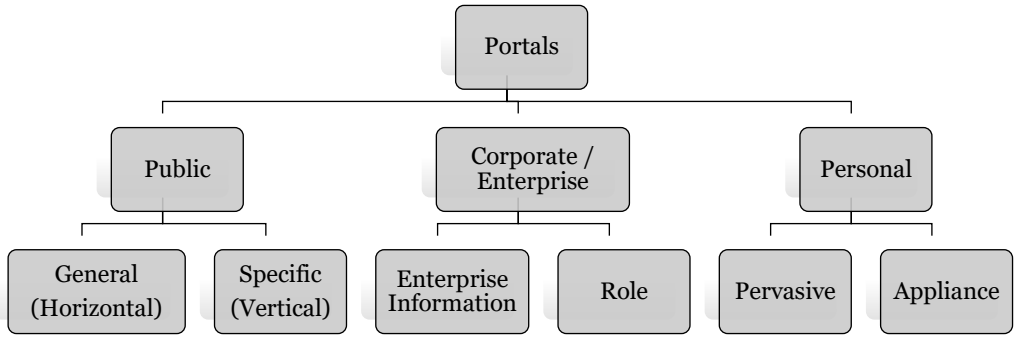

Figure 1: Categories of Portals

Corporate and enterprise portals have evolved significantly, bridging gaps left by corporate intranets. Corporate portals are typically role-structured within an organization, while enterprise portals extend to customers, vendors, and external roles (Collins, 2001; Dias, 2001; Benbya et al., 2004; Burgess & Tatnall, 2007; Calegari et al., 2019). These portals provide integrated access to information and business applications, supporting personalization, customization, and fostering collaboration and community building. Modern enterprise portals have evolved from simple web gateways to sophisticated platforms

offering personalized access to information and functionalities (Pinho et al., 2018; Calegari et al., 2019), supporting dynamic tools for information management (Pinho et al., 2018).

Pervasive computing has introduced embedded portals in phones, appliances, and cars (Davydov, 2001; Tatnall, 2005), enabling remote interaction. Modern enterprise portals integrate various technologies for a comprehensive user experience. For instance, High-Performance Computing (HPC) portals emphasize job submission, data management, and visualization tools (Calegari et al., 2019). Patient portals demonstrate functionalities like appointment scheduling and secure communication, with potential applications in broader enterprise contexts (Bao et al., 2020). User-friendly interface design is crucial for enterprise portal design (Pinho et al., 2018).

Collins (2001) defines enterprise portals as "browser-based applications that allow knowledge workers to access, collaborate with, make decisions, and act on a wide variety of business-related information regardless of the employee's virtual location or department affiliations." Hazra (2002) describes them as "enterprise-wide integration of business applications to the Web," aiming to deliver an electronic workspace for business professionals. These portals use a stack of technologies for federated access to business content and applications, enabling seamless interactions among clients, partners, vendors, and employees (Collins, 2001; Dias, 2001; Benbya et al., 2004) and serves as a single point of entry, access, and information interchange (Collins, 2001; Dias, 2001; Hazara, 2002; Benbya et al., 2004; Burgess & Tatnall, 2007).

Portal usage can be viewed from operational and strategic perspectives (Collins, 2001). Operationally, portals assist employees with day-to-day tasks, simplifying processes (Collins, 2001; Pinho et al., 2018). For example, High-Performance Computing (HPC) portals address researchers' and scientists' operational needs (Calegari et al., 2019). Strategically, portals provide decision-makers with timely and reliable information to achieve or surpass organizational missions (Collins, 2001; Fadelelmoula, 2020). By offering access to relevant data and insights, portals equip leaders with knowledge for informed decision-making, driving organizational success.

Enterprise portals are categorized into business-to-consumer (B2C), business-to-business (B2B), and business-to-employee (B2E) portals (Ash & Burn, 2003; Lundin & Kindström, 2023). B2C portals, designed for consumers, facilitate online retail or procurement by establishing Internet-based relationships between organizations and their customers, partners, and vendors. Examples include American Airlines' reservation system, Amazon's customer profiling, and Dell's self-service sales experience. B2B portals enhance collaboration among businesses by creating Internet-based infrastructures for shared supply chain platforms, yielding significant efficiency gains (Cho, 2006; Lundin & Kindström, 2023). B2E portals focus on human resources, integrating ERP and HR information systems with user profiles to foster a role-based work environment (Ash & Burn, 2003; Remus, 2007). These portals manage HR functions such as positions, compensation, recruiting, hiring, training, promotion, relocation, retirement, and the administration of benefits, pensions, and payroll

Researchers highlight the portal's role in fostering a common community, and enhancing corporate governance (Collins, 2001). Corporate portals aim to surpass traditional intranets by logically organizing and cataloging content from enterprise systems, making it more accessible. Customization allows users to find meaningful information, and seamless access to daily systems like email, financial data, operational information, customer data, and technical reports is crucial (Benya et al., 2004; Burgess & Tatnall, 2007; Amini & Abukari, 2020). These portals facilitate knowledge sharing, enabling employees to seek insights from superiors, colleagues, and collaborators. Enterprise portals can be categorized by the types of information they present (i.e., Information/Knowledge Enterprise Portal) or by the role they play within an

enterprise, as shown in Figure 2. An enterprise information portal (EIP), or knowledge portal, is a comprehensive solution combining myriad technologies, capabilities, and features aiming at becoming a one-stop-shop for corporate information, communication and collaboration within the corporate environment and beyond (to reach customers, vendors, and partners). An information/knowledge portal is often classified as a content management portal, business intelligence/reporting portal, expertise portal, collaborative portal, ERP portal, and Intranet/unstructured portal.

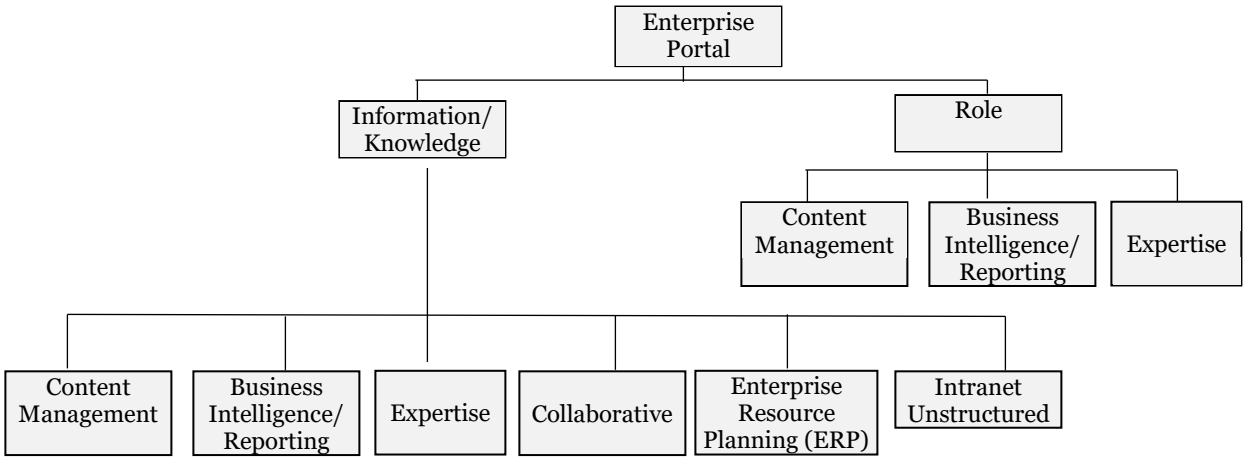

Figure 2: Types of Enterprise Portals

Research on user characteristics such as gender, age, and experience has explored their impact on user satisfaction with web portals, revealing no gender-based differences in satisfaction (Xiao & Dasgupta, 2005; Huang et al., 2003). Henriksen and Pedersen (2009) noted significant impacts of enterprise portal personalization on perceived usefulness, ease of use, attitude, and perceived behavioral control, moderated by gender. However, studies specifically focusing on gender in a role-based enterprise portal environment are scarce. While the importance of upper management involvement in developing information systems is emphasized, suggesting executive belief in IT benefits is crucial (Tseng, 2008; Herath et al., 2023), there's a research gap on how management status and project involvement level affect perceived system effectiveness, particularly for portals (Karat & Karat, 2003).

Methodology

This research investigates the influence of user type, project involvement, and gender on role-based enterprise portal design using a case study approach. A role-based portal provides users with relevant information based on their responsibilities, suggesting that its design is less sensitive to user influence. The study developed a prototype portal, evaluated through surveys targeting different stakeholders in the case company.

User type, project involvement, and gender are binary independent variables, indicating if a respondent is an administrator or general user, male or female, and involved or not involved in prototype development. The influence of these variables on portal design is measured by effectiveness, usability, and the ability to convey the organization’s corporate image and values. Effectiveness was assessed by how easily respondents could find specific information on the prototype. Usability was measured by ease of use, interface friendliness, and presentation attractiveness. Corporate image and values recognizability were measured by the perceived value of logo design in conveying corporate strategies, goals, and objectives, consistent content placement across portal pages, and generalized usage of document templates.

A literature review was conducted to characterize portal solutions in global corporations, identify the role and impact of enterprise portals, classify motivations for portal implementation, and categorize portal functionality. Prototype requirements were gathered through on-site visits over six months, allowing rich interaction with employees at the case company. The research question and hypotheses, along with data collection methods, are detailed in the subsequent sections.

Research Question and Hypotheses

The overall research question addressed by this study is "Are employees' perceptions of a role-based enterprise portal's effectiveness, usability, and corporate image/values recognizability influenced by the user types, gender, and project involvement?" To address this question, the following research hypotheses were developed:

Hypothesis 1: User Type effect:
There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among employees of user types. (H_0: $Type_i = 0$)

Hypothesis 2: Gender effect
There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among employees of different gender. (H_0: $Gender_j = 0$)

Hypothesis 3: Project Involvement effect
There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among employees that were and were not involved in project development. (H_0: $Involve_k = 0$)

Hypothesis 4: Interaction between User Type and Gender
There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among the same user type regardless of their gender. (H_0: $Type_i$ X $Gender_j = 0$)

Hypothesis 5: Interaction between User Type and Project Involvement.
There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among the same user type regardless of their project involvement. (H_0: $Type_i$ X $Involve_k = 0$)

Hypothesis 6: Interaction between Gender and Project Involvement.
There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity among employees of the same gender regardless of their project involvement. (H_0: $Gender_j$ X $Involve_k = 0$)

The research model is stated as below:

$$Y_{x\ i,j,k} = \mu + Type_i + Gender_j + Involve_k + Type_i \text{ X } Gender_j + Type_i \text{ X } Involve_k + Gender_j \text{ X } Involve_k + e_i$$

Where

$Y_{x\ i,j,k}$: Performance outcome, x = 1, 2, 3
μ : the overall mean effect;
$Type_i$: User Type effect, i = 1, 2
$Type_1$: administrator or $Type_2$: general users
$Gender_j$: Gender effect, j = 1, 2
$Gender_1$: Male employees or $Gender_2$: Female employees
$Involve_k$: User Type effect, k = 1, 2
$Involve_1$: Employees involved in project development
$Involve_2$: Employees not involved in project development
e_i = random effect.

Table 1 provides the name of the effectiveness, usability, and corporate identity design measures along with the corresponding survey questions.

Table 1:Name of the Effectiveness, Usability, and Corporate Identity Design Measures with Corresponding Survey Questions

Dependent Variable	Measure Name	Survey Questions
Effectiveness	News	I can find Human Resources News
	Contacts	I can find Human Resources Contacts
	Emp_info	I can find links to the following applications: Employee Self Service, Online Paystub, Online W2, and Wells Fargo (P-Card)
	Emp_benefit	I can find Benefits and Compensation information
	Emp_service	I can find information about the Services offered by the Human Resources Department
	Emp_train	I can find Employee Training and Development information
	Emp_notice	I can find the Employee Notices
Usability	EasyUse	The proposed system is easy to use.
	Interface	The proposed system has a user-friendly interface.
	Visual	The proposed system has an attractive presentation.
Corporate Identity Design	Logo_value	Associating the company's Four Pillars for Management (Collaborate/Innovate/Inspire/Execute) with the logo helps me to understand the company's strategies, goals, and objectives.
	Portal_layout	I find it beneficial to have a consistent placement for common sections (such as News, Document Libraries, Contacts, Organizational Charts, …) across different sections of the portal.
	Contact_template	I find it beneficial to have common templates for contact sheets and employee profiles across different sections of the portal.

Case Study Company

Headquartered in Missouri and employing 7,300 people, the case company is a Fortune 500 company with a total revenue of over $6,000 million. The case company's operations are primarily centered in two countries: the United States and Australia. Throughout the years, the case company has significantly diversified the source of its reserves and expanded its trading and brokerage activities worldwide. Its growing network of offices spans globally: the United States, Europe, Australia, China, Indonesia, South Africa, and South America. The truly global nature of the case company's operations, now embracing different cultures, languages, and time zones, represents a major challenge to corporate culture and value awareness organization wide. The case company's expansionary path, sometimes a result of acquisitions, adds to the complexity of promoting global vision alignment. Despite the new challenges, as the case company expands globally, effective and timely communication remains a critical business requirement.
After a successful ERP implementation in the early 2000s, the case company is currently focusing on providing optimal support to business users in an increasingly global operation. This new effort has two main focuses: accessibility (i.e., providing access to the right set of tools to the right people) and usability (i.e., making it as simple and intuitive as possible).

While many of the business units' content had already been migrated from the legacy corporate intranet to the new portal, the Human Resources (HR) content remained an exception, to a great extent, due to the intricate security surrounding many of its documents. This arose as the perfect opportunity to develop a

prototype using role-based personalization which could, in turn, accelerate the deployment of the underlying solutions required for the Human Resources content to be deployed in the new portal. As part of its migration to SAP, the case company runs the SAP Netweaver Portal as its enterprise information portal solution. This new portal replaces a custom-developed corporate intranet (officially decommissioned by the end of June 2010). The prototype was developed on this Portal platform.

Case Company Prototype Development

Role-Based Portal Design and Deployment

The system currently features 139 content objects, with the majority (55%) in the Benefits and Compensation group, followed by HR Services (23%), Employee Development (16%), and the Home Page (6%). Approximately 35% of these objects are deployed as role-based personalization, while 65% are visible to all users. A detailed breakdown reveals that the "Benefits and Compensation" group not only has the largest cluster of pages but also relies most on role-based content, with 58% of its content being role-aware. This group alone accounts for 92% of all role-based deployed content, while the remaining 8% is on the HR Services page. Figure 4 illustrates the distribution of role-based personalized content by site area.

The system currently features a total of 139 content objects. The majority of them belong to the Benefits and Compensation group (55% of the total), followed by the HR services group (23%), Employee Development (16%), and, finally, the Home Page (With 6% of the total). About 35% of content objects are deployed as role-based personalization. The majority of the content (65%) is visible to all the users. Drilling down further, Figure 4 below provides a breakdown of the content objects relying on role-based personalization for deployment by Site area. The largest cluster of pages “Benefits, and Compensation” is also one that relies the most on role-based content – more than half of its content (58% to be exact) is role-aware. This page alone accounts for 92% of all the role-based deployed content. The remaining 8% lies on the HR Services page.

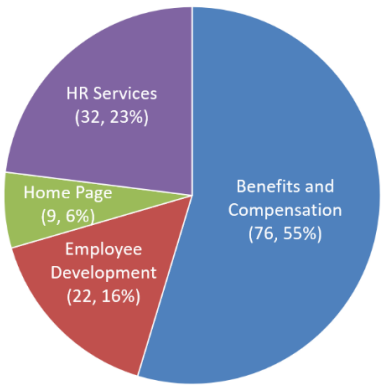

Figure 3: Content Distribution per Cluster

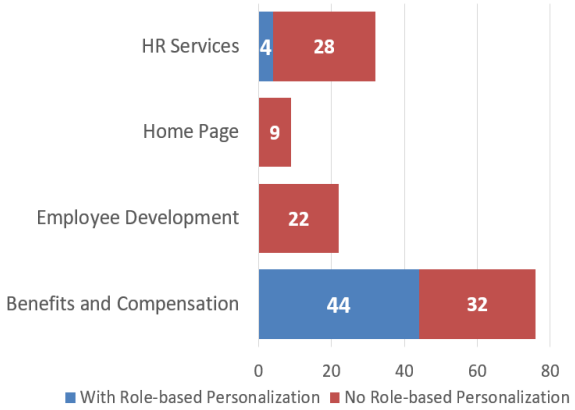

Figure 4: Content has Role Differentiation (by Cluster)

Portal Governance Design

Portal governance revision achieved three major accomplishments: portal branding logo redesign, consistent portal page layout definition, and common document template definition. Please note that, in

order to protect the identity of the case company, the company's full name is replaced on all screenshots by "XYZ", and its abbreviation by "XX".

Portal branding logo redesign. Seeking to increase the readability of the case company enterprise portal brand, a new version of the existing logo was created, as shown in Figure 5. Remaining loyal to the original typeface, proportions, and color scheme, the new version makes exclusive use of typography, dropping the pictorial element for the benefit of a stronger, clearer, more identifiably brand. The reduced height provides some screen real-estate gains. In contrast with the original version, which was exclusively available in a low-resolution raster graphics file, the new one was created in vector format, with all the added flexibility that it entails. A second version of the logo was created to include the four directives defined by the case company's Human Resources department and passed on to management.

Original Logo

Redesigned logo

New Logo Derivation Featuring Management Directives

Figure 5: Logo Redesign (Before and After)

Consistent Portal Page Layouts. In an effort to standardize page layouts across the portal, new rules were formally documented, to guide content administrators on how to structure their pages. These seek to provide users with visual cues redounding on a sense of familiarity and ultimately leading to easier and faster content retrieval in the portal. All portal pages should feature banners identifying its topic.

Document Templates: The effort to standardize the content on the portal expands to documents, despite being contributed by different areas of the business, exhibit similar structure. These include department news, department or team contact sheets or employee profiles. All templates feature the derivation of the new logo including the four management directives: apart from indicating where the documents were obtained, this enforces a sense of belonging to a common organization, while being a subtle reminder of notions that have been defined as integral to good performance by the case company.

Data Collection

Online surveys were created and emailed to 64 employees of the case company. As shown in Table 2, the response rate was 62% among general employees and 64% among steering committee members. Considering only the general users, 58% of the respondents are male and 42% female. Regarding the steering committee respondents, the numbers reveal that 14% of the respondents were male (this percentage represents, in fact, a single respondent) and 86% female. Table 4 shows classifications of survey respondents.

Table 2 Gender

	Employees (53)		Steering Committee (11)		Overall (64)	
Gender	**Number of Responses**	**%**	**Number of Responses**	**%**	**Number of Responses**	**%**
Male	19	58%	1	14%	20	50%
Female	14	42%	6	86%	20	50%
Total	33	100%	7	100%	40	100%
Response Rate	62%		64%		63%	

Table 3 below shows the response rate for participating individuals, broken down by ranges of number of employees under one's direct supervision. The overall response rate was 63% with the vast majority of the responses (70%) revealing that the respondents are not administrators. The response rate was 62% among general employees and 64% among steering committee members. Among the general employees, 79% of the respondents are also not administrators. The steering committee has 71% administrators who are one to five employees

Table 3: Number of Employees Under Direct Supervision

	Employees (53)		Steering Committee (11)		Overall (64)	
Number of Employees	**Number of Responses**	**%**	**Number of Responses**	**%**	**Number of Responses**	**%**
None	26	79%	2	29%	28	70%
1-5	5	15%	5	71%	10	25%
6-40	1	3%	0	0%	1	3%
>= 40	1	3%	0	0%	1	3%
Total	33	100%	7	100%	40	100%
Response Rate	62%		64%		63%	

4. Results

Figure 6 summarizes the respondents' perceptions of the several questions that were part of the demographic section of the survey, which was presented to the respondents before the prototype was introduced. One sample mean tests at $\alpha = 0.05$ indicate the statistical significance that the majority of the respondents are aware of the case company's mission, vision, and values, find such information motivational, are willing to use an enterprise portal solution given that it provides information that is relevant to their jobs, would perform better if primarily shown information that applies to them, find it easier to retrieve information from systems with consistent layouts, and consider limiting access to sensitive information an effective measure to protect company information.

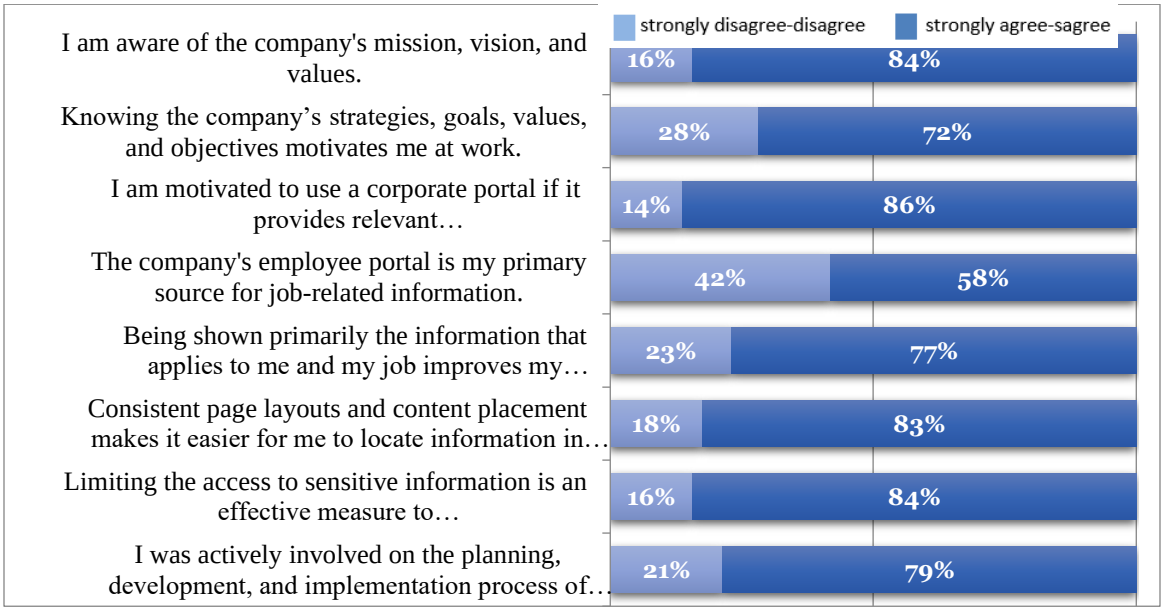

Figure 6: Employee Background Information and Perception Prior to Prototype Demo

Figure 7 below illustrates the respondents' perception of the prototype's usability. One sample mean test at $\alpha = 0.05$ level indicated statistical significance that the prototype is easy to use, has a user-friendly interface,

an attractive presentation, and provides a clear high-level breakdown of the company's Human Resources Department structure. Figure 8 illustrates the respondents' perception of the prototype's effectiveness. One sample mean test at $\alpha = 0.05$ level indicated statistical significance that the prototype is easy for them to find news, contacts, applications links, benefits, and compensation information, information about services offered, information on employee training and development, and employee notices within the Human Resources site.

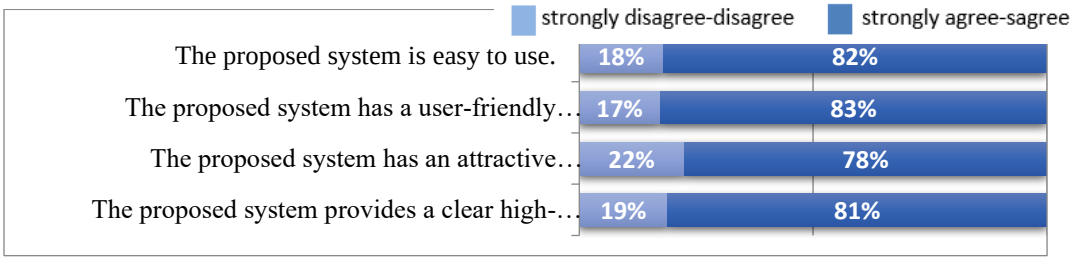

Figure 7: Employee Perception of Usability After Prototype Demo

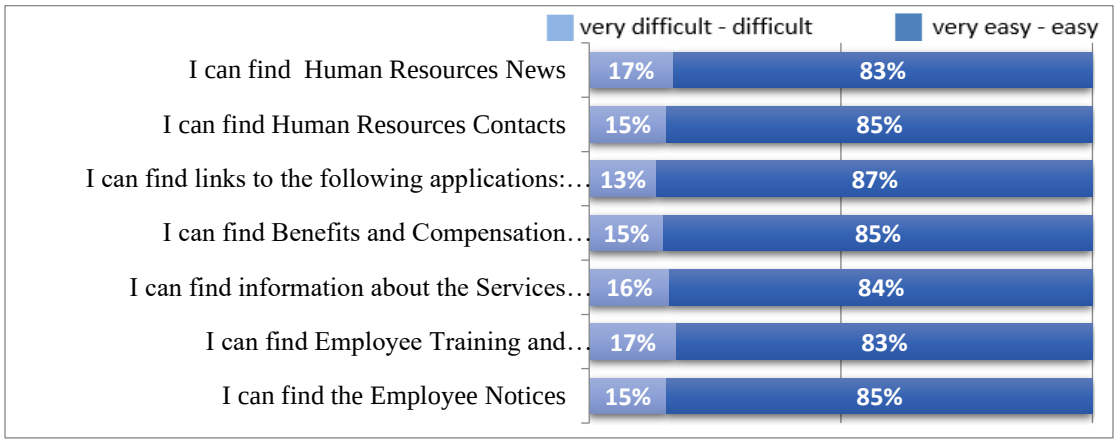

Figure 8: Employee Perception of Prototype Effectiveness.

Multiple analysis of variance (MANOVA) was used to test the proposed hypotheses. As the dependent measures for effectiveness, usability, and corporate identity design of a role-based Enterprise Portal are not independent to each other and the same subject is used to answer various questions for each effect, the design is a Multivariate Repeated Measure. Therefore, multiple analysis of variance (MANOVA) is used to evaluate the main and interaction effects of categorical variables on multiple dependent interval variables. MANOVA is used to compare groups formed by categorical independent variables on group differences in a set of interval-dependent variables. In this case, the MANOVA was used to test if an overall effect is significant based employee's management role, gender, and project involvement. Where the MANOVA results were significant, univariate analysis was conducted to test if the influence of the independent variables is significantly measured by the measures of the dependent variables (i.e., Effectiveness, Usability, Identity).

Hypotheses Testing And Results Discussions

MANOVA tests were conducted to investigate interaction effects (hypotheses 4 to 6) and concluded that interactions were not significant among all three independent variables: user types, project involvement,

and gender. Therefore, hypotheses 1 to 3 were carried out and results are presented in the following sections.

Hypothesis 1: *There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among employees of different user types. (H_0: $Type_i = 0$)*

The MANOVA tests are conducted to test if observations from descriptive statistics are statistically significant and the MANOVA results are provided in Table 6. As the p-value from Wilks' Lambda and Hotelling's Trace are greater than 0.05 at α=0.05 level, there is no sufficient evidence to reject null hypothesis 1. That is, the perceived effectiveness, usability, and corporate identity design are not affected by the employees' management role. As none of the MANOVA results is statistically significant, univariate analysis is not conducted.

Table 6 MANOVA Test Results (a. Exact statistic)

	Effect	Value	F	Hypothesis df	Error df	Sig.
Effectiveness	Pillai's Trace	0.101	.433[a]	7	27	0.873
	Wilks' Lambda	0.899	.433[a]	7	27	0.873
	Hotelling's Trace	0.112	.433[a]	7	27	0.873
	Roy's Largest Root	0.112	.433[a]	7	27	0.873
Usability	Pillai's Trace	0.015	.157[a]	3	31	0.925
	Wilks' Lambda	0.985	.157[a]	3	31	0.925
	Hotelling's Trace	0.015	.157[a]	3	31	0.925
	Roy's Largest Root	0.015	.157[a]	3	31	0.925
Identity	Pillai's Trace	0.009	.095[a]	3	30	0.962
	Wilks' Lambda	0.991	.095[a]	3	30	0.962
	Hotelling's Trace	0.01	.095[a]	3	30	0.962
	Roy's Largest Root	0.01	.095[a]	3	30	0.962

Hypothesis 2: *There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among employees of different genders. (H_0: $Gender_j = 0$)*

Descriptive statistics for the seven effectiveness measures, three usability measures, and three corporate identity design measures broken down by gender are provided in Table 7. Results clearly indicated that respondents tend to clearly agree with the proposed statements, with means varying between 3.65 and 4.7. For all the measures of effectiveness, female respondents, more than their male counterparts, agreed that the proposed tasks were easier to accomplish. The same statement is true for the usability measures, with women finding the site easier to use, more user-friendly, and more appealing than men. Finally, in regards to corporate identity design, male respondents gave a significantly higher rating to the importance of incorporating managerial values in the logo design when compared to the one attributed by female respondents. The inverse was true for maintaining a consistent layout across portal sites and employing document templates, both features that were considered more relevant by females.

The MANOVA tests are then conducted to test if observations from descriptive statistics are statistically significant and the MANOVA results are provided in Table 7. For effectiveness and usability measures, as the p-value from Wilks' Lambda and Hotelling's Trace are greater than 0.05 at α=0.05 level, there is no sufficient evidence to reject null hypothesis 2 and no univariate tests are needed. That is, the perceived effectiveness and usability are not affected by employee gender. However, the p-values from Wilks' Lambda and Hotelling's Trace are 0.01 and 0.01 respectively and that are less than 0.05 at α=0.05 level, there is no sufficient evidence to accept null hypothesis 2 when measured by corporate identity design (Identity). That is, the perceived corporate identity design is affected by employee gender. Therefore,

univariate analysis is conducted and the results are provided in Table 8. The p-values for embedding the Four Pillars for Management (Collaborate/Innovate/Inspire/Execute) into the logo design (Logo_value), consistent portal layout (Portal_layout), and using document templates (contact template) are 0.204, 0.006, and 0.758 respectively as shown in Table 9. Therefore, the influence of gender is not significant when measured by embedding the Four Pillars for Management into the logo design and by using document templates.

Table 7: Descriptive Statistics by Gender

Dependent Variables		Gender	Mean	Std. Deviation	N	Dependent Variables		Gender	Mean	Std. Deviation	N
Effectiveness	News	1 Male	4.32	0.749	19	Usability	Easy Use	1 Male	4.21	0.976	19
		2 Female	4.38	0.669	21			2 Female	4.38	0.669	21
		Total	4.35	0.7	40			Total	4.3	0.823	40
	Contacts	1 Male	4.32	0.749	19		Interface	1 Male	4.21	0.976	19
		2 Female	4.48	0.602	21			2 Female	4.43	0.676	21
		Total	4.4	0.672	40			Total	4.33	0.829	40
	Emp_info	1 Male	4.47	0.841	19		Visual	1 Male	4	1	19
		2 Female	4.48	0.602	21			2 Female	4.24	0.7	21
		Total	4.48	0.716	40			Total	4.13	0.853	40
	Emp_benefit	1 Male	4.32	0.749	19	Corporate Identity Design	Logo_value	1 Male	4.06	0.998	18
		2 Female	4.52	0.602	21			2 Female	3.65	0.933	20
		Total	4.43	0.675	40			Total	3.84	0.973	38
	Emp_service	1 Male	4.26	0.733	19		Portal_layout	1 Male	4.22	0.548	18
		2 Female	4.48	0.602	21			2 Female	4.7	0.47	20
		Total	4.38	0.667	40			Total	4.47	0.557	38
	Emp_train	1 Male	4.21	0.787	19		Contact_template	1 Male	4.39	0.502	18
		2 Female	4.43	0.598	21			2 Female	4.45	0.686	20
		Total	4.33	0.694	40			Total	4.42	0.599	38
	Emp_notice	1 Male	4.26	0.733	19						
		2 Female	4.52	0.602	21						
		Total	4.4	0.672	40						

Table 8: MANOVA Test Results (* significant at α=0.05 level)

	Effect	Value	F	Hypothesis df	Error df	Sig.
Effectiveness	Pillai's Trace	0.066	.273[a]	7	27	0.959
	Wilks' Lambda	0.934	.273[a]	7	27	0.959
	Hotelling's Trace	0.071	.273[a]	7	27	0.959
	Roy's Largest Root	0.071	.273[a]	7	27	0.959
Usability	Pillai's Trace	0.011	.112[a]	3	31	0.952
	Wilks' Lambda	0.989	.112[a]	3	31	0.952
	Hotelling's Trace	0.011	.112[a]	3	31	0.952
	Roy's Largest Root	0.011	.112[a]	3	31	0.952
Identity	Pillai's Trace	0.309	4.475[a]	3	30	**0.01***
	Wilks' Lambda	0.691	4.475[a]	3	30	**0.01***
	Hotelling's Trace	0.447	4.475[a]	3	30	**0.01***
	Roy's Largest Root	0.447	4.475[a]	3	30	**0.01***

Table 9: Univariate Analysis Results (* significant at α=0.05 level)

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	Logo_value	1.558	1	1.558	1.675	.204
	Portal_layout	2.163	1	2.163	8.361	**.006***
	Contact_template	.035	1	.035	.096	.758
Intercept	Logo_value	562.506	1	562.506	604.584	.000
	Portal_layout	754.163	1	754.163	2915.855	.000
	Contact_template	740.141	1	740.141	2014.326	.000

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.
Gender	Logo_value	1.558	1	1.558	1.675	.204
	Portal_layout	2.163	1	2.163	8.361	**.006***
	Contact_template	.035	1	.035	.096	.758
Error	Logo_value	33.494	36	.930		
	Portal_layout	9.311	36	.259		
	Contact_template	13.228	36	.367		

However, the influence of gender is significant when measured by using a consistent portal layout. That is, as descriptive statistics provided in Table 10 indicate, female employees (mean value = 4.70) find it more beneficial to have a consistent placement for common sections (e.g., News, Document Libraries, Contacts) across different pages of the enterprise portal than male employees (mean value = 4.20).

Table 10: Descriptive Statistics for Using Consistent Portal Layout

Gender	Mean	Std. Deviation	N
1 Male	4.22	.548	18
2 Female	4.70	.470	20
Total	4.47	.557	38

Hypothesis 3: *There is no difference in the enterprise portal's perceived effectiveness, usability, and corporate identity design among employees who were and were not involved in project development. (H_0: $Involve_k = 0$)*

The MANOVA tests are conducted to test if observations from descriptive statistics are statistically significant and the MANOVA test results are provided in Table 11.

Table 11 MANOVA Test Results (a. Exact statistic)

	Effect	Value	F	Hypothesis df	Error df	Sig.
Effectiveness	Pillai's Trace	0.037	.146[a]	7	27	0.993
	Wilks' Lambda	0.963	.146[a]	7	27	0.993
	Hotelling's Trace	0.038	.146[a]	7	27	0.993
	Roy's Largest Root	0.038	.146[a]	7	27	0.993
Usability	Pillai's Trace	0.013	.135[a]	3	31	0.939
	Wilks' Lambda	0.987	.135[a]	3	31	0.939
	Hotelling's Trace	0.013	.135[a]	3	31	0.939
	Roy's Largest Root	0.013	.135[a]	3	31	0.939
Identity	Pillai's Trace	0.037	.388[a]	3	30	0.762
	Wilks' Lambda	0.963	.388[a]	3	30	0.762
	Hotelling's Trace	0.039	.388[a]	3	30	0.762
	Roy's Largest Root	0.039	.388[a]	3	30	0.762

As the p-value from Wilks' Lambda and Hotelling's Trace are greater than 0.05 at α=0.05 level, there is no sufficient evidence to reject null hypothesis 3. That is, the perceived effectiveness, usability, and corporate identity design are not affected by the employees' involvement in project development. As none of the MANOVA results is statistically significant, univariate analysis is not conducted.

Discussion

The case study data showed statistically significant positive perceptions of the company's mission, vision, values, and the prototype's usability and effectiveness at $\alpha = 0.05$. Respondents indicated they are motivated by the company's core information, prefer portals that provide job-relevant information, find consistent layouts beneficial, and support restricted access to sensitive data. MANOVA tests revealed no significant differences in perceived portal effectiveness, usability, and corporate identity design based on user types, management roles, or project involvement. However, gender differences were noted in the importance placed on consistent portal layouts, with female employees finding this feature more beneficial. This insight suggests that while user demographics may not broadly impact portal perceptions, certain design elements like layout consistency could be tailored to enhance user experience further.

Results from this research indicate that employees' perceptions of a role-based enterprise portal's effectiveness, usability, and corporate identity design are generally not influenced by user types, project involvement, and gender. This finding suggests that stakeholders and developers can shift their focus away from these factors and concentrate on other aspects of portal content development. The study also highlights that employees value portal designs that enhance their awareness of the company's mission, vision, values, strategies, goals, and objectives. Employees prefer to receive information pertinent to their roles and agree that limiting access to sensitive information is beneficial for protecting company data.

Limitations

The lack of significant influence from project involvement suggests that forming a well-structured project steering committee can be crucial for successful role-based enterprise portal design and development. Survey results showing positive reactions from both involved and non-involved employees imply that incorporating user-identified relevant features in the prototype fosters end-user adoption. Additionally, the study underscores the importance of requirement-gathering methodologies, such as free listing, card sorting, and joint application development sessions, and software development methodologies like rapid application development for similar web development projects.

Several constraints affected the amount of formally documented and analyzed data, including time limitations and shifting business priorities. The case company's technological infrastructure and specific concerns before the official project roll-out date restricted the survey assessments to a selected group of employees. Thus, results might differ if the survey were distributed to all employees within the company.

Conclusion and Future Research

This research provides valuable insights into the factors influencing the effectiveness, usability, and corporate identity design of role-based enterprise portals. It demonstrates that project involvement, user types, and gender do not significantly affect these perceptions, redirecting focus to other critical factors such as requirement-gathering approaches, user awareness of organizational values, and the company's organizational structure. The study also supports the adequacy of specific requirement-gathering and software development methodologies for web development projects.

Further analysis of the collected data, particularly survey results, presents an interesting future research direction. Exploring the impact of different independent variables, such as age and academic background, on corporate governance in a role-based enterprise portal environment would be beneficial. Redeploying the survey to a larger group of employees served with role-aware content could enhance the relevance of

the results. Additionally, investigating the factors determining the pages that benefit most from role-aware content deployment would be valuable for refining portal design strategies.

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